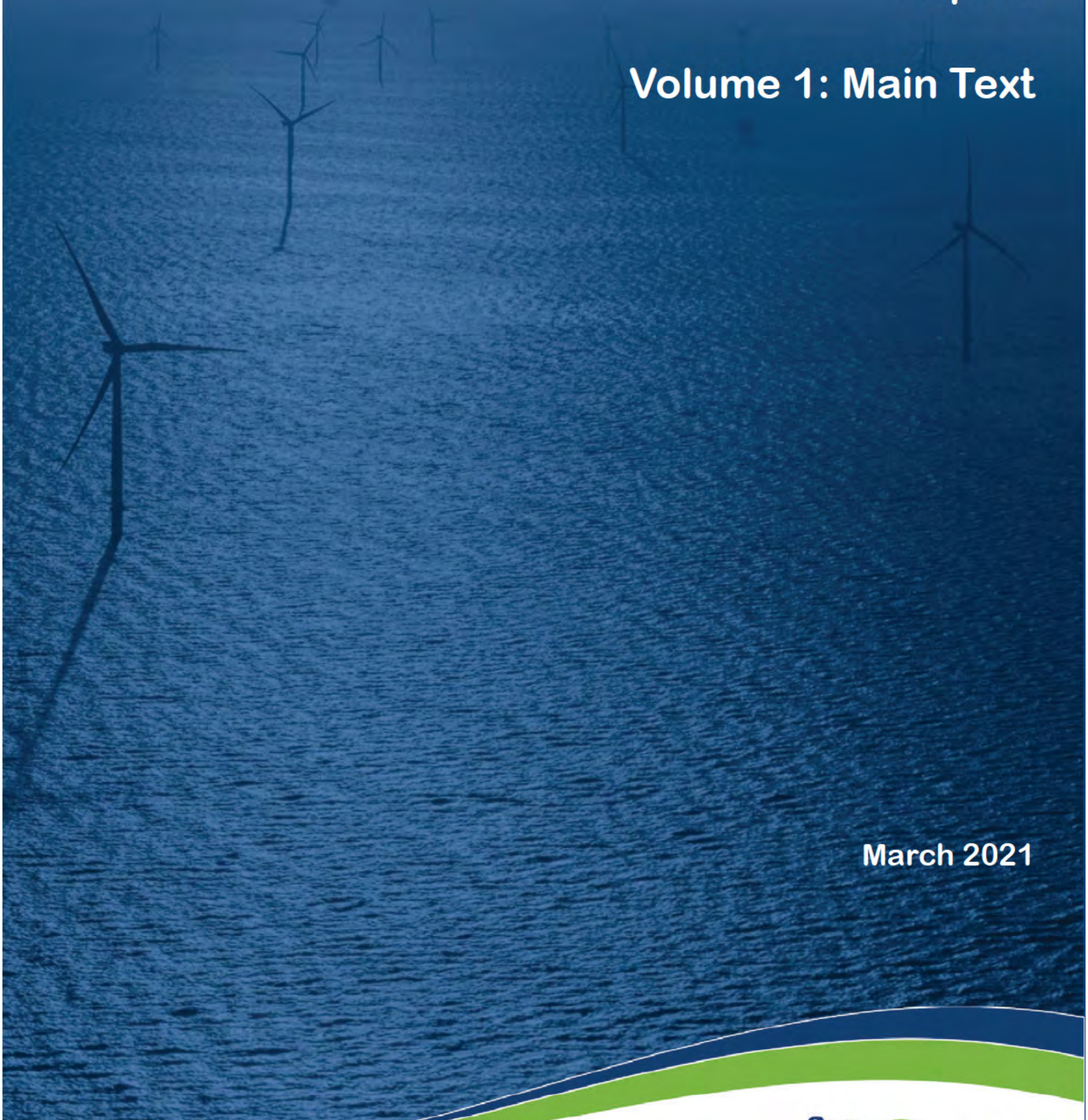
Seagreen 1A: Offshore Export Cable Corridor

Environmental Impact Assessment Report

Volume 1: Main Text



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Seagreen 1A Export Cable Corridor Environmental Impact Assessment Report

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Table of Contents

Table of Acronyms

AfL	Area for Lease
AIS	Automatic Identification System
B	Magnetic Components
BGS	British Geological Survey
CaP	Cable Plan
CBRA	Cable Burial Risk Assessment
CDM	Construction Design and Management
CEH	Centre for Ecology & Hydrology
CEMP	Construction Environmental Management Plan
CITES	Convention on International Trade in Endangered Species
CMS	Convention of Migratory Species
COSHH	Control of Substances Hazardous to Health Regulation
cSAC	Candidate Special Area of Conservation
DP2	Dynamic Positioning
E	Electric
ECR	Offshore Export Cable Corridor
EIA	Environmental Impact Assessment
ELC	East Lothian Council
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPS	European Protected Species
EU	European Union
FLO	Fisheries Liaison Officer
FMMS	Fisheries Management and Mitigation Strategy
GT	Gross Tonnage
TI	Trenchless Installation
HES	Historic Environment Scotland
HRA	Habitat Regulations Appraisal
HSE	Health, Safety and Environment

iE	Induced Electric
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
m	Meters
MBES	Multibeam Echosounders
MCA	Marine Coastguard Agency
MLWS	Mean Low Water Springs
MNNS	Marine Non-Native Species
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
µT	Micro Tesla
NCA	Nature Conservation Appraisal
NCMPA	Nature Conservation Marine Protected Area
nm	Nautical Miles
NMPi	National Marine Interactive Plan
NRA	Navigational Risk Assessment
O&M	Operation and Maintenance
OFTO	Offshore Transmission Owner
OTA	Offshore Transmission Asset
OWF	Offshore Wind Farm
PAC	Pre-Application Consultation
PAH	Poly-Aromatic Hydrocarbons
PCB	Poly-Chlorinated Biphenyls
PMF	Priority Marine Features
pNCMPA	Possible Nature Conservation Marine Protected Area
pSPA	Proposed Special Protection Area
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub-Bottom Profilers

SCANS	Small Cetaceans in the European Atlantic and North Sea
SEL	Sound Exposure Levels
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SG1A	Seagreen 1A Limited
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SMU	Seal Management Units
SSC	Suspended Sediment Concentration
SSS	Side Scan Sonar
SWEL	Seagreen Wind Energy Limited
SG1A Ltd	Seagreen 1A Limited
TEC	Transmission Entry Capacity
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra-Short Baseline
UXO	Unexploded Ordinances
V m-1	Volts Per Metre
VMP	Vessel Management Plan
VTS	Vessel Traffic Service
WTG	Wind Turbine Generators

1. Introduction

Seagreen Wind Energy Ltd (SWEL, hereafter referred to as Seagreen) is a joint venture between SSE Renewables and Total. In 2014 Seagreen was awarded Section 36 Consents (S36 Consents) under the Electricity Act 1989 by Scottish Ministers for Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs). Marine Licences for Seagreen Alpha and Bravo OWFs and the Offshore Transmission Asset (OTA) (together the 'Marine Licences') were also awarded by Scottish Ministers in October 2014, under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. Together the wind farms Seagreen Alpha and Seagreen Bravo and the OTA collectively comprise 'the Seagreen Project'.

To maximise energy generation and facilitate full export capacity for the Seagreen Project, Seagreen 1A Limited (hereafter referred to as Seagreen 1A, or SG1A) is proposing to consent an additional export cable corridor (approximately 110km) from the consented Seagreen Project Area to an identified landfall location at Cockenzie (see Figure 1-1). This single offshore export cable infrastructure comprises the offshore Seagreen 1A Project, hereafter referred to as the offshore SG1A Project.

In accordance with Part 4 of the Marine (Scotland) Act 2010, Seagreen 1A has submitted an application for a Marine Licence to Marine Scotland's Licensing and Operations Team (MS-LOT) for the installation of the offshore SG1A Project. This Environmental Impact Assessment Report (EIAR) covers the single offshore export cable infrastructure up to MHWS in support of the offshore SG1A Project Marine Licence application.

1.1 Background and Project Need

In February 2020, Seagreen received a grid offer from National Grid for the Cockenzie substation in East Lothian with Transmission Entry Capacity (TEC) of 360MW. This was accepted by Seagreen in June 2020, with a connection date of October 2023. The Project is currently considering whether this capacity could be increased, through dialogue with National Grid. The offshore SG1A Project, comprises one high voltage offshore export cable to mean high water springs (MHWS), cable landfall and connection to the onshore infrastructure. Scour protection and cable protection may also be required.

The proposed export cable infrastructure of the offshore SG1A Project will transmit electricity from up to 36 WTGs already consented in the Seagreen Project Area, via an OSP also consented under the Seagreen Project, to the new landfall location at Cockenzie.

An onshore EIAR has been prepared to accompany an application for PPP, in accordance with The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. Both EIARs have been prepared to meet the requirements of Schedule 4 of the EIA Regulations and the Institute of Environmental Management and Assessment (IEMA) Quality Mark Criteria. The EIAR also takes account of the relevant guidance set out in the Scottish Government Planning Advice Note (PAN2), which emphasises the importance of achieving a proportionate EIA scope, focussed on the likely significant effects. Any potential impacts which may result from the offshore SG1A Project landward of MLWS are considered within the onshore EIAR (Seagreen 1A EIA Report Volume 2: Main Report (LF000012-CST-ON-LIC-DEV-REP-

0002)) and not within the offshore SG1A Project EIAR. The term ‘the SG1A Project’ has been used when referring to the onshore and offshore components.

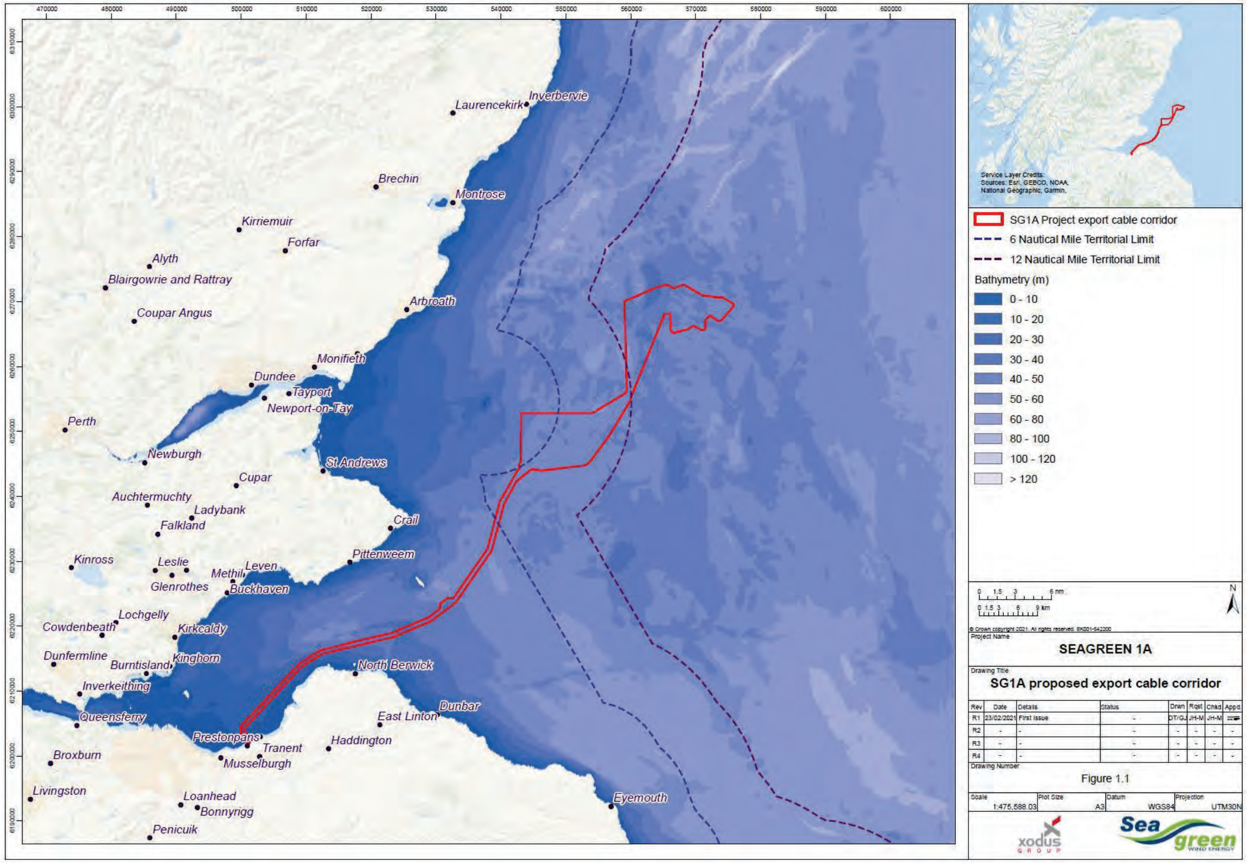


Figure 1-1 The proposed offshore SG1A Project export cable corridor

1.2 Purpose of the EIAR

The purpose of this EIAR is to support the offshore SG1A Project's Marine Licence application for a single offshore export cable. This EIAR is submitted in accordance with the requirements of the Marine Works (EIA) (Scotland) Regulations 2017, which transpose the amendments made to the EIA Directive 2011/92/EU by Directive 2014/52/EU.

In December 2020, the offshore SG1A Project submitted a Screening Request to Marine Scotland, requesting that an environmental impact assessment (EIA) was not required for the offshore SG1A Project. Details of this Screening Request can be found in Appendix A: Offshore SG1A Screening Report (LF000012-CST-OF-LIC-DEV-REP-0001).

Under the EIA Directive, an EIA is required for all projects listed under Annex I; Annex II projects may require an EIA depending on the potential environmental effects of the project. The offshore SG1A Project represents a change or an extension to an authorised project and therefore falls under the description of projects provided at Paragraph 13 of Schedule 2 of the 2017 EIA Regulations (i.e. a change to an installation for the harnessing of wind power for energy production (wind farms) where those works are already authorised). An Annex II project requires an EIA to be undertaken where the project is "likely to have significant effects on the environment by virtue of factors including their nature, size or location". A Screening Opinion was received from MS-LOT on the 19th February 2021 confirming Scottish Ministers have determined the offshore SG1A Project is an EIA project and therefore this EIAR has been produced in support of the Marine Licence application.

The potential environmental impacts of the offshore SG1A Project have been assessed using a systematic approach to EIA, in accordance with the Marine Works (EIA) (Scotland) Regulations 2017. This EIAR describes the potential impacts of the offshore SG1A Project throughout construction, operation and decommissioning for both project alone and cumulatively with other relevant infrastructure projects. Full details of the methodology is provided in Section 6 and the assessment conclusions presented in Section 13.

In addition to this EIAR, a Nature Conservation Appraisal Report (NCA Report) has been produced (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012- CST-OF-LIC-DEV-REP-0002)) to provide detailed assessment of the offshore SG1A Project's potential for effect on protected sites designated for their nature conservation interests.

In accordance with The Marine Licensing (PAC) (Scotland) Regulations 2013, a Pre-Application Consultation Report has been produced and is provided as part of the offshore SG1A Project Marine Licence application material.

This EIAR should be read in conjunction with the following documents:

- Marine Licence Application Form;
- Pre-application Consultation (PAC) Report;

- Screening Opinion and Screening Report (Appendix A: Offshore SG1A Screening Report (LF000012- CST-OF-LIC-DEV-REP-0001));
- Chart and WGS84 Co-ordinates of the Offshore SG1A Marine Construction Licence Boundary (Appendix B of the EIAR);
- Nature Conservation Appraisal (NCA) Report (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012- CST-OF-LIC-DEV-REP-0002)); and
- Navigational Risk Assessment (Appendix D: Offshore SG1A Navigational Risk Assessment (A4611-SSE-NRA-01)).

1.3 Project Team

This EIAR presents the results of the assessment of environmental impacts undertaken by a number of competent experts. This EIAR has been coordinated and prepared by Xodus Group. The offshore SG1A Project Team along with their respective disciplines and contribution to this EIAR are presented in Table 1.1.

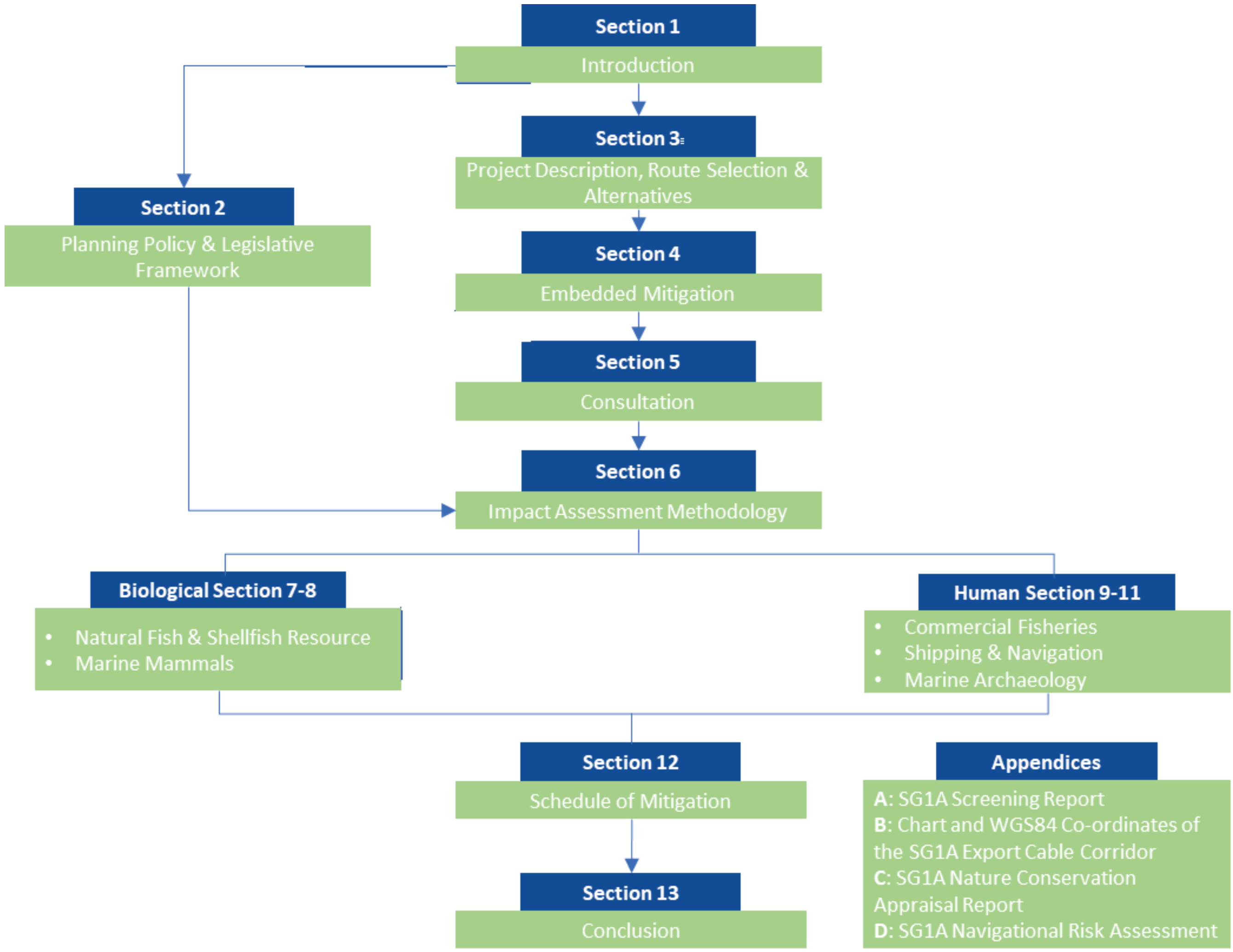
Table 1.1 Offshore SG1A Project EIA and Design Team

EIAR Input	Organisation	Expertise/Qualifications
EIAR Coordinator, Introductory chapters, Conclusion and Non-Technical Summary	Xodus Group	Xodus Group has decades of experience in delivering EIA and consent applications for offshore marine energy infrastructure, particularly offshore wind and export cable projects. The Xodus team was led by Alex Hampson and Jennifer Hilton-Miller. Alex has an MSc Environmental Governance, BSc Geography and CEnv. Alex is a Chartered Environmentalist with 12 years' experience in EIA and consenting for marine infrastructure projects. Jennifer's experience is detailed below in Natural fish and Shellfish Resource.
Principal designers and engineers (Project Description – Section 3)	SG1A	Seagreen 1 A Ltd is a joint venture between SSE Renewables and Total with extensive experience in the design, engineering, construction and operation of marine energy infrastructure in particular of export cables.
Legal advisors to the SG1A Project and part of the EIAR review team	Ampersand Advocates	Marcus McKay QC has a specialist interest in planning and environmental law. He is regularly involved in all aspects of the consents process for major energy projects from initial advice on the requirements of the Environmental Impact Assessment Regulations (including EIA Report work), to appearances at public inquiries and judicial review hearings in the Court of Session. Marcus has

		appeared at a wind farm inquiry in England and has experience of national infrastructure projects. He also acts for planning authorities and has successfully resisted applications for judicial review of planning decisions.
Natural fish and Shellfish Resource	Xodus Group	Lead author is Jennifer Hilton-Miller BSc Zoology, MSc Environmental Consultancy. Jennifer is a Senior Environmental Consultant, a Full Member of the IMarEST with 12 years' experience. Jennifer has worked on the production and review of EIAs, appraisals, consenting and stakeholder strategy for many offshore projects in Scotland. During her role as the Fisheries Liaison Officer (FLO) for 5 Scottish offshore windfarms and as the company FLO for SG1A, Jennifer gained detailed knowledge of the potential sensitivities of different projects and regions in Scotland, particularly in relation commercial fisheries, fisheries strategies, mitigation policies and assessment and mitigation of impacts.
Marine Mammals (including underwater noise)	Xodus Group	Lead author is Jennifer Smith BSc in Marine Biology, Research Masters in Applied Ecology. Jennifer has 16 years' experience working in the environment sector and has been marine mammal lead for a number of offshore renewable energy and export cable projects. Jennifer has strong technical background in statistical and spatial modelling combined with detailed knowledge of the marine environment giving her the required expertise to assess underwater noise impacts on marine mammals.
Commercial Fisheries	Xodus Group	Lead author is Jennifer Hilton-Miller, who is also the company FLO for SG1A (see above).
Shipping and Navigation	Anatec Ltd	Anatec are a Scottish marine risk consultancy and have been at the forefront of the marine hazard analysis and risk management field for over 20 years. Anatec have also completed Navigational Risk Assessments (NRA) and EIA Report chapters for the vast majority of UK offshore wind farm sites, including Scottish sites such as Moray Firth, Seagreen 1, Robin Rigg, Aberdeen Bay, Hywind Scotland, Kincardine, Beatrice, Inch Cape and NNG. Lead author is Lucy MacNay BSc Mathematics-Physics, PhD Mathematics. Lucy is a Principal Risk Analyst with ten years of technical experience

		working in risk assessment in the offshore renewables, oil & gas and marine industries. She has been involved in authoring and managing numerous Navigational Risk Assessments and Cable Burial Risk Assessments for interconnectors, telecommunication cables and export cables associated with offshore renewables developments. She has also been heavily involved in the research and development of models used to calculate risk related to subsea infrastructure, particularly subsea cables and pipelines, including anchor dragging, emergency anchoring, foundering, dropped objects and trawl gear interaction and has had extensive experience in producing cable and pipeline risk assessments in UK and international waters.
Marine Archaeology	Orkney Research Centre for Archaeology (ORCA)	Lead author is Paul Sharman BA, PGDip Post-excavation Studies, Fellow of the Society of Antiquaries of Scotland. Paul has more than 35 years as an archaeologist and been involved in EIA for more than 20 years, and has extensive experience in marine renewables and marine historic environment projects in Scotland over the last 10 years. Paul has extensive knowledge of the historic environment, and the policy, guidance and legislation that underpins assessment. He provides lectures to UHI MA students in Archaeological Practice in aspects of archaeology in the planning system, desk-based assessments and environmental impact assessments.

1.4 EIAR Structure



2. Consenting, Licensing, Planning Policy and Legislative Framework

2.1 Introduction

The following sections present the key policy and legislative context for the offshore SG1A Project. The international and European policy context is presented, followed by more detail on the key UK and Scottish policy relevant to the offshore SG1A Project. Where specific policy or legislation exists with respect to environmental topic assessments, this is set out in each relevant Section (7 to 11).

2.2 Policy

The following international policy and legislation are relevant to renewable energy generation, which the offshore SG1A Project supports:

- The Kyoto Protocol (1997, ratified by the UK in 2002);
- The Paris Agreement 2016; and
- EU Renewable Energy Directive (Directive 2009/28/EC);

Despite the UK's decision to leave the EU following the EU Referendum in June 2016, the understanding is that most EU law is expected to continue to be in place following Brexit; however, it is difficult to make assumptions regarding the longer term continuation or enforcement of EU legislation.

The following UK policy and legislation are relevant to renewable energy generation, which the offshore SG1A Project supports:

- UK Climate Change Act 2008;
- National Policy Statement for Energy (NPS EN-1);
- National Policy Statement for Renewable Energy (NPS EN-3); and
- UK Marine Policy Statement 2011 (under Section 44 of the Marine and Coastal Access Act 2009).

The following Scottish policy and legislation are relevant to the offshore SG1A Project:

- Climate Change (Emissions Reduction Targets) (Scotland) Act 2019;
- The Electricity Generation Policy Statement 2013;
- The Scottish Energy Strategy 2017;
- National Planning Framework 3 supported by Scottish Planning Policy; and
- Scotland's Offshore Wind Route Map (updated 2013).

2.3 Scottish Marine Planning

The Marine and Coastal Access Act 2009 and Marine (Scotland) Act 2010 introduced a system of marine planning that covers both Scottish Offshore Waters and Scottish Territorial Waters. Both Acts require authorisation decisions to be made in accordance with the appropriate marine plans (as defined) unless relevant considerations indicate otherwise.

2.3.1 Scottish National Marine Plan

Under the Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010, the Scottish Government is required to prepare a National Marine Plan (NMP) for Scottish territorial waters and the offshore zone. The Scottish Government adopted the Scottish NMP in early 2015 (Scottish Government, 2015) to provide an overarching framework for marine activity in Scottish waters, with an aim to enable sustainable development and the use of the marine area in a way that protects and enhances the marine environment, whilst promoting both existing and emerging industries. This is underpinned by a core set of general policies which apply across existing and future development and use of the marine environment. Sectoral policies are also outlined in the NMP where a particular industry brings with it issues beyond those set out in the general policies. For cable projects, in addition to the general planning policies, the policies covering sea fisheries and submarine electricity cables are of particular relevance.

The offshore SG1A Project has taken all the relevant aspects of the policies outlined below into consideration with regards to the cable installation, operation and decommissioning activities and the assessment of potential environmental and socio-economic impacts.

2.3.1.1 General Planning

The general planning policies of particular relevance to the offshore SG1A Project include:

- General planning – there is a presumption in favour of sustainable development and use of the marine environment when consistent with the policies and objectives of the NMP;
- Co-existence – proposals which enable coexistence with other development sectors and activities within the Scottish marine area are encouraged in planning and decision-making processes, when consistent with policies and objectives of this NMP;
- Climate change – marine planners and decision makers must act in the way best calculated to mitigate, and adapt to, climate change;
- Natural heritage – development and use of the marine environment must:
  - Comply with legal requirements for protected areas and protected species;
  - Not result in significant impact on the national status of Priority Marine Feature (PMF); and
  - Protect and, where appropriate, enhance the health of the marine area.
- Noise – development and use in the marine environment should avoid significant adverse effects of manmade noise and vibration, especially on species sensitive to such effects (GEN 13);

- Landscape/seascape (GEN 7): Marine planners and decision makers should ensure that development and use of the marine environment take seascape, landscape and visual impacts into account.
- Engagement – early and effective engagement should be undertaken with the general public and interested stakeholders to facilitate planning and consenting processes (GEN 18); and
- Cumulative impacts – cumulative impacts affecting the ecosystem of the NMP area should be addressed in decision making and NMP implementation (GEN 21).

2.3.1.2 Sea Fisheries

With respect to sea fisheries, the NMP sets out a number of policies. Those that are relevant to the offshore SG1A Project include:

Fisheries 1: Taking account of the EU's Common Fisheries Policy (CFP), Habitats Directive, Birds Directive and MSFD, marine planners and decision makers should aim to ensure:

- Existing fishing opportunities and activities are safeguarded wherever possible;
- Protection for vulnerable stocks (in particular for juvenile and spawning stocks through continuation of sea area closures where appropriate);
- That other sectors take into account the need to protect fish stocks and sustain healthy fisheries for both economic and conservation reasons; and
- Mechanisms for managing conflicts between fishermen and/or between the fishing sector and other users of the marine environment.

Fisheries 2: The following key factors should be taken into account when deciding on uses of the marine environment and the potential impact on fishing:

- The cultural and economic importance of fishing, in particular to vulnerable coastal communities;
- The potential impact (positive and negative) of marine developments on the sustainability of fish and shellfish stocks and resultant fishing opportunities in any given area;
- The environmental impact on fishing grounds (such as nursery, spawning areas), commercially fished species, habitats and species more generally; and
- The potential effect of displacement on fish stocks, the wider environment, use of fuel, socio-economic costs to fishers and their communities and other marine users.

Fisheries 3: Where existing fishing opportunities or activity cannot be safeguarded, a Fisheries Management and Mitigation Strategy should be prepared by the proposer of the development or use, involving full engagement with local fishing interests (and other interests as appropriate) in the development of the Strategy. All efforts should be made to agree with those interests. Those interests should also undertake to engage with the proposer and provide transparent and accurate information and data to help complete the Strategy. The Strategy should be drawn up as part of the discharge of conditions of permissions granted.

2.3.1.3 Submarine Cables

With respect to submarine cables, the NMP sets out a number of key objectives. Those that are relevant to the offshore SG1A Project include:

- Protect submarine cables whilst achieving successful seabed user co-existence;
- Achieve the highest possible quality and safety standards and reduce risks to all seabed users and the marine environment; and
- Support the generation, distribution and optimisation of electricity from traditional and renewable sources to Scotland, UK and beyond.

There are four marine planning policies laid out in the NMP which relate to submarine cables:

Cables 1: Cable and network owners should engage with decision makers at the early planning stage to notify of any intention to lay, repair or replace cables before routes are selected and agreed. When making proposals, cable and network owners and marine users should evidence that they have taken a joined-up approach to development and activity to minimise impacts, where possible, on the marine historic and natural environment, the assets, infrastructures and other users. Appropriate and proportionate environmental consideration and risk assessments should be provided which may include cable protection measures and mitigation plans. Any deposit, removal or dredging carried out for the purpose of executing emergency inspection or repair works to any cable is exempt from the marine licensing regime with approval by Scottish Ministers. However, cable replacement requires a Marine Licence. Marine Licensing Guidance should be followed when considering any cable development and activity.

Cables 2: The following factors will be taken into account on a case by case basis when reaching decisions regarding submarine cable development and activities:

- Cables should be suitably routed to provide sufficient requirements for installation and cable protection;
- New cables should implement methods to minimise impacts on the environment, seabed and other users, where operationally possible and in accordance with relevant industry practice;
- Cables should be buried to maximise protection where there are safety or seabed stability risks and to reduce conflict with other marine users and to protect the assets and infrastructure;
- Where burial is demonstrated not to be feasible, cables may be suitably protected through recognised and approved measures (such as rock or mattress placement or cable armouring) where practicable and cost-effective and as risk assessments direct; and
- Consideration of the need to reinstate the seabed, undertake post-lay surveys and monitoring and carry out remedial action where required.

Cables 3: A risk-based approach should be applied by network owners and decision makers to the removal of redundant submarine cables, with consideration given to cables being left in situ where this would minimise impacts on the marine historic and natural environment and other users.

Cables 4: When selecting locations for landfall of power and telecommunications equipment and cabling, developers and decision makers should consider the policies pertaining to flooding and coastal protection and align with those in Scottish Planning Policy (SPP) and Local Development Plans.

2.3.2 Scottish Marine Regions

The Scottish NMP sets the wider context for planning within Scotland, including what should be considered when creating local, regional marine plans. Eleven Scottish Marine Regions (SMR) have been created which cover sea areas extending out to 12 nm. Regional Marine Plans (RMP) are being developed by Marine Planning Partnerships, allowing more local ownership and decision making about specific issues within their area. There is a SMR relevant to the SG1A Project the Forth and Tay RMP which is yet to be written.

2.3.3 Sectoral Plans

The Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020) aims to identify sustainable plan options for the future development of commercial-scale offshore wind energy in Scotland, including deep water wind technologies, and covers both Scottish inshore and offshore waters.

2.4 Marine Licencing

The Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009 both require that a Marine Licence is obtained prior to the construction, alteration or improvement of any works or deposit any object in or over the sea, or on or under the seabed. The Marine Licence requirements under the Marine (Scotland) Act 2010 apply in Scottish Territorial Waters and the Marine Licence requirements under the Marine and Coastal Access Act 2009 apply in Scottish Offshore Waters. The responsibility for administering licence applications under the Marine and Coastal Access Act 2009 lies with Scottish Ministers acting through Marine Scotland Licencing Operations Team (MS-LOT).

2.4.1 Marine Licensing (Pre-Application Consultation) (Scotland) Regulations 2013

Applicants for Marine Licences for certain prescribed classes of activities are required to carry out pre-application consultation (PAC) under The Marine Licensing (PAC) (Scotland) Regulations 2013 (the "PAC Regulations"). One of the prescribed classes of activities is the deposit of a submarine cable in the sea, or on or under the seabed from a vehicle, vessel, aircraft, marine structure or floating container, but only where that cable:

1. exceeds 1,853 metres in length; and
2. crosses the intertidal boundary.

Both criteria are met in relation to the offshore SG1A Project and therefore PAC has been undertaken. A virtual offshore PAC event for SG1A Project was undertaken in January 2021. A PAC Report has been produced and submitted in support of the offshore SG1A Project Marine Licence application.

2.5 EIA Legislation

The European Community (EC) EIA Directive (85/337/EEC as amended by 97/11/EC, 2003/35/EC and 2009/31/EC, codified by 2011/92/EU and further amended by 2014/52/EU) requires that an EIA must be carried out in support of an application for development consent for certain types of major projects which are likely to have the potential to give rise to significant environmental effects.

The EIA Directive has been transposed into Scottish law through a number of different regulations. In relation to the offshore SG1A Project, the EIA Directive is applied through the following regulations:

- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (for works within the 12 nm boundary); and
- The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (in relation to works outwith the 12 nm boundary).

Under the EIA Directive, an EIA is required for all projects listed under Annex I; Annex II projects may require an EIA depending on the potential environmental effects of the project. The offshore SG1A Project represents a change or an extension to an authorised project and therefore falls under the description of projects provided at Paragraph 13 of Schedule 2 of the 2017 EIA Regulations (i.e. a change to an installation for the harnessing of wind power for energy production (wind farms) where those works are already authorised). An Annex II project requires an EIA to be undertaken where the project is "likely to have significant effects on the environment by virtue of factors including their nature, size or location". A Screening Opinion was received from MS-LOT on the 19th February 2021 confirming Scottish Ministers have determined the offshore SG1A Project is an EIA project and therefore this EIAR has been produced in support of the Marine Licence application.

2.6 Nature Conservation Legislation

2.6.1 Habitats and Birds Directive

Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, also known as the 'Habitats Directive', provides for the conservation of natural habitats and of wild flora and fauna including in offshore areas. The EC Directive on the conservation of wild birds (Birds Directive) applies to the conservation of all species of naturally occurring wild birds including in offshore areas. Both Directives were transposed into Scots Law by The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (the Habitats Regulations) and in the offshore marine area by the Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Habitats Regulations). Both the Habitats Directive and the Birds Directive form a network of European designated sites.

European sites protected under this legislation include Special Protected Areas (SPA), Special Areas of Conservation (SAC) and Ramsar sites. The European Directives aim to promote the maintenance of biodiversity by requiring EU Member States to maintain or restore representative natural habitats and wild species at a favourable conservation status (FCS), through the introduction of robust protection for those habitats and species of European importance. As part of these protection measures, Member States are required to undertake assessments to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site.

Following the UK's decision to leave the European Union, legislative changes were made so that habitat and species protection and standards under the Directives continued to be implemented in the same way or an equivalent way when the UK exited the EU. As a consequence of amendments to the Habitats Regulations and Offshore Habitats Regulations, the same requirements and obligations continue to be operative post Brexit in relation to European Sites. There is now a "national site network" which is defined to include Natura 2000 sites and those SPAs and SACs designated post EU exit.

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As part of these protection measures, Member States are required to undertake assessments to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site. This process remains relevant for designated sites which are in UK waters. This process of Habitats Regulations Appraisal (HRA) is discussed in more detail below.

2.6.2 Habitats Regulations Appraisal

Special Area of Conservation (SACs) and Special Protection Area (SPAs) within the UK and the Conservation of Offshore Marine Habitats and Species Regulations 2017 no longer form part of the EU's Natura 2000 Network. Alternatively, they form the UK National Site Network [1] (as defined in Regulation 1994) that existing SACs and SPAs and new SACs and SPAs designated under the Habitats Regulations now contribute to. This includes both the inshore and offshore marine areas in the UK.

Where there is potential for a project to have an adverse effect on a SAC, SPA or Ramsar site, including proposed or candidate sites e.g. pSPAs or cSACs, an Appropriate Assessment is required in accordance with the UK legislation that gave effect to the Habitats Directive, and which continues to apply post Brexit (i.e. the Habitats Regulations and Offshore Habitats Regulations), to ascertain whether a project will adversely affect the integrity of a site in view of the conservation objectives of the site.

In accordance with these Regulations, and as part of the Habitats Regulation Appraisal (HRA) process, where it is identified that there is potential for a Likely Significant Effect (LSE) on a designated site, the applicant is required to provide information on the effects of the project on the integrity of a European site to the competent authority, to enable them to undertake an Appropriate Assessment of the project. Despite the recent changes to the Habitats Regulations, following the UK's exit from the European Union, the Habitat Regulation Appraisal (HRA) process remains unchanged (Scottish Government, 2020). Therefore, the European Commission's (2001) guidance identifying a staged process for the assessment of

[1] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/12/eu-exit-habitats-regulations-scotland-2/documents/eu-exit-habitats-regulations-scotland/eu-exit-habitats-regulations-scotland/govscot%3Adocument/eu-exit-habitats-regulations-scotland.pdf?forceDownload=true

the effect of plans or projects is relevant for this assessment. In the UK the four stages are commonly categorised as the following:

- Stage One: Screening
- Stage Two: Report to Inform Appropriate Assessment
- Stage Three: Assessment of Alternative Solutions; and
- Stage Four: Assessment of 'Imperative Reasons of Overriding Public Interest' (IROPI).

HRA in Scotland is undertaken in line with the NatureScot guidance document 'Habitats Regulations Appraisal: Guidance for Plan-Making Bodies in Scotland' (Tyldesley et al., 2015).

The purpose of HRA Screening is to identify aspects of the project/plan for which it is not possible to rule out the risk of significant effects on a European site (referred to as likely significant effect (LSE)), either alone or in-combination with other projects. A likely effect is one that cannot be ruled out on the basis of objective information. The Court of Justice of the EU has recently ruled (case C-3232/17) that it is not appropriate, at the screening stage, to take account of measures intended to avoid or reduce the harmful effect of a plan or project. Previously, it was considered suitable to consider limited form of mitigation at the screening stage.

European Sites and features which will be subject to an Appropriate Assessment (AA) are those for which LSEs could not be ruled out during the screening exercise. A European Site is progressed to the AA Stage (Stage 2 of the HRA) where it is not possible to exclude a LSE to one or more qualifying features of that site in view of the Conservation Objectives. A project provides a report to inform the AA which takes consideration of the impacts of a project, alone and in-combination with other plans and projects, on the integrity of a European Site, with regard to the site's structure and function and its Conservation Objectives. A competent authority shall then carry out an AA on the implications for a site in view of that site's conservation objectives, before deciding to undertake or give any consent, permission or other authorisation for a plan or project.

The need for AA extends to plans or projects out with the boundary of the site in order to determine their implications for the interests protected within the site. Competent authorities (in this case Marine Scotland) need to identify the qualifying interests and the conservation objectives for each European site involved in an AA.

The offshore SG1A Project has produced a Marine Nature Conservation Appraisal (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012- CST-OF-LIC-DEV-REP-0002)) in support of the Marine Licence application and to fulfil the requirements of Stage 1 and 2 of the HRA process.

2.6.3 NCMPA Appraisal

Under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, Marine Scotland is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature of a Nature Conservation Marine Protected Areas (NCMPA) or any protected ecological or geomorphological process on which the conservation of any protected feature of an NCMPA is dependant. The offshore SG1A Project has produced a Marine Nature Conservation Appraisal (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012- CST-OF-LIC-DEV-REP-0002)) in support of the Marine Licence application and to fulfil the requirements of NCMPA Appraisal.

The NCMPA assessment process follows the following broad steps:

Initial screening

The assessment stage focuses on what can reasonably be predicted as a consequence of the proposal and whether it is 'capable of affecting (other than insignificantly)' a protected feature of a NCMPA. A capability that is both remote (in terms of likelihood of occurrence) and hypothetical should not be the basis of a conclusion that further assessment is required. If a project is 'capable of affecting' a designated site then consideration is also given to whether the proposed development or activity will affect the protected features of a NCMPA, other than insignificantly. Consideration of the degree of pressure that could be exerted by the activity on a spatial basis should help to establish what level of effect might occur.

Main assessment

Focuses on determining whether the exercise of a function would or might significantly hinder, or there is or may be a significant risk of the act hindering (referred to as a significant risk of hindering), the achievement of the Conservation Objectives. Aspects such as scale, timing and duration of the proposed activities or developments should all be considered. However, whilst the initial screening focuses on the protected features, this main assessment focuses on the potential impact on the achievement of the Conservation Objectives of the protected features.

2.6.4 European Protected Species (EPS) and Wildlife Licensing Requirements

For any EPS, the Conservation (Natural Habitats, &c.) Regulations 1994 which apply out to 12 nm and the Conservation of Offshore Marine Habitats and Species Regulations 2017, which apply beyond 12 nm, make it an offence to deliberately or recklessly capture, kill, injure, harass or disturb any such animal. It is also an offence to deliberately or recklessly obstruct access to a breeding site or resting place of any such animal, or otherwise to deny the animal use of the breeding site or resting place. In addition, it is an offence to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs. For cetaceans (dolphins, porpoises and whales) only, there is a more general offence of deliberately or recklessly disturb any individuals belonging to this group. The damage or destruction of a breeding site or resting place of any EPS of animal is an offence of strict liability. An EPS Licence is required for any activity that might result in disturbance to an EPS.

SG1A obtained the required EPS Licence to undertake the project's geophysical survey campaign. The requirement for future licences for either survey activity or cable installation activities will be determined post consent during project development.

Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act (1981 as amended) which prohibits the killing, injuring or taking by any method of those wild animals listed on Schedule 5 of the Act. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the Wildlife and Countryside Act (1981 as amended), strengthening the legal protection for threatened species to include 'reckless' acts. The Act makes it an offence to intentionally or recklessly disturb basking sharks. Licensing requirements under the Wildlife and Countryside Act (1981 as amended) are similar to those for EPS protected under Annex IV of the Habitats Directive.

2.7 Other Legislation

2.7.1 Marine Strategy Framework Directive (MSFD)

Following the UK exit from the EU, the EU Marine Strategy Framework Directive 2008/56/EC (MSFD) which was formally adopted in July 2008 and was transposed into UK Legislation under the Marine Strategy Regulations 2010 on 15th July 2010 is included in the 'retained EU laws' which are relevant to the UK. The Directive is the environmental pillar of the Integrated European Maritime Policy which focuses on the development of a coherent, coordinated and integrated approach to the management of marine environment through marine planning. The MSFD constitutes a vital environmental component of the European Union's (EU) future maritime policy and is designed to achieve the full economic potential of oceans and seas in harmony with the marine environment (MSFD, 2015).

The main requirement of the MSFD is for Member States to prepare national strategies, including marine spatial plans (MSP), to manage their seas to achieve Good Environmental Status (GES) by 2020. In December 2012, the UK Marine Strategy Part 1 was published. This included an assessment of the UK marine waters; proposals on defining GES and developing targets and indicators for achieving and monitoring GES. In July 2014, Part 2 of the Marine Strategy was published by the UK government to establish and implement coordinated monitoring programmes for the ongoing assessment of the environmental status of marine waters around the UK (DEFRA, 2014). Part 3 of the Marine Strategy was established at the end of 2015, setting out a programme of measures to enable the achievement of GES.

2.7.2 United Nations Convention on the Law of the Sea (UNCLOS)

UNCLOS is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place between 1973 and 1982. The Law of the Sea Convention defines the rights and responsibilities of nations with respect to their use of the world's oceans, establishing guidelines for businesses, the environment, and the management of marine natural resources.

2.7.3 Merchant Shipping Act

The Merchant Shipping Act 1995 consolidates much of the UK's maritime legislation. The Act is divided into 13 parts relating to different aspects of maritime shipping:

- Part I: British ships
- Part II: Registration
- Part III: Masters and Seamen
- Part IV: Safety
- Part V: Fishing Vessels
- Part VI: Prevention of Pollution
- Part VII: Liability of Shipowners and Others
- Part VIII: Lighthouses
- Part IX: Salvage and Wreck
- Part X: Enforcement Officers and Powers
- Part XI: Accident Investigations and Inquiries
- Part XII: Legal Proceeding
- Part XIII: Supplemental

The UK is party to the 1910 Collision Convention and also applies the 1972 Collision Regulations to all foreign ships within territorial waters and to all British ships around the world. Both are implemented by the Merchant Shipping Act 1995.

3. Project Description

3.1 Introduction

The Seagreen Wind Farm and the SG1A Project is a joint venture between SSE Renewables (49%) and Total (51%), with SSE Renewables managing the project development.

The Seagreen Offshore Wind Farm was consented in 2014 under the Marine (Scotland) Act 2010. This consent covers 150 wind turbines, the Offshore Substation Platforms and the associated offshore infrastructure. Of these 150 turbines:

- 114 wind turbines (1,075 MW) have permission to connect into the national electricity transmission network at Tealing in Angus through an offshore export cable
- The remaining 36 turbines have been given a connection to the national electricity network at Cockenzie in East Lothian.

In February 2020, the SG1A Project received a grid offer from National Grid for the Cockenzie substation in East Lothian with Transmission Entry Capacity (TEC) of 360MW. This was accepted by Seagreen in June 2020, with a connection date of October 2023. To enable the connection the following offshore infrastructure is proposed, which makes up the SG1A Project:

Offshore: one export cable of approximately 110 km in length from the Seagreen Offshore Wind Farm to the landfall at Cockenzie. The offshore SG1A project overlaps considerably with the consented Inch Cape OWF export cable corridor, with the offshore SG1A export cable corridor running south and east of the Inch Cape OWF, north of the consented Neart na Gaoithe OWF and northwest of Berwick Bank and Marr Bank proposed OWFs. The proposed SG1A Offshore Export Cable Corridor is shown in Figure 3-1.

At landfall, the offshore SG1A export cable will connect to an onshore export cable to a new onshore substation. The onshore cable infrastructure, above MLWS, will be consented under the Town and Country Planning Act (Scotland) 1997 and is not considered further within this EIAR and Marine Licence application.

Onshore: An onshore EIAR (The Seagreen 1A EIA Report Volume 2: Main Report (LF000012-CST-ON-LIC-DEV-REP-0002)) has been prepared to accompany the onshore planning application, in accordance with The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. The Seagreen 1A EIA Report Volume 2: Main Report (LF000012-CST-ON-LIC-DEV-REP-0002) considers the construction, operation and decommissioning of an onshore substation, onshore electricity cables and associated infrastructure required to export electricity to the national electricity transmission system at Cockenzie, East Lothian. In summary it includes:

- One shore end export cable between the Mean Low Water Spring (MLWS) mark and the transition joint bay;
- One transition joint bay, where the shore end export cable would interface with the onshore export cable;
- One onshore export cable, running from the transition joint bay to the onshore substation;
- Potential joint bay and temporary pulling pits, for installation of the onshore export cable (potentially located anywhere within the onshore export cable development zone);
- The onshore substation;
- One grid connection cable linking the onshore substation and the existing Cockenzie substation;
- Temporary construction compound and working areas; and
- Access and site tracks.

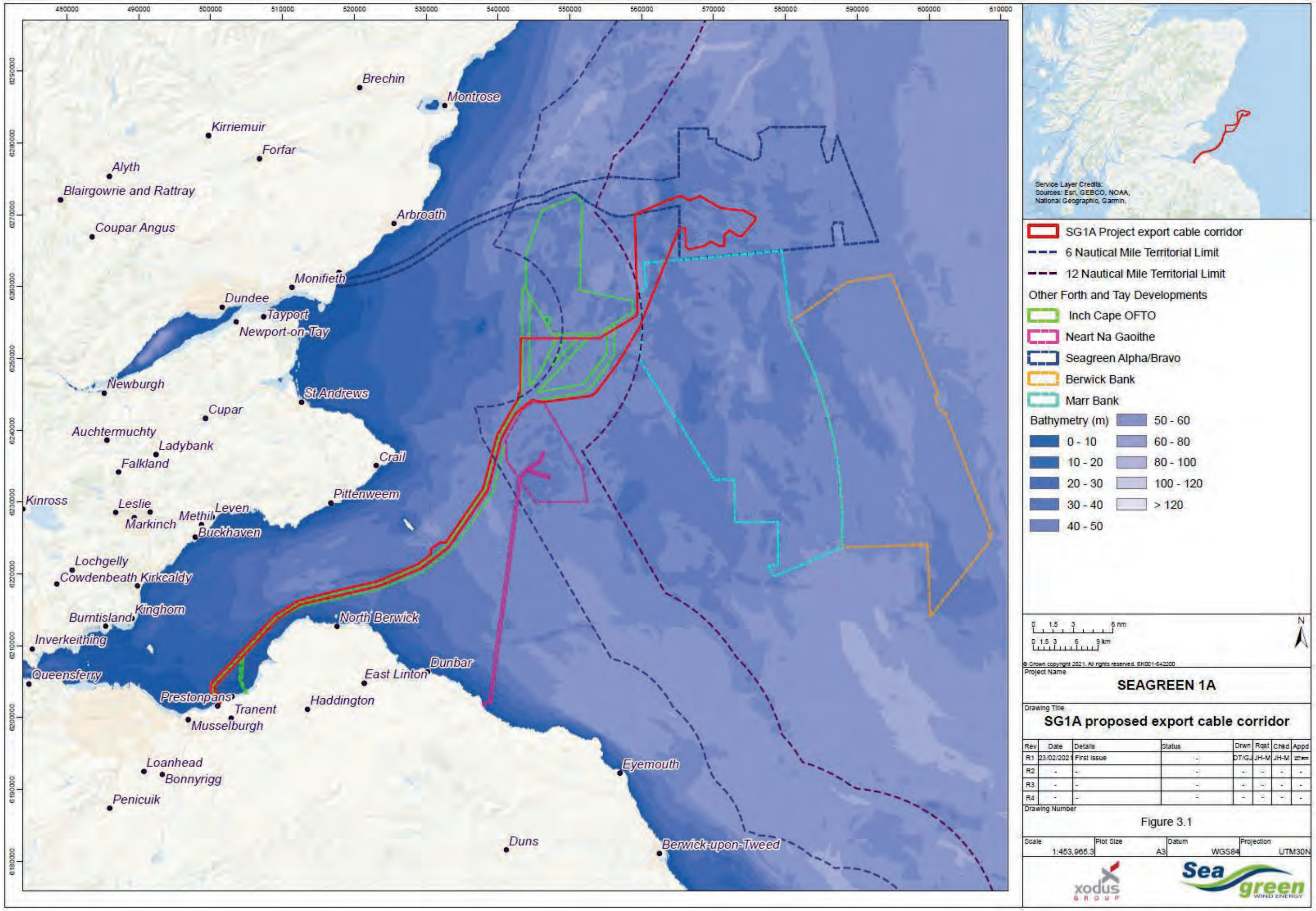


Figure 3-1 The offshore SG1A export cable corridor considered in this EIAR and other nearby offshore projects.

3.2 Project Specifications

Key Parameters of the offshore SG1A Project, which are used in assessments within this EIAR, are outlined in Table 3.1.

Table 3.1 – Key Project Parameters

Export Cable Parameters	Value
Maximum number of export cables	1
Maximum number of export cable trenches	1
Anticipated cable corridor width maximum (km)	1
Anticipated working width maximum (m)	100
Anticipated buried export cable length*	Approximately 80%
Maximum rock or mattress protected length*	Approximately 20%
Temporary zone of influence during cable installation (due to plough or ROV tracks)	6-10 m
If trenched, estimated width per trench (maximum) (m)	3 m
If trenched, cable burial depth (min – max) (m)	1-3 m
If protected, maximum height (m)	1 m
If protected, maximum width (m)	6 m
Number of construction vessels for export cable installation	2

*The project will aim to maximise achievable protection by burial, but allowance is made for cable protection where burial is not possible

3.3 Proposed Cable Construction

Electricity will be transmitted between 220 kV and 400 kV High Voltage Alternating Current (HVAC) submarine cable technology depending on project requirements. The circuit will comprise of a 3-core aluminium or copper cored cable with steel and plastic armour wires (hybrid design) and a polypropylene outer layer. The typical structure of a subsea cable is shown in Figure 3-2 and a cross-section is provided for aluminium or copper cored cables in Figure 3-3. For the purpose of the assessment it is assumed that a 400 kV cable will be used so the scenario using the heaviest cable and maximum protection has been modelled.

The typical diameter of the 400 kV cable will be 300 mm. The weight of a cable of this diameter in air is 138 kg/m (84 kg/m in water).

Prior to installation, dynamic simulations using software such as OrcaFlex will be used to analyse the proposed installation methodology, taking into account the mechanical and operational weather parameters.

The offshore SG1A Project export cable will be buried wherever possible, and is expected to be buried to a depth of between 1 m and 3 m. Where cables are buried to a depth of up to 1 m, the predicted magnetic field strength at the seabed is expected to be below the earth's magnetic field (assumed to be 50 µT) (Moray Firth Offshore Renewables Limited, 2012). Potential impacts on fish from EMF is considered in Section 7.9.2 of this EIAR and interference with magnetic compass equipment in Section 10.9.

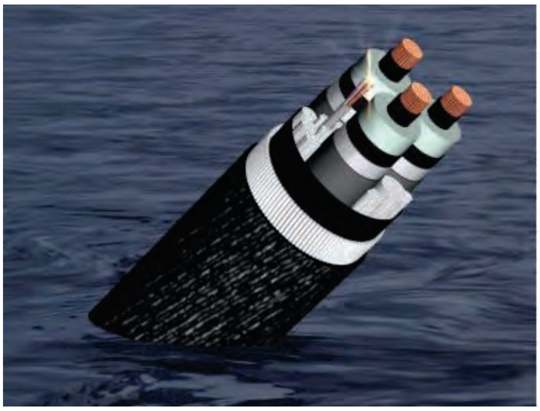
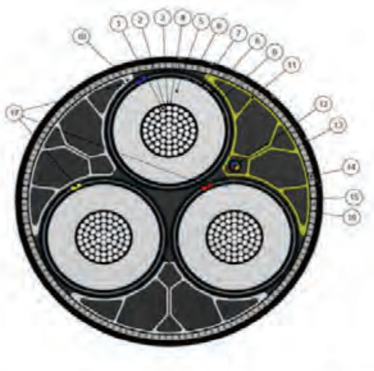
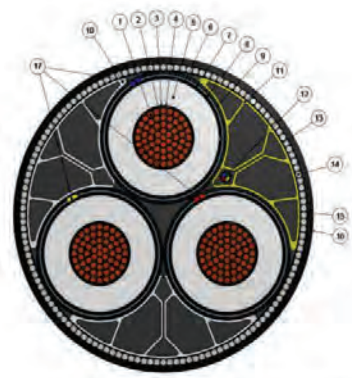


Figure 3-2 Typical subsea cable structure



Item	Description	Item	Description
1	Conductor	10	Filler Element
2	Conductor Filling Compound	11	Filler Element for Fibre Optic
3	Swellable Tape	12	Fibre Optic Element
4	Inner Semi-conductor	13	Armour Bedding
5	Insulation	14	Armour Wires
6	Outer Semi-conductor	15	Polypropylene Serving
7	Swellable Tape	16	Polypropylene Serving
8	Lead Sheath	17	Power Core ID – Plastic strand
9	Polyethylene (PE) Sheath		



Item	Description	Item	Description
1	Conductor	10	Filler Element
2	Conductor Filling Compound	11	Filler Element for Fibre Optic
3	Swellable Tape	12	Fibre Optic Element
4	Inner Semi-conductor	13	Armour Bedding
5	Insulation	14	Armour Wires
6	Outer Semi-conductor	15	Polyethylene Sheath Bedding
7	Swellable Tape	16	Polyethylene Sheath
8	Lead Sheath	17	Power Core ID – Plastic strand
9	Polyethylene Sheath		

Figure 3-3 Examples of cross sections of aluminium and copper core subsea cables

3.4 Cable Protection and Stabilisation Plan

The preferred protection method for the offshore SG1A Project export cable is direct burial. This offers the best engineering solution and minimises the impact on other marine users. However, in some areas direct burial may not be practicable e.g. hard seabed, boulder fields and crossings of other cables or pipelines. In these areas, an alternative protection method will be required such as rock placement, concrete mattresses or grout bags. Alternative protection is used as contingency measure in these instances.

The final design of cable protection and stabilisation is in progress, from which the exact combination of burial and protection that will be required along the cable corridor will be decided. Figure 3-4 shows the indicative offshore SG1A export cable corridor and estimated locations for cable burial and protection. As shown in Figure 3 4, the indicative cable route branches south of the Inch Cape OWF. It should be noted that only one of these branches will be used, but at the time of application this could not be further refined because geophysical surveys, Cable Burial Risk Assessment and final route engineering have not been completed. This may also lead to the volumes of protection being reduced. Table 3.2 shows describes the indicative quantity of protection deposits along the cable corridor. This has been included to ensure that the maximum amount of seabed deposits has been assessed and included in the marine licence application.

The total area of works proposed is 277094600 m^2 or 277.1 km^2 with:

- 80% of the offshore SG1A export cable buried to a target depth of 1-3 m; and
- 20% of the offshore SG1A export cable protected particularly around the areas with rocky outcrops.

For the 20% of the offshore SG1A export cable which may need to be protected, the following methods are being considered:

3.4.1 Rock Placement

Rock placement is the preferred contingency cable protection method after burial. Placement of rock is a relatively quick operation and is possible to complete in more adverse weather than other forms of protection such as mattress installation. Graded rock is used with grain sizes being tailored to achieve the necessary protection. Where water depth is not a limiting factor, rock is usually deposited by a fall pipe vessel as this is the most efficient method of getting the material onto the seabed. In shallower waters (<10 m) a specialist vessel fitted out with basic equipment for depositing the aggregate over the side may be used. Rock placement can be used to provide separation and protection where the cable crosses other cables or pipelines. The depth of rock used will be dependent on agreements made with other asset owners. Rock placement can also be used to protect the cable where burial cannot be achieved due to seabed conditions.

Rock nets may also be used (see Table 3.2), however for the purposes of this EIAR and assessments undertaken, it has been assumed that impacts would be consistent with rock placement and footprints would be in accordance with those presented in Table 3.1.

3.4.2 Concrete Mattresses

Mattresses are generally made of concrete elements formed on a mesh of polypropylene rope, which will conform to changes in seabed morphology. Bevelled elements are used on the edges to create a sloped profile against the seabed. Where appropriate, mattresses fitted with polypropylene 'fronds' can be used to enhance the protection provided. The fronds encourage sediment deposition, in the best case creating a protective sand bank over the mattress. Mattresses require placement either by divers or a ROV to ensure that they are positioned correctly, consequently this takes longer than other methods.

3.4.3 Grout bags

The placement of grout bags over the cables which are then inflated with structural grout. The grout cures to provide an effective over cover protection system for the cables. Concrete mattresses or Grout bags can also be used to provide separation and protection where the cable crosses other cables or pipelines as agreed with the other asset owners.

3.4.4 Trenchless installation

This trenchless technology is proposed for the Cockenzie landfall to bring the cable from above MHWS to cross the intertidal zone. This method means that the cable will be protected below the seabed within a pipe duct. Trenchless Installation is the method for installation at the shore end export cable is likely to use a technique such as horizontal directional drilling (HDD), where a pilot hole is drilled from the landward side (within the landfall working area) to a point below MLWS. The pilot hole is then enlarged using a reaming process, followed by the installation of a conduit pipe through which the shore end export cable can pulled. The detailed trenchless installation design, including entry and exit points, will be dependent on geotechnical investigation as well as the final cable route design of the project

3.4.5 Cast iron segments

Cast iron segments may be used for additional cable protection and stability at the OSP.

In water depths of greater than 20 m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20 m, the water depth will not be affected by more than 1 m.

3.4.6 Summary

The EIAR has been based upon the tabulated amounts defined in Table 3.2 which demonstrates the footprint for the worst-case scenario and maximum possible protection. Any refinements of the offshore SG1A Project may result in a reduction of deposits thereby decreasing seabed footprint. It should be noted that the percentages which are provided for burial, rock placement, mattresses and grout bags are subject to rounding.

Engineering studies are ongoing which may reduce the number of deposits required along the final export cable corridor. However, Figure 3-4 shows the indicative areas in which protection may be applied. This chart was used in the Navigational Risk Assessment.

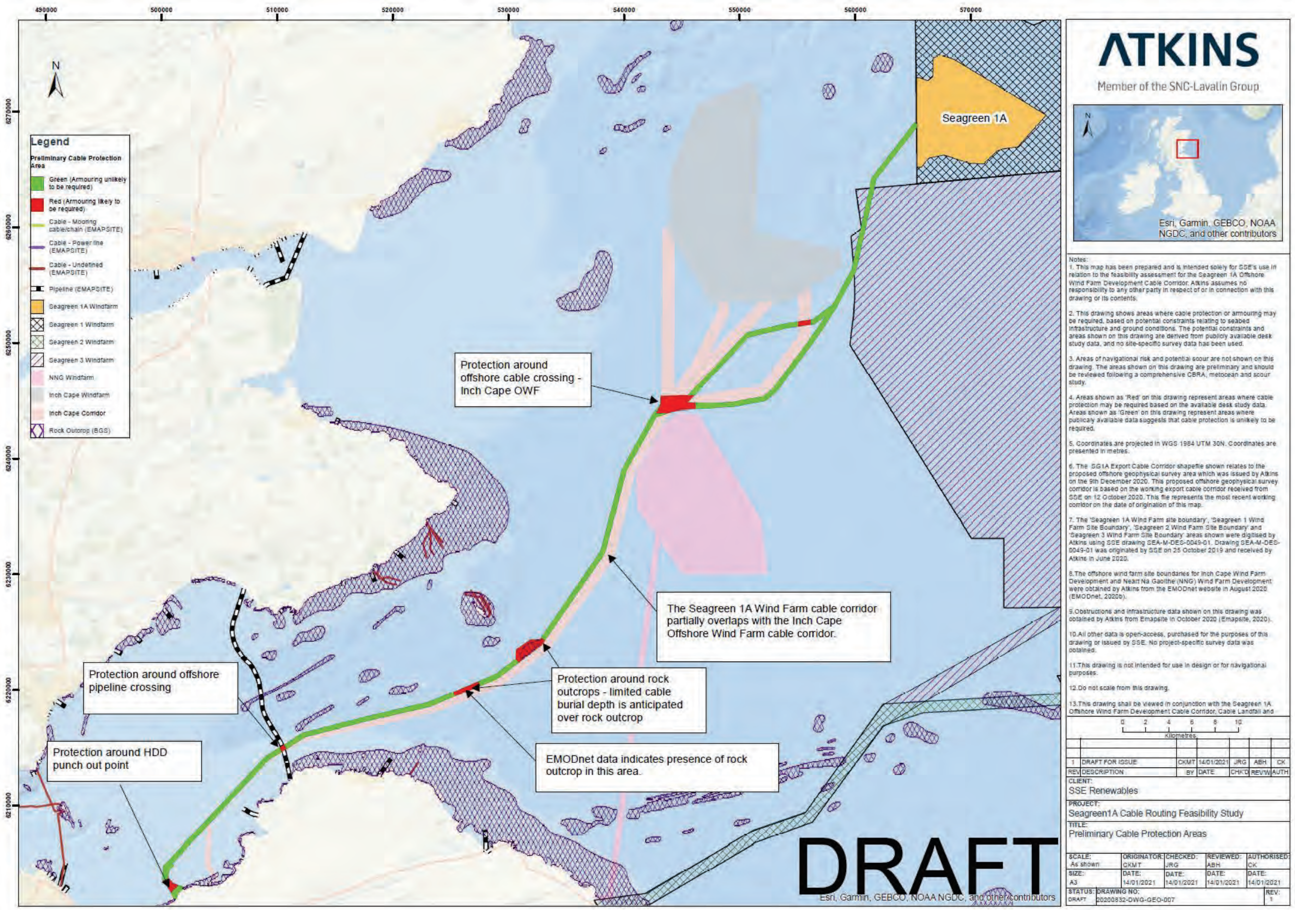


Figure 3-4 Indicative areas for offshore SG1A export cable burial and areas where alternative protection may be required

Table 3.2 Table of indicative cable protection measures and deposits

Location	Kilometre Point Range	Type of Deposit	Description	Quantity and Dimensions (metric)	Total deposited
Punchout around Trenchless Installation	1	HDPE duct	Flexible duct	L 20m Dia 400mm	20m
Offshore Pipeline Crossing	17	Rock 4Tonnes/m	Rock berm separation and coverage	250m coverage = 800T	1000T
Rocky Outcrop 1[2]	32	Rock 3 Tonnes/m*	Rock Berm 1m coverage	2000m coverage=6000T	6000T
Rocky Outcrop 2	40	Rock 3 Tonnes/m	Rock Berm 1m coverage	3000m coverage=8000T	9000T
Rocky Outcrop 3	Contingency[3]	Rock 3 Tonnes/m	Rock Berm 1m coverage	2000m coverage=6000T	6000T
Cable Crossing with Inch Cape OWF	65	Rock 4 Tonnes/m	Rock berm separation and coverage	500m coverage	2000T
Cable	0-110	Cable[4]	3 phase 290mm dia Steel armour, Copper Core 2000mm2, lead sheath, XLPE insulation.	110km at 138kg/km	15180T
Trenchless installation tube	0-1	HDPE duct	HDPE Duct 400m OD	1000m	1000m
OSP rock nets	110	Rock/gabions nets	Rock filled gabions nets surrounding cable to stabilise cable catenary at OSP 4T /unit	20 units. Area of seabed coverage 50m2	80T
Cable protection system at OSP	110	Cast iron segments	Fitted on cable catenary for mechanical protection. Weight 0.1T /m	20m coverage	2T
Grout bag	Contingency[5] 17 and 65	Grout in bags	Used to provide separation of cables at the crossings and stabilise the location of the products	750m coverage (cable and pipe crossings)	4000T

[2] *In rocky outcrops 1, 2 and 3 it is expected that some burial will be achieved which will result in reduced rock allowance 3T/m rock

[3] Geophysical data has not been analysed and therefore target burial may not be achieved in this area.

[4] The cable is assumed to be copper core as this is heavier than aluminium. Although both types of cable may be used.

[5] These values are included as cable and pipeline crossing agreements are not in place, so we cannot determine the engineering required.

Concrete mattresses	Contingency[6] 17 and 65	Concrete segment mattress	Used to provide separation of cables at the crossings and stabilise the location of the products	750m coverage	2000T

3.5 Cable Location and Installation Techniques

3.5.1 Corridor Selection

The selection of the offshore SG1A Project export cable corridor was conducted by desktop study using the current best available information on environmental and engineering constraints and publicly available information on the Neart na Gaoithe, Inch Cape and Marr Bank wind farm projects, including site boundaries and indicative offshore cable corridors as well as consultation with the developers (SG1A PAC Report, 2021). As custodian of the seabed, Crown Estate Scotland have expressed desire that there be open and transparent discussion between all Neighbouring Developments and have facilitated correspondence/discussions where required and this is fully reflected in the route refinement. Crown Estate Scotland have also expressed a desire to co-locate cables and cable corridors as much as possible in order to 'cluster' cable infrastructure and minimise seabed sterilisation.

3.5.2 Alternatives Considered

Figure 3-5 shows the routes which were considered by the desktop study. The study considered the development, assessment, comparison and ranking of the respective potential cable corridor options and cable landfall options.

The following constraints were considered when identifying the preferred offshore export cable corridor:

- Overall cable length;
- Shipwreck locations;
- Munitions dumping sites;
- Locations and types of existing structures (e.g. other Wind Farms, cables and pipelines);
- Environmentally or culturally protected sites (SAC, SPA, Ramsar, MPA, SSSI, reefs and archaeology);
- Water depth; Seabed slope;
- Soft sediment;
- Hard bedrock within 2 m of the seabed; Boulders;
- Areas of obstructions and foul ground;

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[6] These values are included as cable and pipeline crossing agreements are not in place, so we cannot determine the engineering required.

- Geomorphological features (e.g. scarps, drumlins); and
- Dredging areas.

Following review of each corridor option against the above environmental criteria it was determined that, in line with key advice from Crown Estate Scotland, that the cable route should be designed to minimise seabed utilisation, Corridor 3 is the preferred option. Corridor 3 maximises the overlap with the Inch Cape project, minimising environmental impact by reducing the potential cumulative footprint impacts and seabed utilisation. In addition, Corridor 3 was the preferred route from a technical perspective because it offers the shortest route (fewer factory joints in the cable) and is less geotechnically constrained making it preferred from an engineering perspective. Selecting the shortest route was an important consideration as the chosen offshore SG1A Project export cable corridor (Corridor 3) at 110km is on the upper limits for using alternating current (AC) technology. Longer cable corridor options would likely require direct current (DC) technology which would have significantly greater infrastructure requirements (making project less economically viable), particularly onshore, meaning greater potential for environmental impacts.

A shore landing at Cockenzie is preferred to Seton Sands because of onshore constraints on the cable route. Hard bedrock at this location indicates that direct pipe is not feasible. The overall preferred option is to use trenchless installation from above MHWS at the Cockenzie landfall, emerging below MLWS within the marine environment. In addition, a landfall at Seton sands would have resulted in overlapping with greenfield land, past historic monuments, whereas Cockenzie landfall primarily results in overlapping with brownfield/contaminated sites.

The following key reasons were considered important in the selection of Cockenzie as the preferred landfall and Corridor 3 as the preferred offshore SG1A project export cable corridor:

<u>Landfall</u>

- Cockenzie landfall site closer to onshore grid connection location, therefore shortening cable route length and potential for disturbance;
- Cockenzie landfall site has more favourable nearshore and onshore topography facilitating the trenchless installation methodology; and
- Cockenzie landfall site requires a shorter trenchless installation reducing risk of failure.

<u>Corridor 3</u>

- Shortest cable corridor option thus minimising area of disturbance;
- Maximum overlap with consented Inch Cape cable route thus reducing cumulative area of disturbance;
- Avoids outcropping bedrock, therefore, limiting the requirement for mechanical cutter installation techniques or the use of non-burial cable protection measures;
- Avoids known dangerous shipwrecks and ground tackle, snag or stump features within 500 m of the centreline of the cable corridor where practical;
- Avoids known dredging and foul areas;

- Avoids known munitions dumping areas; and
- Requires only a single cable crossing (some alternative corridors had with zero crossings but these were significantly longer).

The output of the desktop study and Pre-application Consultation feedback resulted in the selection of the offshore SG1A Project export cable corridor shown as the 'Marine Construction Licence Corridor Boundary' shown in Figure 3-6. Full grid co-ordinate details are provided in Appendix B: Chart and WGS84 Co-ordinates of the offshore SG1A Marine Construction Licence Boundary. For consistency, this will be referred to throughout this EIAR and supporting documents as the offshore SG1A export cable corridor.

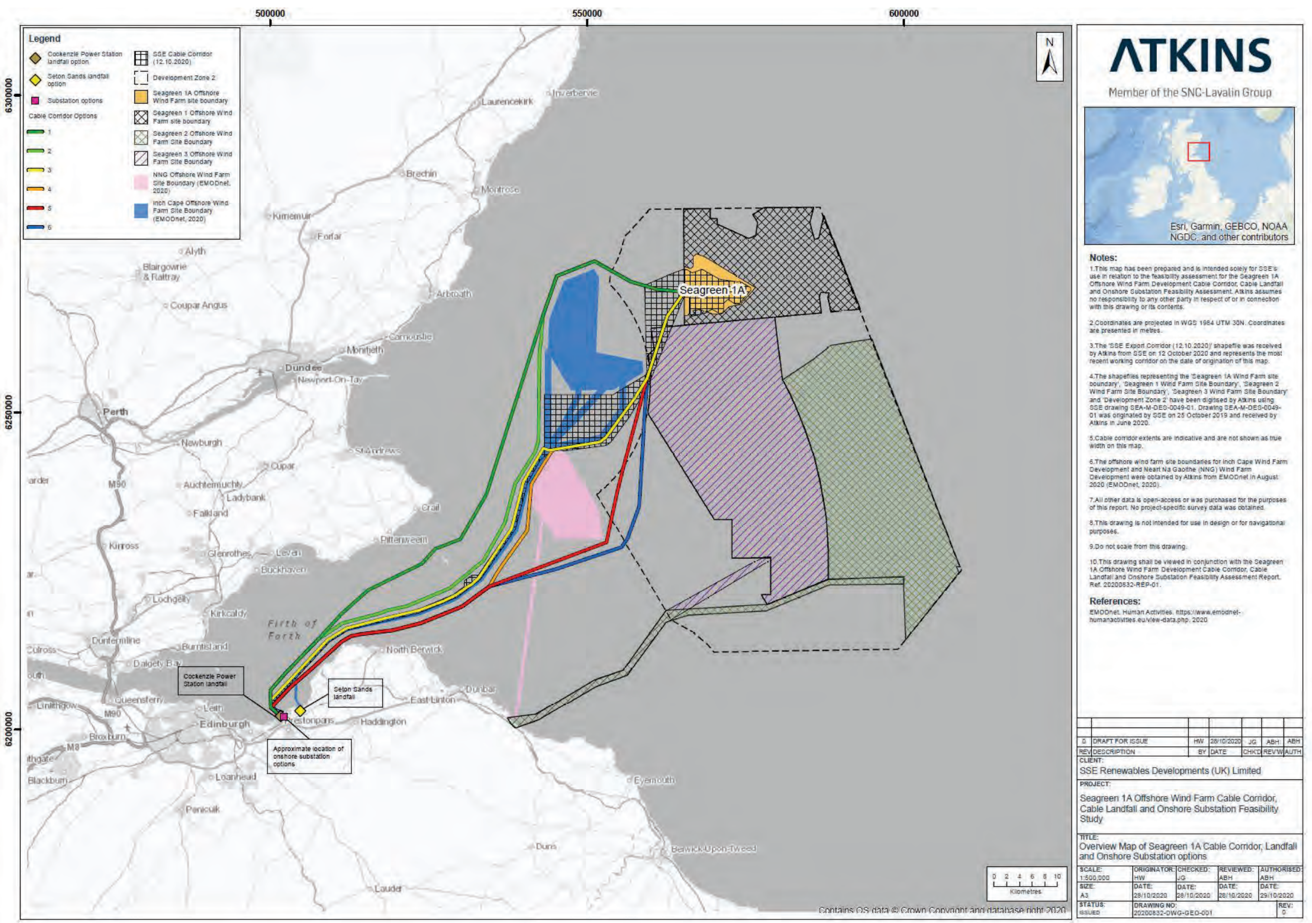

Figure 3-5 The six cable corridors which were considered during the desktop study assessment of alternatives

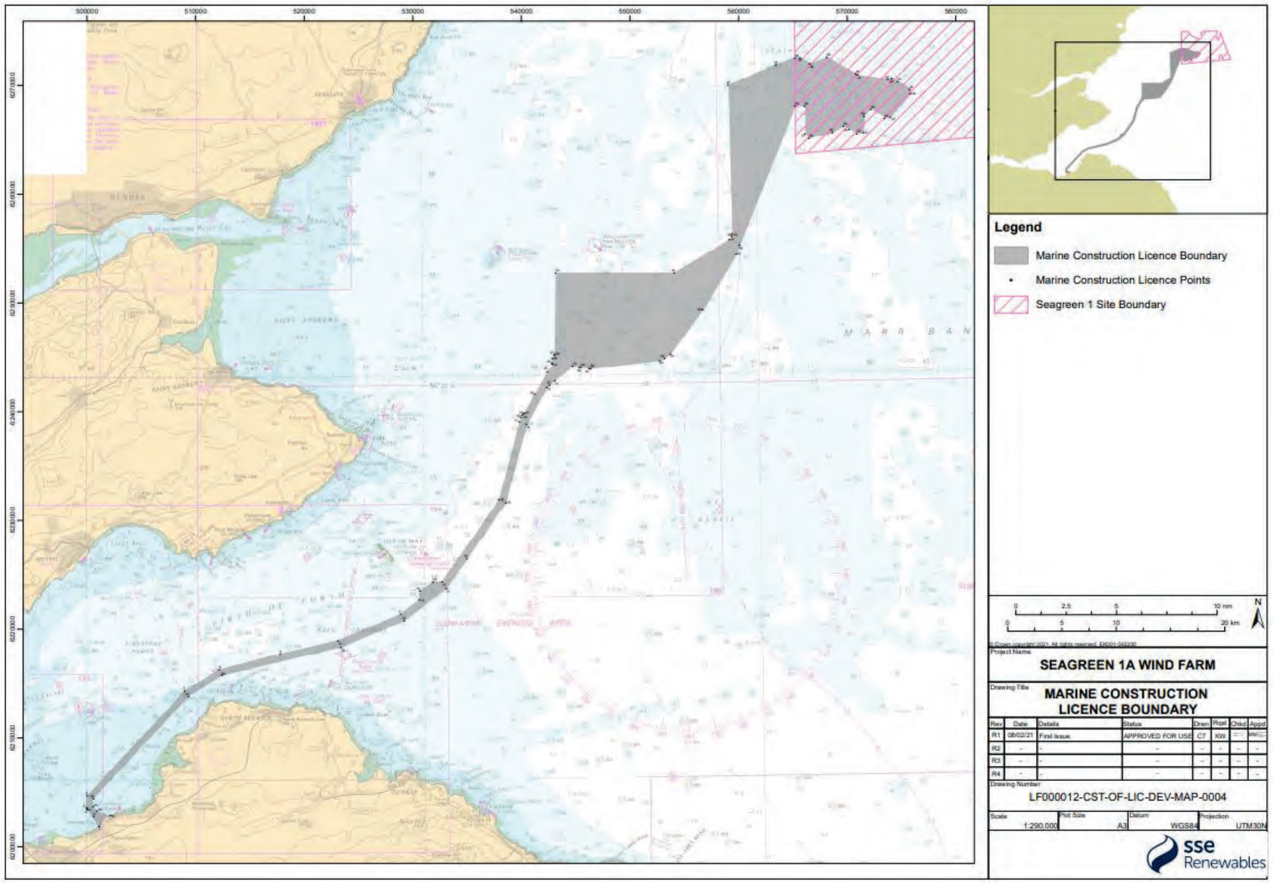

Figure 3-6 Marine Construction Licence Corridor Boundary

3.5.3 Proposed Cable Corridor

The proposed offshore SG1A export cable corridor commences at a broad cable area adjacent to the west of the Seagreen wind farm as the location of the Seagreen OSP is not yet determined. The location will be chosen dependant on several factors such as the wind turbine layout, seabed characteristics and the final electrical system design. The location of the OSP will be optimised to balance the length of distribution network cables from the substation to the furthest turbines, but also to minimise the length of the offshore transmission cable to reduce cost and transmission losses. Finally, the location will also be dependent on soil properties so will require ground investigations to assess this. Further work will be undertaken to determine the most viable and economic location of the substation. This is covered under the existing Seagreen Wind Farm consents[7] and is therefore not considered further within this application.

The offshore SG1A Project export cable corridor will be southerly and passes through the NW corner of the Marr Bank Windfarm AfL area. It then passes to the east of the Inch Cape wind farm site (with a 650 m separation, as specified in the Separation Agreement with Inch Cape Offshore Limited (ICOL)) before entering an area occupied by the four Inch Cape export cable route options. As per standard industry practice, a crossing agreement will be secured with ICOL for this area to ensure that regardless of which developer constructs their cable first, there are arrangements in place for the other developer to cross any constructed export cable. The proposed SG1A export cable corridor maintains a 200 m buffer Min 180m from the Neart na Gaoithe wind farm site boundary (c.500m from the most northerly Neart na Gaoithe WTG, based on the turbine layout as outlined in the published Neart na Gaoithe Consent Discharge documents (Design Specification and Layout Plan, Lighting & Marking Plan).

After crossing the main Inch Cape cable route the cable will run parallel to the west of the Inch Cape cable to landfall at Cockenzie. The proposed route partially overlaps and runs parallel to the approved ICOL AfL and therefore benefits from an established precedent for consented marine cabling in this location, while reducing the spatial extent of cable installation works. It is anticipated that Inch Cape will not utilise their full cable corridor footprint as shown (it was originally consented for up to 6 export cables) and therefore there is further opportunity to reduce the cumulative cable corridors footprint of both projects. The Seagreen 1A AfL corridor includes 300 m outside and to the west of the Inch cape AfL.

A wider export cable corridor to the south-east of the Isle of May is required because of potential rock constraints in this area identified from desktop surveys.

Closer to land, the Seagreen 1A AfL tapers in line with Inch Cape's taper, however, maintains 200m 300m to the west of the Inch Cape AfL at all times. The total route length from the indicative centre point of the Seagreen 1A wind farm site to the landfall location at Cockenzie is approximately 102 km.Closer to land, the Seagreen 1A AfL tapers in line with Inch Cape's taper, however, maintains 200m to the west of the Inch

[7] 04676/19/0 (Alpha) and 04677/19/0 (Bravo)

Cape AfL at all times. The total route length from the indicative centre point of the Seagreen 1A wind farm site to the landfall location at Cockenzie is approximately 102 km.

While cable crossings are not uncommon, where practical the proposed offshore SG1A Project export cable corridor avoids known constraints including extant or planned assets. Minor refinements may be required at specific locations to avoid specific features and/or mitigate potential environmental impacts. For example, the working corridor width may need to be widened to allow the cable to be routed around known wrecks but within the offshore SG1A export cable corridor.

Due to the potential for micro siting, the final location of the export cables will be confirmed once installation has been completed. Route refinement and micro siting will be dependent on seabed conditions; and location of sensitive features which will be further defined at the conclusion of pre-commencement survey activities.

The location of a landfall near Cockenzie power station is limited by the built-up areas of Prestonpans to the west and Cockenzie to the east. The former power station site, in particular, allows the re-use of previously developed land with limited disturbance to nearby communities. Other landfall locations are not considered practicable due to foreshore ground conditions

There are a number of techniques which may be utilised to bring the offshore SG1A Project export cable ashore. To minimise the disruption on the shoreline caused by open trenching the preferred construction method is to use the Trenchless Installation technique; this is subject to the outcomes of the geophysical and geotechnical investigations. The trenchless installation duct will take the offshore cable from a nearshore position to a join trenched land installation.

At this stage the material for the duct has not been specified, with both steel and High-Density Polyethylene (HDPE) being considered as potentially suitable.

A summary of the key points raised during discussions with adjacent projects and other interested parties in relation to the offshore SG1A Project cable corridor is contained within the Pre-application Consultation Report.

3.5.4 Cable burial and installation

In order to protect cable infrastructure and minimise disruption to other marine users, protection is by maximising burial.

The target depth of burial (DoB) of the offshore SG1A export cable will be between 1-3 m along the corridor, and will be determined by ground conditions, the cable burial risk assessment (CBRA) and a detailed hazard identification survey, which will assess the different locations and the various shipping and dredging activities. It is possible that the hazard identification survey will confirm areas where the cable burial depth may need to be varied due to local features, such as: sand waves; erosion of the seabed; shipping traffic anchor risk; intense dredge or trawl fishing activities; and existing infrastructure or observed seabed obstacles.

Based on results and data from the offshore SG1A Project marine surveys (see Section 3.8), a CBRA will be carried out to refine subsea cable route. The main objective of the CBRA will be to ensure that, based on the available survey data, cable burial can be achieved, using a variety of installation tools, along as much as possible of the preferred cable route. The CBRA will consider a variety of tooling, i.e. pre- and post-lay plough, jetting, fluidisation and mechanical cutting, all of which will be considered as options for the cable installation contractor to utilise as required. The CBRA will produce an indicative depth of burial listing for the cable route, which will afford suitable protection to the cable, based on external factors.

The exact details of the cable installation technique to be employed will be confirmed when the contract for installation is awarded. It is however envisaged that a variety of installation and burial techniques will be required due to the variable nature of the seabed along the proposed offshore SG1A Project export cable corridor.

Where this is not possible, for example at crossings with existing cables, or where the seabed characteristics are inappropriate for burial, additional cable protection measures may need to be applied. This is described in detail in Section 3.4.

Different approaches and techniques are available for offshore SG1A Project export cable installation. These are:

- cable lay with post lay burial using a jetting ROV, or a mechanical trencher; and
- simultaneous cable lay and burial, using a cable plough or a mechanical trencher. A combination of methods may be used for cable installations, depending on ground conditions.

The preferred approach will be confirmed on installation contract award. However, Table 3.3 shows the installation methodologies being considered.

Table 3.3 Installation Methods being Considered

Example of Equipment/Vessel	
Seabed Preparations	
Pre-lay Grapnel Run	Seabed Preparations Prior to offshore cable installation, linear seabed debris will be removed by grapnel tow (PLGR). Areas of boulders and confirmed Unexploded Ordinances (UXO) may also require clearance if not avoidable by a minor cable route deviation. Pre-sweeping may be required in order for the burial techniques to be employed effectively. If the debris is hooked, it will be cleared.
Cable Pull in and Cockenzie	

	Cable pull-in • The Cable Protection System is fitted to the cable end on board. (specific mechanical protection applied to protect the cable as it enters the OSP Jtube bellmouth). • A ROV will recover a pre-installed messenger wire within the JTube. The wire will be winched to deck and connected to the sealed cable end. • The cable will be winched into the OSP. **Cable pull in at Cockenzie Landfall** At the Cockenzie landfall location, a trenchless installation technique (such as Trenchless Installlation or Direct Pipe) will be used to install a cable duct from the transition pit location (located onshore above MHWS and subject to a separate planning application) and out to approximately Mean Low Water Springs (MLWS). The cable will be pulled to shore from an offshore vessel suspended by floats. The cable will be drawn through the ducts to the transition pit by a winch. Cables seaward of the pipe ends will be protected by jetting or trench excavation. For any trenchless installation operations, the maximum drill rig area is expected to be of the order of 50 m by 50 m. The equipment to be used includes the drilling rig and drill spoil processing equipment. For the cable pull in, a temporary winch will be required to draw the cable. Cable testing will be performed at various stages during the cable lay operations. Consideration will be given to limiting light spill (by directional lighting, directed downwards) from construction vessels involved in cable laying and related activities at night within 2km of the shore, to avoid visual intrusion at residential locations.
Cable Lay	
	The cable is trenched into the seabed to the target depth. A jetting tool will inject water at high pressure into the sediment surrounding the cable. The seabed is temporarily fluidised and the cable is lowered. If target depth has not been reached, a second trenching pass will be completed to improve the first pass. If necessary, an engineered cable protection solution will further protect any areas of cable not trenched to the required depth (rock armouring, concrete mattressing, or rock placement). Rock protection is usually deposited by a fall pipe vessel.
Cable Lay	
Survey /Cable Lay	Immediately following installation, post installation surveys will be conducted to confirm target burial depths have been achieved or where cable protection measures will be required (as outlined above). During the period between the identification of the need for additional cable protection and completion of additional cable protection activities, a Guard Vessel will be on site to inform other marine users of activities within the area. Monitoring will be undertaken post installation to confirm the cables remain as installed. Monitoring will be determined via a risk-based assessment which will provide a proportional indication of the risk of future cable exposure along the interconnector cable corridor.

3.6 Operation, Inspection, Maintenance and Decommissioning Strategy (OIMD)

Operation and Maintenance (O&M) of the offshore SG1A Project export cable after commissioning will comprise of both scheduled and unscheduled events. Scheduled works on the offshore electrical infrastructure will include regular monitoring or survey, statutory inspection and routine inspection visits. When necessary, retrofitting and upgrading works may also take place. Any offshore survey works will normally be timetabled for the summer months, given the typically more settled weather and longer day light hours. It is noted that maintenance/monitoring work is expected to be less disruptive and span a shorter period than cable installation (during the construction period). Twenty-four hour working will also be evaluated, as this type of solution could be delivered from a mothership stationed offshore.

The offshore SG1A Project will have an O&M team in place for the day to day management and control of the project infrastructure.

The requirement to decommission the offshore SG1A export cable is a condition of The Crown Estate lease and is also incorporated in the statutory consenting process through the provisions of the Energy Act 2004. Under the statutory and licensing processes, the appointed Offshore Transmission Owner (OFTO) will be required to prepare a detailed decommissioning programme and set aside funds for the purposes of decommissioning. The decommissioning programme will consider the latest technological developments, legislation and environmental requirements at the time that the work is due to be carried out. These provisions were subsequently updated by the Energy Act 2008.

3.7 Programme

The indicative construction programme for the offshore SG1A Project commences in Q2 2023 and completes in Q2 2024 (Table 3.4). SG1A Project offshore export cable construction activities are expected to take place 24/7 and at any time of the year, as vessel utilisation is important in maintaining schedule and reducing cost.

It is in the offshore SG1A Project's interest to plan and implement an efficient and effective construction programme. Construction activities will take place within the periods below, but are not expected to take the full duration shown against each activity.

Seagreen 1A will endeavour to minimise impact or disruption to other users of the sea in planning the construction activities in more detail. For example, the export cable will be buried or protected as soon as is practicable after being laid on the seabed.

It is proposed to maintain ongoing dialogue with the commercial fishing sector from project inception, throughout development and into construction through the designated communication channels, including the Fisheries Liaison Officer.

Table 3.4 Indicative offshore SG1A export cable installation schedule

Activity	*Estimated duration (worst case scenario) excluding weather*

Seabed preparation (pre-lay survey, crossing construction and PLGR)	*4 weeks*
Cockenzie Landfall preparation and form of trenchless installation	*2 months dependant on length of drill*
Cable lay with post lay burial using a jetting ROV, or a mechanical trencher; and/or simultaneous cable lay and burial, using a cable plough or a mechanical trencher	*Up to 6 weeks*
Cable Pull in	*1 week*
Rock/grout bag/mattress placement	*1 week dependant on extents*
Post-lay survey	*1 week*

3.8 Existing studies and validation marine surveys

The proposed offshore SG1A Project export cable corridor was selected to reduce the overall cable length and consider the following constraints:

- **Environmental and cultural sensitivities** including environmental and cultural heritage sites protected by legislation; important seabed habitats; and wreck features; and
- **Impact on other marine users** including commercial fisheries and other offshore wind developments in the region.

The offshore SG1A Project Area is well studied with considerable data already available including benthic surveys and marine ornithology studies (see Section 3.8.1).

The offshore SG1A Project has undertaken its own validation survey works during winter 2020/21 including offshore geophysical, geotechnical and benthic surveys as well as nearshore and intertidal ornithology surveys. Completion of these SG1A Project surveys is expected in Spring 2021. Details are provided in Section 3.8.2.

3.8.1 Regional existing surveys

The offshore SG1A Project area is well studied with considerable existing data available for the Forth and Tay region, including:

- Benthic surveys:
  - EUSeaMap;
  - The Seagreen Project (characterisation and pre-construction);
  - Inch Cape and Neart na Gaoithe survey data and EIA; and
  - Cooper and Barry (2017). A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed.
- Marine Ornithology surveys:

- Seagreen, Inch Cape and Neart na Gaoithe OWF monthly boat-based surveys;
- Seagreen, Inch Cape and Neart na Gaoithe OWF monthly aerial surveys;
- Seagreen 1A Project (offshore cable): intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), July 2020 to present; and
- Inch Cape offshore cable: intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), January 2012 to January 2013.

3.8.2 Offshore SG1A Project Marine Surveys

Additional surveys were carried out by the offshore SG1A Project, to validate existing survey data and to provide up-to-date data to inform detailed design and installation methods. These surveys include a static fishing gear observation survey (November 2020), offshore ornithology surveys (ongoing), benthic (December 2020), geophysical and geotechnical (January-March 2021) surveys.

3.8.2.1 Static fishing gear observation survey

A static fishing gear and fishing vessel observation survey was carried out by Brown and May Marine Limited in November 2020. This was undertaken by a commercial fishing vessel, which followed transects within the offshore SG1A export cable corridor, with surveyors recording the location of any static fishing gear markers which were observed. The survey was carried out under specific weather conditions to ensure the sea state was favourable for maximising visibility. In addition any fishing vessels, their location and their activity was recorded.

3.8.2.2 Ornithology Surveys

Nearshore and intertidal surveys in relation to the offshore SG1A Project have been commissioned by Seagreen 1A and have been ongoing since July 2020 and will be completed in March 2021.

The ‘Seagreen 1A Transmission Cable: Onshore and offshore ornithology survey strategy’ (Seagreen 1A, 2020) includes the following approaches for data collection:

- Continue the current digital aerial survey campaign commenced in 2019 on behalf of the Forth and Tay developers: Seagreen, Inch Cape and Neart na Gaoithe. Data will provide information on breeding, passage and wintering seabirds for approximately 47 km along the offshore SG1A Project at its seaward end, depending on its final location. Data will be compared to boat-based data collected between 2009 and 2013 for a comparable area;
- Monthly nearshore and inter-tidal bird surveys at set standardised locations, with an estimated minimum coverage of out to 1.5 km offshore from Mean High Water Springs, onshore; and
- For the remaining portion of the offshore SG1A Project information will be derived from the existing literature. This is in line with the strategy deployed by Inch Cape and agreed with NatureScot based on the low level of impacts predicted for the central region of the offshore SG1A Project.

This Screening Report, and the Marine Licence application for the offshore SG1A Project, considers the marine bird species relevant to the offshore and inshore waters only (greater than 1 km from the coast). The ornithology interests for the intertidal, nearshore (up to 1 km from the coast) and onshore habitat zones will be considered in the SG1A Project's onshore consent application.

3.8.2.3 Benthic surveys

A benthic subtidal ecology baseline validation survey was conducted by the offshore SG1A Project (RPS, 2020) in December 2020, in order to validate the existing benthic ecology baseline characterisation by confirming habitats and biotopes along the export cable corridor. The benthic survey scope of works was presented on 18 November 2020, and preliminary results were presented on 19 February 2021 to MS-LOT, Marine Scotland Science and NatureScot (see Section 5).

The benthic validation surveys included the following tasks:

- Repeat sampling of representative habitats/biotypes, with a division of the offshore SG1A Project into three areas according to the existing understanding of the sediment characteristics, as follows:
    - Offshore course sediments;
    - Sand and muddy sediments; and
    - Inshore coarse sediments.
- The sampling methodology which was completed is summarised below:
    - 20-30 combined grab and seabed imagery sampling locations;
    - Grab samples: Particle Size Analysis (PSA), benthic infauna (ID, abundance and biomass); and
    - Seabed imagery: stills and video analysed for habitats of conservation importance (e.g. reefs; sea pens and burrowing megafauna).

3.8.2.4 Geophysical surveys

Pre-construction geophysical surveys will take place at predefined locations within the offshore SG1A Project using low to high frequency survey devices such as multibeam echosounders (MBES), side scan sonar (SSS) sub-bottom profilers (SBP).

Additionally, subsea survey and cable installation equipment, such as ROVs, trenchers, and ploughs, may employ ultra-short baseline (USBL) technology to monitor their positions. In addition, Cone Penetration Tests will be carried out at specific locations within the offshore SG1A export cable corridor.

Geophysical studies will also allow for the avoidance of known assets and identified geophysical anomalies that are likely to be anthropogenic as the primary embedded mitigation strategy. This will be supported by a marine Protocol for accidental archaeological discoveries (mPAD), and a marine archaeological written scheme of investigation (WSI).

A range of different equipment may be employed during the geophysical survey activities, with their use summarised in Table 3.5 . Each item of equipment has been assessed for its potential to introduce noise into the marine environment and/or interact with protected species in Section 8.

Table 3.5 Comparison of sound-emitting survey equipment operating characteristics

Equipment	Description	Estimated source pressure level (dB re 1 µPa @1m)	Expected Sound Frequency
MBES	Multi-beam echo-sounders are used to obtain detailed 3-dimensional (3D) maps of the seafloor which show water depths. They measure water depth by recording the two-way travel time of a high frequency pulse emitted by a transducer. The beams produce a fanned arc composed of individual beams (also known as a swathe). Multi-beam echo-sounders can, typically, carry out 200 or more simultaneous measurements. With regards to this Project, the MBES specifications are to be high resolution; Max ping space of 25 cm or 9 pings per square metre with towed set up.	~220 peak; 213 rms	200kHz - 400kH
SSS	Side-scan sonar is used to generate an accurate image of the seabed and is used to identify surface seabed features such as boulders, scarps, and debris. An acoustic beam is used to obtain an accurate image of a narrow area of seabed to either side of the instrument by measuring the amplitude of back-scattered return signals. The instrument can either be towed behind a ship at a specified depth or mounted on to a ROV/ROTV. The frequencies used by side-scan sonar are generally very high and outside of the main hearing range of all marine species (NOAA, 2018). The higher frequency systems provide higher resolution but shorter-range measurements.	245 peak; 24 rms	800kHz
SBP	SBP systems are used to identify and characterise layers of sediment under the seafloor. A transducer emits a sound pulse vertically downwards towards the seafloor, and a receiver records the return of the pulse once it has been reflected off the seafloor. There are numerous SBP technologies which may be deployed during survey operations, including; pingers and chirpers. These devices can operate across a range of frequencies depending on the purpose of the survey. Higher frequencies of operation provide the highest resolution but are limited in amount of penetration below the sea floor. The high frequency profilers are particularly useful for delineating shallow features such as faults, gas accumulations and relict channels. Lower frequencies	~223 peak	1kHz -12kHz

	yield more penetration but provide less resolution; lower frequency systems are more general-purpose tools that provide a good compromise between penetration capacity and resolution.		
Boomer	An Ultra-High Resolution Seismic (UHRS) system optimised to achieve a sub-bed penetration depth focusing on the depth range of 10–1000 m below seafloor. This technology requires a controlled seismic source of energy connected by high voltage cable to a sound source (boomer or sparker) that transfers the energy through the water to penetrate the seabed. The energy reflected back from the different sediment layers below the seabed is received by hydrophones on the sea surface, recorded and processed by a data acquisition system aboard a vessel, so that visual profile of the seabed can be created. There are numerous UHRS technologies which may be deployed during survey operations, including both boomers, and sparkers. A seismic sparker works by discharging an electrical pulse between electrodes and a grounding point in seawater. This discharge creates an acoustic pulse, and the reflected signal is received by a hydrophone deployed at a set distance from the source.	220 peak	200Hz - 10kHz
Sparker		245 peak	200Hz - 10kHz
USBL	USBL systems are used to determine the position of subsea survey items, including ROVs, towed devices, grab samplers, etc. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. A USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the subsea equipment. The transducer transmits acoustic signals through the water and the transponder sends a response which is detected by the transducer. The USBL calculates the bearing and time taken for the transmissions to be completed and thus the position of the subsea equipment is determined.	~206 peak	21kHz - 31kHz

3.8.2.5 Geotechnical Surveys

In addition to the Geophysical surveys which are detailed in Section 3.8.2.4, shallow Cone Penetration Tests (CPT) and vibrocores will be carried out at regular intervals along the offshore SG1A export cable corridor.

CPT testing is a geotechnical investigation technique used to obtain soil parameters for engineering design. It involves pushing a small instrumented steel cone into the ground to measure cone tip resistance and sleeve friction. This data allows identification of soil type as well as soil strength and stiffness parameters. Offshore CPT systems can be divided into 2 distinct types: seabed systems and downhole systems. Seabed systems involve deploying individual units ranging between 1 to 20 tonnes generally from a vessel crane (or A-frame) to the seabed. Downhole systems are deployed within a borehole using specialist tools on a dedicated geotechnical drillship.

Vibrocore sampling may also be employed. Vibrocore sampling is a well established technique of quickly obtaining soils samples up to a depth of around 6m below seafloor. A vibrocore unit basically consists of an electrical motor attached to a 4" diameter steel tube housed within a frame. The unit is deployed from a vessel (via crane / A-frame) to the seabed, with the sampling tube then vibrated into the ground at high frequency. The recovered soil samples are described and tested by technicians, with the information generally being used to inform cable and pipeline burial assessments.

4. Embedded Mitigation

An overview of the offshore SG1A Project embedded mitigation measures that will be applied are summarised in Table 4.1. Any additional mitigation that is required is presented in the relevant environmental topic section.

Table 4.1 - Summary of offshore SG1A Project embedded mitigation

Measure	Details
General	
Pre-construction surveys will be conducted to inform detailed route engineering.	Appropriate pre-construction validation surveys including geophysical, geotechnical, terrestrial and benthic scopes will be conducted to confirm the locations of potentially sensitive features. Detailed route design will be informed by the survey results, and sensitive features avoided where possible.
Environmental planning.	Development and implementation of a Marine Pollution Contingency Plan (MPCP) Development and implementation of a Construction Environmental Management Plan (CEMP). The CEMP will set out those responsible for overseeing work and the implementation of mitigation and good practice working methods during construction to minimise environmental effects.
Offshore	

Measure	Details
Marine mammal mitigation.	• All vessels will be compliant with the Scottish Marine Wildlife Watching Code (NatureScot, 2017) • A marine mammal observer (MMO) will be on the geophysical survey vessel to carry out the proposed mitigation. • The MMO will conduct a pre-shooting search of a 500 m radius mitigation zone. If a marine mammal is observed survey commencement will be delayed until 20 minutes after the marine mammal has left the mitigation zone or was last observed. • Soft start procedures will be implemented by seismic survey equipment, where practical, through the uniform ramping up of power. It is acknowledged that this is not possible for some SBP equipment (i.e. it is either on or off) and such instances will be ascertained by the appointed survey contractor; and • For SBP, in relation to line change procedures, it is interpreted here that equipment should be turned off if line changes (or other pauses) are expected to be longer than 40 minutes, and also where practical if line changes/pauses are less than 40 minutes, with the above pre-shooting search and soft start procedures applying in both cases.
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Marine Non-Native Species (MNNS) introduction during construction, operation and decommissioning is minimised.
Vessels will adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).	The Biofouling Guidelines provide a consistent approach to minimising the risk of MNNS introduction via biofouling on ship's hulls.

Measure	Details
The use of external cable protection including rock berms and/or mattresses will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial.	Cable burial is the first choice for protection, as this minimises impacts on the environment and other sea users. However, when this is not possible due to existing subsea assets, or seabed conditions, other cable protection measures may be utilised to ensure the cable is adequately protected. The preferred option for this will be rock placement.
All rock berms and external cable protection will be designed with slopes less than 1:2.5, and of suitable construction to minimise snagging risk.	Minimising disruption to commercial fisheries resulting from the installation and operation of the cables.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Liaison and Mitigation Action Plan (FLMAP).	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.
Additional communication for Forth Ports and local harbours	To communicate full details of construction works and programme.
Cable lay vessels (CLV) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability	Ensure navigational safety
Temporary aids to navigation will be deployed (if required) to guide vessels around any areas of installation activity.	Ensure navigational safety
Guard vessel(s) will be employed to work alongside the installation vessel(s) during the construction period. The guard vessel(s) will alert third party vessels to the presence of the installation activity and provide assistance in the event of an emergency.	Ensure navigational safety

Measure	Details
Passing vessels will be requested to maintain a "safe" distance from installation vessels restricted in manoeuvrability, e.g. for a CLV with dynamic positioning a typical safe distance is 500m. This will be monitored by guard vessels	Ensure navigational safety
In water depths of greater than 20m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20m, the water depth will not be affected by more than 1m.	Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out.
Compliance with International Regulations for the Prevention of Collision at Sea (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project, compliance will ensure navigational safety and minimise the risk of equipment snagging.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk of equipment snagging.
Crossing and Proximity agreements will be established with relevant cable and pipeline owners or operators of other assets.	These agreements will include the ability of a cable or pipeline operator to access their asset during construction if required. If such works are required to occur simultaneously, consultation with the cable or pipeline operator will be undertaken.
Protocol for Accidental Discoveries of Marine Historical Assets.	The Protocol will define procedures to be taken in the event of a discovery in order to avoid impact to any marine historic assets. Marine archaeology exclusion zones will be established where relevant, where access will be restricted.
Avoidance of any identified seabed heritage assets and geophysical anomalies. Conduct and review marine geophysical surveys to support avoidance.	Geophysical surveys and archaeological review of data, will allow for the avoidance of known assets and identified geophysical anomalies that are likely to be anthropogenic as the primary strategy. This will be supported by a marine Protocol for accidental archaeological discoveries (mPAD), and a marine archaeological written scheme of investigation (WSI).
Protocol for Dropped Objects at Sea	Seagreen 1A will implement prevention, notification and recovery processes for Dropped Objects
Navigational safety	Appropriate lighting and marking of vessels will be implemented to minimise risk to other marine users.

5. Consultation

The offshore SG1A Project has engaged with key stakeholders from an early stage and throughout the EIA process, in order to inform this EIAR and ensure that the development proposed is acceptable in terms of design and environmental effects.

As detailed in Section 2.4.1, PAC was required to support the offshore SG1A Project Marine Licence application. SG1A has undertaken consultation in line with both the marine and terrestrial requirements in relation to PAC. Extensive and early consultation has been carried out as part of the offshore SG1A Project design, route selection, and Marine Licence application. Further information on the PAC process, including details on the virtual PAC exhibition and event, is provided in the SG1A PAC Report (LF000012-CST-EV-LIC-DEV-REP-0001).

This section, therefore, concentrates on consultations with statutory and non-statutory consultees with specific regard to EIAR topics.

5.1 EIA Consultation

In accordance with COVID-19 guidelines and protocols, (The Marine Works and Marine Licensing (Miscellaneous Temporary Modifications) (Coronavirus) (Scotland) Regulations 2020) all consultation carried out to inform the EIAR and the Marine Licence application for the offshore SG1A Project was undertaken using teleconference, email, website updates, virtual events or by telephone.

In December 2020, SG1A submitted a Screening Report (SG1A Screening Report - LF000012-CST-OF-LIC-DEV-REP-0001). Consultation responses to the Screening Report and subsequent meetings between December 2020 and production of the EIAR are provided in Table 5.1. The consultation comments received, along with the offshore SG1A Project response and where the comment is addressed within the EIAR, or other Marine Licence application documents, is provided in Table 5.1.

In response to the offshore SG1A Project Screening Report, the offshore SG1A Project received a number of requests from consultees to consider specific impacts in any environmental assessment undertaken to support the Marine Licence application, particularly in relation to marine mammals, EMF, pre-construction activities and protected sites. These impacts are all now included within either this EIAR or Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012-CST-OF-LIC-DEV-REP-00020). A meeting was held with NatureScot, Marine Scotland Science and MS-LOT on 19th February 2021 where each attendee’s consultation responses on the offshore SG1A Project Screening Report were discussed. Attendees at the meeting agreed with the SG1A responses and the approach being taken in particular in relation to the environmental topics to be included in any environmental assessment undertaken to support the Marine Licence application.

The Screening Opinion which was received on 19/02/2021 is summarised in Table 5.1 and is provided in full in Appendix A: Offshore SG1A Screening Report and Screening Opinion.

Table 5.1 Offshore SG1A EIA Screening Report Consultation Summary

Comment Reference Number	Consultee	Summary of comments	SG1A Project Response	EIAR Section / other report where addressed
C1	MS-LOT	There remains uncertainty as to the extent of the onshore works associated with the Proposed Works. East Lothian Council highlighted that further onshore transmission works including a substation within East Lothian will be required however details of this have not been provided. The screening opinion request also refers to the construction of an onshore operations and maintenance facility for the Proposed Works however does not provide any further details. The Proposed Works and onshore transmission works are integral to each other, as the electricity cannot be exported to the grid without both. The Scottish Ministers are required to consider the whole project when considering EIA.	The onshore SG1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) has been prepared to accompany an application for PPP, in accordance with The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 20171 (herein referred to as the 'EIA Regulations'). The Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) considers the construction, operation and decommissioning of an onshore substation, onshore electricity cables and associated infrastructure required to export electricity to the national electricity transmission system at Cockenzie, East Lothian. In summary it includes: • One shore end export cable between the Mean Low Water	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)

			Spring (MLWS) mark and the transition joint bay; • One transition joint bay, where the shore end export cable would interface with the onshore export cable; • One onshore export cable, running from the transition joint bay to the onshore substation; • Potential joint bay and temporary pulling pits, for installation of the onshore export cable (potentially located anywhere within the onshore export cable development zone); • The onshore substation; • One grid connection cable linking the onshore substation and the existing Cockenzie substation; • Temporary construction compound and working areas; and • Access and site tracks. The above onshore works are not considered in this offshore EIAR or SG1A Project Marine Licence application but	

			are sufficiently included in the onshore consent application material.	
C2	MS-LOT	The Proposed Works are located within or in close proximity to the Outer Firth of Forth and St Andrews Bay Complex Special Protected Area ("SPA"), the Firth of Forth SPA, the Firth of Forth Banks Complex Nature Conservation Marine Protected Area ("ncMPA"), the Firth of Forth Site of Special Scientific Interest ("SSSI"), the Forth Islands SPA and the Isle of May Special Area of Conservation ("SAC"). NatureScot advised that there are a number of impact pathways which may lead to significant effects on one or more of these protected sites.	See C17 and C18 responses.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C3	MS-LOT	NatureScot advised that quantification of any habitat loss during the construction and decommissioning phases is needed to assess the impact on habitat and benthic features as well as habitats used by seabirds or migratory birds. NatureScot advised that this needs to be considered for all qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA which overlaps with the cable corridor, as well as the Firth of Forth SPA which overlaps with the landfall locations. NatureScot also advised that the features of the Firth of Forth Banks Complex ncMPA should be assessed for any potential impact pathways.	See C19 response.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C4	MS-LOT	NatureScot also advised, that disturbance and displacement effects during the construction phase are possible for all the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA, the Firth of Forth SPA, the Firth of Forth SSSI as well as seabird qualifying features (guillemot,	See C18 response.	Section 8 of the NCA Report (LF000012-

		kittiwake, puffin, razorbill (and seabird assemblage)) of the Forth Islands SPA. NatureScot advised that a qualitative assessment based on vessel movements and areas occupied by activity should be undertaken and that depending on the construction schedule, consideration may also be required for the Isle of May SAC designated for grey seals.		CST-OF-LIC-DEV-REP-0002)
C5	MS-LOT	In relation to the operation and maintenance phase, NatureScot advised that it is not yet known to what extent introducing hard structures to a soft sediment environment will impact benthic and fish communities. There is the potential for impacts across multiple trophic levels due to changes in prey availability and this will need to be considered for all the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA and also the seabird qualifying features of the Forth Islands SPA.	See C19 response.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C6	MS-LOT	East Lothian Council highlighted that construction works at the landfall locations may be in close proximity to sensitive residential receptors. These may be impacted by noise, vibration and dust caused by the Proposed Works. East Lothian Council advised that this could be controlled through the submission of a Construction Environmental Management Plan which should include practicable control measures for reducing visible dust emissions, details of daytime and night time construction noise mitigation measures and assessment of vibration impacts from tunnelling and trenching during construction. However, the Scottish Ministers note that details of these mitigation measures have not been provided	Impacts from construction works at the landfall, including noise, vibration and dust are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application.	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)

		so there remains a potential for significant effects on sensitive receptors.		
C7	MS-LOT	HES advised that sufficient information has been provided to demonstrate that any potentially significant effects on historic environment interests can be effectively mitigated. The Scottish Ministers note however, that details of this mitigation have not been provided and HES have also requested sight of the Written Scheme of Investigation and Protocol for Accidental Discoveries which it requires to be submitted to show how accidental impacts on marine heritage will be avoided or mitigated and to manage any accidental discoveries of archaeological interest.	See C38 response.	Section 11.8 and Section 11.9
C8	MS-LOT	NatureScot also advised on the need to consider pre-construction activities such as unexploded ordnance clearance and geophysical activities that may create significant underwater noise. NatureScot confirmed that these impacts will require assessment under European Protected Species licensing as well as an assessment of the effects on designated sites with marine mammal and potentially diadromous fish qualifying features. East Lothian Council supported this view about impacts on marine mammals and referred to the Isle of May SAC and Moray Firth SAC as being potentially impacted. NatureScot also advised that greater consideration of electromagnetic field effects for diadromous fish and in particular Atlantic salmon, is required.	See C16 response.	Section 8; Section 9 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C9	MS-LOT	Concerns were raised by East Lothian Council regarding the lack of detail about the mitigation measures which have been	Impacts and mitigation measures from onshore infrastructure works, including	Onshore EIAR - Seagreen 1A

		proposed. East Lothian Council noted that this is particularly relevant for potential effects with regard to noise, accidental spillage of pollutants, invasive non-native species, possible risks to the health of the general public and fisheries. East Lothian Council also noted with respect to landscape, that the visual disturbance from the intertidal works requires further consideration as part of the Proposed Works.	landfall, are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application. Details of embedded mitigation in relations to accidental spillage of pollutants in the marine environment are provided in Section 4.	EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002); Section 4
C10	MS-LOT	The Proposed Works will overlap considerably with the Inch Cape Offshore Wind Farm export cable corridor which underwent an EIA. The screening opinion request proposes that assessments carried out in support of the Inch Cape project can be used to show that the Proposed Works will not have significant effects on the environment. However, NatureScot noted that while much can be drawn across from the previous assessments, all key environmental receptors and impact pathways have been screened out across all development phases in the screening opinion request without any project-specific quantification or justification of these impacts. NatureScot disagrees with the proposed approach due to a lack of knowledge on the Inch Cape build out and advised that insufficient consideration has been given to impacts on protected sites and features, including the potential for in-combination effects. NatureScot also advised that other works that may be sequential or operating at the same time as the Proposed Works require further consideration and may need to be assessed further.	See C15 response.	Sections 7 - 11 Sections 7-9 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)

C11	MS-LOT	The Scottish Ministers note the proposal in the screening opinion request to include some of this information as part of an environmental appraisal to be submitted along with the marine licence application. However, the Scottish Ministers are of the view that due to the number of uncertainties, insufficient detail on mitigation and the potential for the Proposed Works to have a significant effect on the environment, an environmental appraisal is not appropriate, and the Proposed Works are an EIA project.	In response to the Screening Opinion received, the offshore SG1A Project have produced this EIAR to support the Marine Licence application.	Section 3.8.2.5; Topic specific mitigation within Sections 7-11; Section 12. Full impact assessment provided in Section7-11.
C12	MS-LOT	In view of the findings above, the Scottish Ministers are of the opinion that the Proposed Works are an EIA project under the 2017 MW Regulations and the 2007 MW Regulations and, therefore, an EIA is required to be carried out in respect of the Proposed Works.	In response to the Screening Opinion received, the offshore SG1A Project have produced this EIAR, to support the Marine Licence application.	Offshore EIAR LF000012-CST-OF-LIC-DEV-REP-0003
C13	NatureScot	We have reviewed the Screening Report provided (document reference LF000012-CST-OF-LICDEV-REP-0001) and note that the cable route largely follows the route of the consented Inch Cape cable corridor route from Cockenzie out to the Inch Cape wind farm array area before tracking north east to the Seagreen 1 wind farm array area. The final landfall location (and export cable route) are yet to be determined with two potential landfall options identified - Cockenzie or Seton Sands. Trenchless Installation or direct pipe is being considered for the Cockenzie landfall location (Section 4.4)	Cockenzie is preferred landfall location. Consideration of alternatives which was undertaken will be presented in the EIAR. Trenchless installation is the confirmed installation method at landfall.	Section 3

		however no further information is provided in relation to Seaton Sands.		
C14	NatureScot	The Inch Cape export cable corridor was originally assessed in 2011 and revalidated in 2018 for the revised project design. However, Inch Cape have yet to reach financial closure (FID) and as such there are still many project elements that could still be refined including whether or not all 6 consented cables will be required. We welcome ongoing discussion to see how these projects may align.	Noted. SG1A considers ongoing discussion with Inch Cape important. Further details on consultation with neighbouring developments and the CES are included in the PAC report	PAC Report (LF000012-CST-OF-STK-DEV-REP-0001)
C15	NatureScot	EIA Requirements We are content that the SG1A project does not require a full EIA, as we acknowledge that much can be drawn across from the previous assessments, however, these cannot be relied upon exclusively. We support the need for a bespoke environmental appraisal to accompany the forthcoming Marine Licence application for the SG1A project and commend the commissioning of additional benthic surveys to validate and augment the existing baseline given the length of the intervening time period since original baseline characterisation. With regard to the approach taken within the screening report - all of the key environmental receptors and impact pathways have been screened out across all development phases without any project-specific quantification or justification of these impacts, instead reference is made to these impacts as previously been assessed as not significant in the Inch Cape or Seagreen ES. We do not agree with this approach for the reasons stated above regarding lack of	Not all topics have been screened out of further assessment. The EIAR will include detailed assessment on commercial fisheries, fish & shellfish ecology, marine mammals, shipping and navigation and marine archaeology. In addition, a Nature Conservation Appraisal (NCA) report will be submitted with the ML application (to satisfy HRA requirements) and will include detailed assessment on the relevant NCMPA (marine processes/benthic), SPA (ornithology) and SAC (grey seals) designated sites, including in-combination effects. Whilst the screening report acknowledged the conclusions of Inch	Section 6.1; Sections 7 - 11; Sections 7-9 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)

		knowledge on the Inch Cape build out. We also advise insufficient consideration has been given to impacts to protected sites / features, despite the overlap with the SG1A project area, including the potential for in-combination effects.	Cape and Seagreen, it also presented the key parameters of SG1A and why for many topics no impacts are considered likely due to the footprint of a single cable and the use of only 2 construction vessels. However, greater emphasis will be placed on this in the NCA and EIAR rather than previous project conclusions. The EIAR containds an upfront section to re-confirming the conclusions of the screening report and which topics are not required for assessment in the EIAR. A meeting was held with NatureScot, Marine Scotland Science and MS-LOT on 19th February 2021 where agreement was reached in relation to the environmental topics to be considered in this EIAR and the NCA Report.	
C16	NatureScot	Pre-construction phase impact pathways We advise on the need to consider pre-construction activities that can emit significant underwater noise e.g. UXO clearance and some geophysical activities. Impacts will require both assessment under EPS licensing as well as effects to designated sites with marine mammal and potential diadromous fish (Atlantic salmon) features. These impacts should be considered within the EA rather than post-consent.	Impacts from geophysical survey activity to sensitive species will be included (as well as the use of similar equipment during installation) within the NCA report and EIAR. At this stage UXO clearance is not likely to be required as pre-construction surveys will inform cable routeing to avoid features therefore this is not considered in the impact assessment. Post-consent,	Section 8 Section 9 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)

			should it be required then sufficient assessment will be undertaken in support of any EPS licence application.	
C17	NatureScot	Construction phase impacts Direct habitat loss / disturbance Despite the temporary nature of this impact pathway during construction, quantification of any habitat loss should be provided to assess the impact on habitat/benthic features as well as habitats used by seabirds or migratory birds. We advise therefore that the Outer Firth of Forth and St Andrews Bay Complex SPA which overlaps with the cable corridor as well as the Firth of Forth SPA which overlaps with the landfall locations are screened in for all features so that this can be considered further. We also advise that the features of Firth of Forth Banks Complex Nature Conservation MPA will need to be assessed for any potential impact pathways.	NCA report will be submitted with the Marine Licence application (to satisfy HRA requirements) and will include detailed assessment on the relevant NCMPA (marine processes/benthic), SPA (ornithology) and SAC (grey seals) designated sites, including in-combination effects.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C18	NatureScot	Disturbance and or displacement Disturbance / displacement effects during construction should be considered for all the qualifying features for Outer Firth of Forth and St Andrews Bay Complex SPA, the Firth of Forth SPA (& SSSI) as well as seabird qualifying features (e.g. guillemot, kittiwake, puffin, razorbill (and seabird assemblage)) of Forth Islands SPA. A qualitative assessment based on vessel movements and areas occupied by activity should be undertaken. Depending on the construction schedule consideration maybe required for the Isle of May SAC designated for grey seals.	Confirmed - these sites have been included in NCA. All qualifying features have been assessed, except for waders (which are covered in onshore application material.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)

C19	NatureScot	Operation & maintenance phase Changes to prey availability We don't yet know the extent to which introducing hard structures (e.g. cable protection) to soft sediment environment will have on benthic and fish communities and the inter play across trophic levels. This impact should be considered for all the qualifying features for Outer Firth of Forth and St Andrews Bay Complex SPA and the seabird qualifying features of the Forth Islands SPA.	Changes to sea bird prey availability is considered in the NCA report. Considering the localised and temporary nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no LSE is predicted.	Section 8 of the NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C20	NatureScot	EMF / barrier effects Greater consideration of EMF effects for diadromous fish particular Atlantic salmon is required. It is likely that key current research projects being undertaken by Marine Scotland Science will have reported or will have results that can be utilised in the assessment and mitigation of this project.	The potential impacts of EMF emissions during the operational phase to sensitive fish and shellfish species are included within fish and shellfish assessment in this EIAR.	Section 7.9.2 and Section 7.9.2.
C21	NatureScot	Decommissioning phase impact pathways Our advice above for construction phase impacts should also be considered for decommissioning phase activities.	Noted. The Impacts during decommissioning phase have been included in the EIAR and are assumed to be the same in terms of WCS as the impacts during installation.	Sections 7 - 11 where required.

C22	NatureScot	Cumulative / In-combination impacts The approach taken for consideration of cumulative impacts or in-combination effects mirrors that described above where the conclusions from the previous Inch Cape and or Seagreen ESs have been utilised without any project-specific quantification or justification. It would be helpful to revisit this and consider what other works may be sequential or operating at the same time that may need to be assessed further.	Methodology for cumulative impact assessment has been included in this EIAR. Environmental topic specific cumulative impacts included in each relevant section. The NCA Report also considers in-combination impacts in relation to marine protected sites.	Section 6.4; Section 7.10, 8.10, 9.10, 10.10, 11.10; NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)
C23	East Lothian Council	In order to export electricity to the national grid via this cable, further onshore transmission works including a substation within East Lothian will be required. The cable route and onshore transmission works are integral to each other, as the electricity cannot be exported to the grid without both. In addition, Section 4.5 of the Screening Report notes 'This [Operations & Maintenance team] is expected to be based in purpose built onshore O & M facilties, ideally situated on the quayside at the chosen operations port location. If there is no local airport or heli-port available, this facility could also accommodate the helicopter hangar and heli-pad if required'. The onshore works within East Lothian have not been screened however the developer has stated they will submit an Environmental Statement with the application for these works. I am not aware of whether the O & M facility is intended to be in East Lothian or if it will be included in that application. You may wish to consider whether the cable works can be considered separately from the onshore works within East Lothian in terms of EIA with regard to 'salami	An Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)has been prepared to accompany an application for PPP, in accordance with The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 20171 (herein referred to as the 'EIA Regulations'). The purpose of this EIAR is to support the SG1A Project's Marine Licence application for a single offshore export cable. This EIAR is submitted in accordance with the requirements of the Marine Works (EIA) (Scotland) Regulations 2017, which transpose the amendments made to the EIA Directive 2011/92/EU by Directive 2014/52/EU.	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)

		slicing'. The Council will require to do the same on receipt of any application or Screening Request for onshore works here.		
C24	East Lothian Council	Local Air Quality, Dust, Noise and Vibration. If there are construction works at landfall locations in close proximity to sensitive residential receptors then there could be impacts upon them due to noise, vibration and dust in the construction phase that can be adequately controlled via submission of a Construction Environmental Management Plan (CEMP) to address the following: Air Quality - no significant Impacts upon National Air Quality Objectives during the construction phase are anticipated. However, with regards to dust the CEMP should include details regarding practicable control measures for reducing visible dust emissions affecting properties beyond the site boundary. Control measures to be considered are identified in Section 8 of the Institute of Air Quality Management Guidance on the assessment of dust from demolition and construction (2014)	Impacts from onshore construction works, including at the landfall, are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application.	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)
C25	East Lothian Council	Noise – the CEMP should refer to "Best Practice Guidance" as recommended BS5228-1: 2009 "Code of practice for noise and vibration control on construction and open sites. Noise impacts during the construction phase shall be assessed having regard to appropriate guidance and methodology. The CEMP shall include details of any mitigation measures required to ensure the following criteria can be met:	Impacts from onshore construction works, including at the landfall, are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application.	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)

		• Daytime Construction Noise – Predicted noise levels outside living room windows of noise sensitive properties shall not exceed the 70dB trigger level specified in BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control on construction and open sites. Part 1: Noise. • Night Time Construction Noise – Any noisy work during the night (2300-0700 hours) shall comply with the World Health Organisation Night Noise Guidelines for Europe (2009) which recommends a limit of 40dBnight, outside.		
C26	East Lothian Council	Vibration - It is possible that sub-surface tunnelling methods at the Landfall and open trenching or horizontal drilling for the onshore and offshore export cables may give rise to vibration. Vibration impacts during the construction phase shall be assessed. Any assessment to take account of BS 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control on construction and open sites. Part 2: Vibration	Impacts from onshore construction works, including at the landfall, are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application.	Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002);
C27	East Lothian Council	Biodiversity The Council values its biodiversity, including that of the Firth of Forth SPA, the Forth Islands SPA, and the Outer Firth of Forth and St Andrews Bay Complex proposed marine SPA. It also values the marine mammals which are visitors to the East Lothian coast, including those from the nearby Isle of May SAC and further afield Moray Firth SAC. There is legislative provision for the protection of such sites and species. If NatureScot consider impacts should be assessed through EIA the Council would support their views.	A Nature Conservation Appraisal (NCA) report has been submitted with the Marine Licence application (to satisfy HRA requirements) and includes detailed assessment on the relevant NCMPA (marine processes/benthic), SPA (ornithology) and SAC (grey seals) designated sites, including in-combination effects.	NCA Report (LF000012-CST-OF-LIC-DEV-REP-0002)

C28	East Lothian Council	Landscape The Screening Report notes that visual disturbance from landfall works will be included within the onshore planning application and supporting environmental information. However, the intertidal works are part of this application, and therefore should be considered. The Screening Report notes that as the project will be an underwater cable there is no pathway for impact. No permanent signage has been included in the description of the project, for example to show where the cable is buried and this response is given on the basis that this is not necessary.	Given the use of trenchless installation technique at the landfall no works in the intertidal area are considered to give rise to any visual impacts and therefore this is not considered further in this EIAR. Visual impacts from onshore construction works, including landfall works, are included in the Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002) submitted in support of the onshore planning consent application. Environmental topics to be included in this EIAR were agreed with NatureScot and MS-LOT at a consultation meeting held 19th February 2021. Landscape and visual impact was not required to be assessed in this EIAR.	Onshore EIAR - Seagreen 1A EIA Report Volume 2: Main Report (LF0000012-CST-ON-LIC-DEV-REP-002)
C29	East Lothian Council	Air Quality and climate change The applicant notes that no potential pathways are identified for the SG1A project. However the Report indicates both helicopter and shipping movements, as well as the use of materials (including concrete) that could cause emissions which could effect the climate and air quality. One of the main benefits of the project as a whole (the offshore wind turbines) is to reduce climate change emissions. Moving away from coal generation also improves air quality. The purpose of this change to the project is to enable 36 wind turbines to export	The offshore SG1A Project involves installation of a single offshore export cable. Given the small footprint of the export cable corridor and the small number of construction vessels required (max 2), the offshore SG1A Project will not generate any emissions that will have any notable impact on climate change. In addition, the offshore SG1A Project will facilitate the export of clean renewable	Section 6.1

		electricity to the national grid. Whether or not the turbines as structures are considered part of the project, the savings of emissions to air including carbon dioxide resulting from export of additional renewable energy is attributable to the existence of the cable and other export infrastructure. Good practice advice from the IEMA advice on climate change mitigation (see https://transform.iema.net/article/eia-and-search-significance) notes that "Greenhouse gas emissions have a combined environmental effect that is approaching a scientifically defined environmental limit, as such any GHG emissions or reductions from a project might be considered to be significant." The project therefore has both positive and negative impacts on climate. You may consider this is a significant effect in terms of EIA for the cable	energy from the Seagreen OWF and therefore the offshore SG1A Project will make a significant contribution to the UK achieving renewable energy and net zero emission targets. As a buried offshore cable the offshore SG1A Project is not vulnerable to climate change. Therefore climate change is not considered as part of the assessments included in this EIAR. Detailed design of the cable installation at landfall will account for any potential physical changes at the coast due to climate change thus ensuring the cable will not become exposed. Environmental topics to be included in this EIAR were agreed with NatureScot and MS-LOT at a consultation meeting held 19th February 2021. Air quality and climate change was not required to be assessed in this EIAR.	
C30	East Lothian Council	Fishing Fish as a harvestable food resource and fishing boats/gear can be considered material asset in terms of EIA. It is not clear from the information provided what the impact will be on fishing within East Lothian, though some boats do operate from here. The Scoping Report notes there are some potential	The potential impacts to commercial fisheries receptors which operate out of East Lothian has been assessed in this EIAR. See C39-C41 consultation responses	Section 9.9

		pathways to commercial fishery receptors. This is proposed to be the subject of consultation with commercial fisheries stakeholders. Some impacts will also be considered in an Environmental Appraisal, namely temporary loss or restricted access to fishing grounds; displacement of fishing activity into other areas and safety issues for fishing vessels. Interference with fishing activity, increased steaming times and impacts to commercially exploited species will not be assessed. Safety issues are potentially a significant issue however safety zones and other mitigation will be in place.		
C31	East Lothian Council	Mitigation The Council is concerned to avoid impacts on its area including from accidental spillages of pollutants, as well as nuisance from dust and noise noted above, the introduction of invasive nonnative species, and on fishing interests. Potential impacts have been noted, with mitigation measures outlined. The applicant states on page 31 that “Due to the measures in place to control and/or manage waste, pollution and nuisance, which are expected to be secured by consent conditions, significant adverse effects on the environment are not predicted.” Where this mitigation is relied on to avert the need for EIA, the mitigation should be fully specified and evaluated at this stage to ensure there is confidence in its effectiveness. This is also the case for mitigation described for commercial fisheries. There is also the need for clear control measures to make sure that the mitigation is successfully implemented to avoid, reduce or offset the environmental impact. This is relevant for potential effects in East Lothian	In response to the Screening Opinion received, the offshore SG1A Project have produced this EIAR, to support the Marine Licence application. Implementation of the embedded and additional mitigation presented in this EIAR is outlined in Section 12.6. To ensure implementation of the embedded and additional mitigation in this EIAR, the schedule of mitigation (including Table 4.1 - Summary of offshore SG1A Project embedded mitigation) will be included in the offshore SG1A Project Construction Environmental Management Plan (CEMP) which will be produced prior to construction.	Section 12.6

		with regard to noise, accidental spillage of pollutants, invasive non-native species and possible risks to the health of the general public controlled through COSHH Regulations, and fisheries. If there is doubt that the mitigation described will be effective in avoiding a significant impact, EIA should be carried out.	Any Contractor appointed to work on the offshore SG1A Project is expected to work to the offshore SG1A Project CEMP and will be required to produce a Contractor specific EMP in line with the project CEMP.	
C32	Angus Council	"Based on the information provided the scale, location and potential impacts arising from the installation of the additional export cable would be unlikely to have significant effects on the environment. Angus Council is therefore of the opinion that a full Environmental Impact Assessment is not required in this instance as it is considered that any potential impacts can be identified and mitigated without requiring the support of a full EIA. This view is based on the information contained in the Seagreen 1A Export Cable Corridor Screening Report however, it is the decision of your organisation to determine if a full EIA is required."	Noted	N/A
C33	Dundee City Council	"Thank you for sending us the EIA consultation material. I can advise that we have no comment to make on this particular EIA process."	Noted	N/A
C34	Fife Council	"Fife Council has not provided a formal opinion on the basis that this request relates to an area outwith our geographical jurisdiction. We consider, however, that an additional cable in the same channel as the existing consented works would not	Noted	N/A

		significantly impact further on the environment than has already been assessed through the environmental assessments carried out to date."		
C35	Scottish Borders Council	Due to the remote location of this installation from the Scottish Borders, we have no comments to make on this Screening Request but thank you for consulting us.	Noted	N/A
C36	Forth Ports	There are ports/docks at Inverkeithing, Methil, Kirkcaldy etc. (associated with Fife and Kirkcaldy) to be aware of	Noted. These ports have been included in the Shipping and Navigation Section of the EIAR	Section 10
C37	Crown Estate Scotland	The key request from Crown Estate Scotland has been that Cable route should be designed to minimise seabed utilisation	The offshore SG1A Project export cable corridor has been selected to minimise seabed utilisation among other considerations	Section 3
C38	Historic Environment Scotland	Agreement that the Marine License application will consider in further detail the impact on the seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies. Support the preparation of a marine heritage Written Scheme of Investigation and Protocol for Accidental Discoveries to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest.	Detailed assessment of impact on the seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies can be found in the Marine Archaeology Section.	Section 11.8 and Section 11.9
C39	Scottish Fishermen's Federation (SFF)	A request to confirm that target burial areas and depths are achieved and to carry out an overtrawl survey. Request for	SG1A has committed to provide details on overtrawl surveys where applicable, within a FLMAP. Some microrouting of the offshore SG1A export cable will be	Section 9.9.3, Section 3.5.2

		consideration of route alteration south of the isle of May to avoid hard ground	carried out following the review of geophysical survey data, however the current corridor reflects the preferred corridor based on the consideration of various factors, including reducing environmental impact by overlapping with existing offshore export cable corridors. Details on the consideration of alternatives has been provided in this EIAR.	
C40	SFF	Request to assess the impacts to *Nephrops* and scallops during installation	Potential impacts to seabed dependent key commercially exploited species are assessed within the EIAR	Section 7.9.1
C41	SFF	Request for detailed consideration of the potential impacts of displacement of fishing activity and potential loss of grounds	Potential impacts of displacement and loss of grounds have been assessed within the EIAR. In response to consultation additional mitigation measures have been committed to and will be detailed within the FLMAP.	Section 9.9, Section 9.9.3, Section 9.8
C42	SFF	Advise not to rely on AIS data for the assessment	The commercial fisheries baseline has been informed using a variety of data sources to ensure reliability, coverage of all vessel sizes, and representation of the activity within the region. AIS data has been used to compliment the other data sets which are referred to	Section 9.4

C43	SFF	Request for commitment on when post-lay surveys are undertaken	SG1A has committed to carrying out an overtrawl survey 12 months following the completion of the installation and placement of any protection. A post-installation survey will be carried out prior to the overtrawl survey.	Section 9.9.3
C44	Pittenweem Fishermen's Mutual Association (FMA)	Request that SG1A commit to overtrawl surveys as part of the mitigation measures.	The potential impacts to commercially exploited fish and shellfish, the impact of displacement of fishing activity into other areas, and of the potential changes to steaming times has been assessed within this EIAR.	Section 7.9.1, Section 9.8 and Section9.9.
C45	Pittenweem FMA	Concerns raised on the impacts of installation to *Nephrops*, changes to fishing vessel steaming times and displacement of fishing activity during installation	Impacts to vessel transit routes and steaming times and impacts to *Nephrops* are assessed within the commercial fisheries, Shipping and Navigation sections of this EIAR See responses to C40	Section 7.9.1, Section 9.9, Section 10.9,
C46	North and East Inshore Fisheries Group	Request that an EIAR is produced	SG1A has prepared an EIAR in response to consultation comments	Offshore EIAR LF000012-CST-OF-LIC-DEV-REP-0003
C47	North and East Inshore Fisheries Group	Request that displacement of fishing activity and impacts to *Nephrops* fishery are carefully considered	Potential impacts to *Nephrops* trawlers has been carefully considered as part of each commercial fisheries impact assessment.	Section 9.9

C48	North and East Inshore Fisheries Group	Request for consideration of overtrawl survey	See response to C39	Section 9.9.3
C49	St Andrews Inshore Fishermen's Association	Requested that the potential impacts of EMF are assessed, and overtrawl surveys are carried out where applicable	See response to C20 and C39	Section 7.9.2, Section 9.9.3
C50	Fishing vessel operator (Pittenweem)	Concern over the potential impacts to *Nephrops* and EMF	See response to C40 and C20	Section 7.9.1, Section 7.9.2
C51	Fishing vessel operator (Arbroath)	Concern over loss of grounds, effects of displacement and cumulative impacts	See response to C41. The potential for cumulative effects on commercial fisheries impacts has been carefully considered in the EIAR.	Section 9.9, Section 9.10.2
C52	Dunbar Fishermen's Association	Concern over the cumulative effect of developments in the area, and potential impact to the *Nephrops* fishery	See response to C41 and C47	Section 9.9, Section 9.10.2
C53	Fishing vessel operator (Burnmouth/Eyemouth)	Request for assessment of cumulative effects, an evidence-based cooperation payment methodology and clarity of project communications	See response to C41. A company FLO is in place to ensure consistent and accurate information is provided to the fishing industry. SG1A has committed to an evidence-based cooperation methodology in line with FLOWW guidance	Section 9.9.3, Section 9.10.2
C54	Under 10-m Association	Request to consider cumulative effects, loss of grounds during operation and an overtrawl survey	See response to C41, C39 The potential impact of loss or restricted access to fishing grounds during	Section 9.9, Section 9.10.2

			operation has been assessed within the EIAR	
C55	North Berwick Fishermen's Association	Request to consider the impacts on local static gear operators during installation, and for clarity on the approach for cooperation agreements	See response to C41 and C52	Section 9.9, Section 9.10.2

5.2 Ongoing Stakeholder Engagement

The offshore SG1A Project has engaged a Fisheries Liaison Officer since November 2020 (Xodus Group). This has ensured consistent, thorough and frequent consultation has been carried out with fisheries stakeholders via associations, and with independent vessel operators. Consultation will continue with fisheries stakeholders, and other marine users as detailed in Section 3.8.2.5.

The Marine Communications Strategy and the FLMAP will provide further details as how stakeholder consultation will continue as the offshore SG1A Project develops. Details of mitigation measures to be included in the offshore SG1A Project's FLMAP are presented in Section 9.8.

6. Impact Assessment Methodology

This section of the EIAR describes the process that has been followed in undertaking an EIA for the offshore SG1A Project to support the Marine Licence application. This includes an overview of the methodology used to identify, assess and mitigate potential significant environmental impacts associated with the construction, operation and maintenance, and decommissioning phases of the offshore SG1A Project.

The approach to assessment set out within this section is applicable to all aspects of the offshore SG1A Project parameters, as set out in Section 3 of this EIAR.

6.1 Topics not included in this EIAR

The offshore SG1A Screening Report (LF000012-CST-OF-LIC-DEV-REP-0001) provided a summary of the environmental baseline and potential environmental impacts relevant to the SG1A Project. The SG1A Screening Report presented what topics and impacts would be considered further in any environmental assessment undertaken to support the offshore SG1A Project Marine Licence application.

Therefore, this section provides a summary of the topics and impacts that are not assessed in this EIAR along with the required justification.

In the offshore SG1A Screening Report, the topics presented in Table 6.1 were not considered to be relevant to the offshore SG1A Project and no further consideration was made within the Screening Report. Therefore, these topics are also not considered in this EIAR (see Appendix A: Offshore SG1A Screening Report (LF000012-CST-OF-LIC-DEV-REP-0001)for more detail).

Table 6.1 Environmental topics not considered further in the offshore SG1A Screening Report or this EIAR

Environmental Topic	Justification
Seascape, Landscape and Visual Amenity (SLV)	During operation, the offshore SG1A Project will be an underwater cable therefore there is no pathway for impact. During construction and decommissioning the presence of 2 construction vessels in an active shipping area will not result in any impacts on SLV. Visual disturbance from landfall works will be included within the onshore Planning Application and supporting environmental information.
Military and Civil Aviation	During operation, the offshore SG1A Project will be an underwater cable therefore there is no pathway for impact. During construction and decommissioning the presence of 2 construction vessels in an active shipping area will not result in any impacts on aviation. Potential impacts on military vessel operations is considered within the Shipping and Navigation assessment in this report (Section 10).

Socio-economics, Tourism and Recreation	No potential impact pathways are identified for the offshore SG1A Project and these receptor groups in light of the nature, duration, extent and location of the works.
Population and Human Health	
Air quality and Climate Change	
Offshore Airborne Noise	
Other Human Activities	

The offshore SG1A Screening Report then undertook a more detailed characterisation of potential impacts for a number of environmental topics. For those presented in Table 6.2 it was concluded that no impacts were considered likely to be significant and therefore were not required to be considered further in this EIAR. Full details of this process can be found in Appendix A: Offshore SG1A Screening Report (LF000012-CST-OF-LIC-DEV-REP-0001).

Table 6.2 Environmental topics not considered further within this EIAR

Environmental Topic	Justification for not including in this EIAR
Physical Environment and Water and Sediment Quality	All potential impacts considered not significant in the offshore SG1A Screening Report in consideration of the location, duration, extent and nature of the works.
Benthic Ecology	The likelihood that the SG1A is Capable of Affecting Nature Conservation Marine Protected Areas which have benthic ecology qualifying features which are of relevance to the SG1A Project has been considered in Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012-CST-OF-LIC-DEV-REP-0002). All other potential impacts to benthic ecology considered not significant in the offshore SG1A Screening Report in consideration of the location, duration, extent and nature of the works.
Offshore Ornithology	The potential for a Likely Significant Effect in relation to designated sites which are of relevance to SG1A and have offshore ornithology qualifying features have been considered in Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012-CST-OF-LIC-DEV-REP-0002). All other potential impacts considered not significant in the SG1A Screening Report in consideration of the location, duration, extent and nature of the works.

Since production of the offshore SG1A Screening Report, a Screening Opinion has been received from MS-LOT, and on this basis SG1A have produced this EIAR in support of the Marine Licence application. In accordance with the Marine Works (EIA) (Scotland) Regulations 2017, the topics which are provided in Table 6.3 have been reviewed and are not included for further assessment in this EIAR.

Table 6.3 Additional topics not included for further assessment in this EIAR

Environmental Topic	Justification for not including in this EIAR
Climate change and vulnerability to climate change	The offshore SG1A Project involves installation of a single offshore export cable. Given the small footprint of the export cable corridor and the small number of construction vessels required (max 2), the offshore SG1A Project will not generate any emissions that will have any notable impact on climate change. In addition, the SG1A Project will facilitate the export of clean renewable energy from the Seagreen OWF and therefore the offshore SG1A Project will make a significant contribution to the UK achieving renewable energy and net zero emission targets. As a buried offshore cable the offshore SG1A Project is not vulnerable to climate change. Therefore climate change is not considered as part of the assessments included in this EIAR. Detailed design of the cable installation at landfall will account for any potential physical changes at the coast due to climate change thus ensuring the cable will not become exposed.
Vulnerability of the works to risks of major accidents and disasters	The offshore SG1A Project involves installation of a single buried offshore export cable. Given the small footprint of the export cable corridor and the small number of construction vessels required (max 2), the offshore SG1A Project is not vulnerable to risks from major accidents and disasters. In addition, embedded mitigation (detailed in Section 3.8.2.5) ensures all construction vessels will have the required emergency plans in place regarding accidental pollution release to adhere to MARPOL Annex I.
Transboundary impacts	The majority of the offshore SG1A Project lies within the 12nm limit and all works, including those beyond 12nm, are small scale and highly localised to the immediate export cable corridor or construction vessel movements within the Firth of Forth. Therefore, no transboundary impacts will occur in relation to the offshore SG1A Project.

6.2 Potential Impacts assessed in this EIAR

The offshore SG1A Screening Report and subsequent stakeholder consultation comments and the Screening Opinion has informed the full list of environmental receptors for which a detailed assessment of potential impacts has been carried out. These potential impacts and the offshore SG1A Project phase to which they are relevant are provided in Table 6.4.

Table 6.4 Potential impacts requiring assessment within this EIAR

Potential Impacts	Relevant phase of offshore SG1A Project		
	Cable installation	Cable operation	Cable decommissioning
Natural Fish and Shellfish Resources			

Potential Impacts	Relevant phase of offshore SG1A Project		
	Cable installation	Cable operation	Cable decommissioning
Temporary habitat disturbance	✓	x	✓
Electro-magnetic Fields	x	✓	x
Marine Mammals			
Disturbance or injury as a result of underwater noise from geophysical survey activities	✓	x	x
Commercial Fisheries			
Temporary loss or restricted access to fishing grounds	✓	✓	✓
Displacement of fishing activity into other areas	✓	x	✓
Safety issues for fishing vessels, including allision and collision and potential for snagging with project infrastructure	✓	✓	✓
Shipping and Navigation			
Collision of a passing (third party) vessel with a vessel associated with cable installation, maintenance or decommissioning	✓	✓	✓
Cable installation / decommissioning causing disruption to passing vessel routeing/timetables.	✓	X	✓
Increase in the risk of a vessel-to-vessel collision due to construction / decommissioning vessel activity	✓	X	✓

Potential Impacts	Relevant phase of offshore SG1A Project		
	Cable installation	Cable operation	Cable decommissioning
Cable installation / decommissioning causing disruption to fishing and recreational activities.	✓	X	✓
Cable installation / decommissioning causing disruption to third party marine activities (military, dredging)	✓	X	✓
Vessel drags anchor over the cable	✓	✓	✓
Vessel anchors in an emergency over the cable	✓	✓	✓
A vessel engaged in fishing snags its gear on the cable	✓	✓	✓
Reduction in under keel clearance resulting from laid cable and associated protection	x	✓	X
Interference with Marine Navigational Equipment	X	✓	x
Marine Archaeology			
Seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies	✓	✓	✓

6.3 Assessment Methodology

6.3.1 Overview

For each of the environmental topics being assessed, the appropriate professional guidelines for EIA have been applied and followed as considered necessary, along with any other relevant guidance documents and best practice techniques. As a result, where the standard assessment criteria and terminology set out below are not followed for a specific environmental topic, this will be identified within the relevant environmental section of the EIAR, along with specific information on the preferred assessment criteria that have been applied.

The environmental assessment is conducted in two stages. The first stage characterises the nature of the impacts (positive or negative) and the second determines the level of significance of the impacts. An impact results from the consequences of a change (or impact) acting on a resource / receptor. The impact significance will depend on the interaction between the degree of impact (e.g. extent, duration, magnitude, permanence etc.) and the sensitivity, value or number of the receptor in each case.

6.3.2 Baseline data limitations

Each environmental topic section in this EIAR begins with a detailed description of the baseline environment of that topic in relation to the offshore SG1A Project location. The understanding of the environmental baseline is then used to assess the potential impacts on that baseline from the construction, operation and decommissioning of the offshore SG1A Project.

Each environmental topic section provides details of the data sources used to inform both the baseline and impact assessments. For this EIAR, desk-based data sources have been used. The offshore SG1A Project is located in an area that has already been widely studied by previous projects in the Firth of Forth, therefore there is a significant amount of desk-based studies and data available. There are no known limitations to the baseline data used in this EIAR and it is fully sufficient to inform the impact assessments undertaken.

The offshore SG1A Project is currently undertaking a programme of project specific geophysical and benthic surveys. Results from these surveys will be used to inform detailed design and cable route design in the post consent phase.

6.3.3 Definition of Impact

The EIA Regulations (Scottish Ministers, 2017a) (Scottish Ministers, 2017b) makes reference to both environmental ‘impact’ and ‘effect’. The Regulations do not provide a definition of this terminology, but rather, they are used interchangeably. For consistency throughout this EIAR, the following terminology will be adopted for the purposes of impact assessments:

- ‘Impact’: the way in which an environmental resource / receptor is changed by the offshore SG1A Project. The phrase ‘potential impact’ will be used to describe any impacts which may arise as a result of the offshore SG1A Project and the ‘magnitude of impact’ will be determined for each resource / receptor as part of the process (further detail below).

Taking into consideration the ‘sensitivity of a receptor’ and the ‘magnitude of impact’, the overall impact significance is determined, as described in the following sections.

The assessment identifies the origins of environmental impacts, positive (beneficial) and negative (adverse), from the offshore SG1A Project and predicts their impacts on resources or receptors. A resource is any environmental component affected by an impact (e.g. items of environmental capital such as habitats, aquifers, landscape, views and community facilities). A receptor is any environmental or other defined feature (e.g. human beings) that is sensitive to or has the potential to be affected by an impact.

Assessment of whether the impact of the offshore SG1A Project on any particular resource or receptor was made by suitably qualified and experienced practitioners as presented in Section 1.3). Where possible, quantitative analysis was undertaken to support the impact assessments. Where the subject does not lend itself to quantitative analysis, qualitative analysis based on the relevant literature and similar studies is undertaken to provide a robust assessment. This will be determined for each environmental topic depending on the nature of the receptor. The initial assessment of impact significance takes into account embedded mitigation (Section 3.8.2.5).

Following initial assessment, if the impact does not require additional mitigation (or none is possible) the residual impact will remain the same. If, however, additional mitigation is required there will be an assessment of the post-mitigation residual impact.

6.3.4 Sensitivity and Value

Using a set of criteria and terminology defined within each technical section, a sensitivity value will be assigned to each environmental resource or receptor. This is often categorised in accordance with EIA guidance documents for each environmental topic.

The categories used to describe value / sensitivity will be defined within the 'Assessment Criteria' section of the individual environmental topic (Section 7-11).

6.3.5 Magnitude of Impact

Once a sensitivity or value has been assigned to each environmental resource or receptor, the magnitude of the impact will be identified. The magnitude of impact terminology and criteria applied are defined within each environmental topic section (Section 7-11).

Impacts are identified as either permanent (e.g. lasting the length of the period the development is in place for, such as loss of habitat due to the construction of a new access road) or temporary (e.g. restricted to the construction period only, such as noise emissions from construction plant). A permanent impact is considered to be irreversible and from which recovery is not possible within a reasonable timescale, or for which there is no reasonable chance of action being taken to reverse. A temporary impact is reversible and from which spontaneous recovery is possible, or for which effective mitigation is both possible and an enforceable commitment has been made (CIEEM, 2016).

Temporary impacts can be further sub-divided if necessary in accordance with the following guideline, although definitions of this terminology is highly dependent on other factors depending upon the environmental topic being assessed (e.g. lifecycle of flora and fauna species):

- Short-term – less than 1 year in duration;
- Medium-term – between one to three years in duration; and
- Long-term – more than three years in duration.

6.3.6 Significance of Impact

Taking both the sensitivity / value of the resource / receptor and the magnitude of impact into consideration, a determination of impact significance is made. Table 6.5 shows how the two elements can be combined to give an overall impact significance.

Table 6.5 Categorising impact significance

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	Medium	Low	Negligible
Major/Large/High	Major	Major	Moderate	Minor
Moderate/Medium	Major	Moderate	Minor	Negligible
Minor/Small/Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Table 6.6 Categorisation and Definition of Impacts

Category	Definition
Negligible	No detectable change to the environment resulting in no significant impact.
Minor	A detectable, but non-material change to the environment resulting in no significant impact.
Moderate	A material, but non-fundamental change to the environment, resulting in a possible significant impact.
Major	A fundamental change to the environment, resulting in a significant impact.

For the purposes of this EIAR, potential impacts identified as major or moderate are generally considered to be significant in EIA terms and mitigation may be required, while impacts identified as minor or negligible are generally considered to be not significant in EIA terms.

In instances where the method of assessment deviates from that described, or necessitates a change in terminology, this is clearly described within the relevant environment topic (Section 7-11). Owing to the nature of certain environmental impacts, for particular topics, the application of the matrix approach may not be capable in itself of defining whether an impact is significant or not. In such cases the professional opinion of the topic specialist is applied, to determine potential impact significance.

6.4 Interrelationships

Interrelationships describe the potential interaction of multiple project impacts upon one receptor and have a spatial and temporal component. Impacts may be short term, temporary or longer term over the lifetime of the offshore SG1A Project. When considering the construction, operation and decommissioning phases of the offshore SG1A Project, the impacts on all receptors presented in this EIAR are not anticipated to interact in such a way as to result in combined impacts of greater significance than the assessments presented within each of the individual assessments. Therefore, no potentially significant interrelationships have been identified and this is not considered further in this EIAR.

Where there is interaction between different environmental topics, for example commercial fisheries and shipping and navigation, EMF on both natural fish and magnetic compass interference, these have been referenced and documented in the individual topic impact assessments.

6.5 Cumulative Impact Assessment

6.5.1 Introduction

EIA Regulations require the assessment of cumulative impacts. This requires consideration and assessment of existing projects, projects under construction and consented or proposed projects identified in relevant development plans and programmes that have the potential to impact cumulatively with the offshore SG1A Project.

Cumulative impacts can occur when the impacts from one project on an identified receptor combine (through either spatial or temporal overlap) with similar impacts from other projects on the same receptor. The purpose of considering cumulative impacts is to understand if the impacts from the offshore SG1A Project, when considered together cumulatively with other plans and projects are different, or more significant than from the individual projects in isolation. This enables additional mitigation to be identified, as appropriate.

6.5.2 Cumulative impact assessment methodology

The assessment of cumulative effects on potential impacts resulting from the projects identified in Section 6.5.3, is detailed in the relevant topic specific sections (Section 7-11). The assessments are in line with the methodology laid out in Section 6 and topic specific methodologies provided. Potential cumulative effects on impacts may occur if the construction periods of the various other projects overlap with the installation of the offshore SG1A Project, or where consecutive periods of installation for two projects occurs. For natural fish and shellfish resource, commercial fisheries and in some instances shipping and navigation, the worst case scenario for cumulative impacts is assumed to be consecutive periods of installation

Cumulative impacts are considered for all stages of the offshore SG1A Project throughout construction, operation and decommissioning. Where project design parameters remain unchanged and where topics impacts have been removed from further assessment in this EIAR (see Section 6.1), these are not reassessed.

6.5.3 Identified Projects

The following projects will be considered in the cumulative assessment presented in this EIAR:

- The Seagreen Project (consented, pre-construction);
- Berwick Bank OWF (scoping);
- Marr Bank OWF (concept/early planning);
- Inch Cape OWF (consented);
- Neart na Gaoithe OWF (under construction); and

- Aggregate extraction, cables and interconnector projects that meet the criteria below.

These projects were selected using the following criteria:

- Whether the timing of construction is likely to overlap with or occur directly before or after the construction period of the offshore SG1A Project;
- Whether the project was within 30 km of the offshore SG1A Project export cable corridor; and
- Whether any operational effects of the project were likely to have a cumulative effect with the installation phase of the offshore SG1A Project, particularly related to shipping and navigation, and commercial fisheries.

7. Natural Fish and Shellfish Resource

7.1 Introduction

This section presents the natural fish and shellfish resource EIA of the offshore SG1A Project. The potential impacts on natural fish and shellfish resource receptors are identified and subject to a detailed impact assessment. Where required, mitigation is proposed, potential cumulative impacts are considered, and the residual impacts and their significance are assessed. This section should be read in conjunction with Section 9 (Commercial Fisheries) which details the commercially exploited species that are recorded in areas relevant to the offshore SG1A Project.

Following consideration of the offshore SG1A Screening Report consultation responses (see Section 5), the following natural fish and shellfish resource receptors have been included in this EIAR:

- Seabed-dependent fish and shellfish species which may be vulnerable to temporary disturbance to the benthic environment (sandeel, scallops, *Nephrops*, herring during spawning/egg maturation);
- Migratory fish species which may be sensitive to the effects of Electro-Magnetic Field (EMF) emissions (Atlantic salmon, sea lamprey, and European eel)

7.2 Legislation and Policy Context

This section outlines relevant legislation, policy and guidance applicable to the assessment of the potential impacts on fish and shellfish ecology associated during installation, operation, and decommissioning phases of the offshore SG1A Project.

7.2.1 Legislative Framework

The following legislative instruments are relevant to the assessment of potential impacts to natural fish and shellfish resources:

- The EU Habitats Directive (Council Directive on the Conservation of Natural Habitats and of Wild Flora and Fauna 1992). In Scotland the Habitats Directive was transposed under the Conservation (Natural Habitats, &c.) Regulations 1994 (Habitats Regulations) and Conservation of Habitats and Species Regulations 2010. In UK waters (beyond 12nm and within 200nm of the coast) the Habitats Directive is transposed under the Conservation of Offshore Marine Habitats and Species Regulations 2017 (Offshore Habitats Regulations);
- The European Habitats Directive (EC Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna);
- Eel Recovery Plan (EC Regulation 1100/2007) and associated Scotland Eel Management Plan (2010)
- Wildlife & Countryside Act 1981 (as amended);
- Marine (Scotland) Act (2010);
- Nature Conservation (Scotland) Act 2004;

- Wildlife and Natural Environment (Scotland) Act 2011;
- Marine and Coastal Access Act (2009); and
- Scottish Biodiversity Strategy (2018)

7.2.2 Policy Framework

There are several policies in place which are of relevance to the assessment of impacts to natural fish and shellfish resource. These policies include the following:

- UK Marine Policy Statement
- Convention for the Protection of the Marine Environment of the North-East Atlantic (the 'OSPAR Convention') 1992; and
- Scottish Priority Marine Features (PMF; NatureScot, 2014)
- UK Biodiversity Action Plan; and
- Scottish Biodiversity List.

7.2.3 Guidance

In addition to the guidance which is provided in Section 2, the following guidance documents have been referred to for this section of the EIAR:

- The International Union for Conservation of Nature (IUCN) Red list of threatened species;
- The OSPAR List of Threatened and/or Declining Species and Habitats, considered to be of conservation concern within the north-east Atlantic (OSPAR, 2008);
- The Centre for Environment, Fisheries and Aquaculture Science (CEFAS) have developed a guidance document for Environmental Impact Assessment for the licensing of offshore windfarms (CEFAS, 2004).
- Assessment of the environmental impacts of cables (OSPAR, 2009), which assesses the environmental impacts of sea cables in terms of their relevance for the area covered by the Convention;
- The EIA Handbook (NatureScot, 2018)

Several of these guidance documents have also been used as a key data source for the development of the natural fish and shellfish resource baseline (Section 7.4).

7.3 Consultation

Responses to comments which were provided as part of the MS-LOT Screening Opinion and offshore SG1A Screening Report consultation process are presented in Section 5. On the basis of comments which were received during consultation, SG1A have included a natural fish and shellfish resource assessment within this EIAR. Further details on the consultation which was carried out and the consideration of stakeholder concerns has been provided within the offshore SG1A PAC Report (LF000012-CST-EV-LIC-DEV-REP-0001).

Table 7.1 Consultation with stakeholders relevant to the Natural Fish and Shellfish Resource section of the EIAR

Consultee	Comment	SG1A Response & where addressed
Commercial Fisheries Stakeholders	Request that the potential impacts during installation to benthic fish and shellfish species which are commercially exploited are assessed	The potential impacts of temporary disturbance which may be caused by installation & decommissioning of the offshore SG1A Project have been assessed within this EIAR (Section 7.9.1)
NatureScot, Marine Scotland Science, Commercial Fisheries Stakeholders	Request that the effects of EMF to migratory species, particularly diadromous fish (e.g. salmon) are assed for operational phase of the SG1A Project	The potential impacts of EMF emissions from the SG1A operational cable have been assessed within this EIAR (Section 7.9.2)

7.4 Data Sources

The following key data sources have been used to inform the natural fish and shellfish resources baseline:

- Inch Cape Offshore Environmental Statement (Inch Cape, 2011; 2018)
- Neart Na Gaoithe OWF ES (Neart Na Gaoithe, 2012)
- The Seagreen Project EIA Report (Seagreen, 2012; 2018)
- Fisheries statistics per ICES Rectangle (MMO, 2020);
- Marine Scotland Salmon and Sea Trout fishery statistics (Marine Scotland, 2020);
- Marine Scotland NMPi (NMPi, Marine Scotland, 2020);
- Scottish Biodiversity List (NatureScot, 2020b)
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2020)
- Coull *et al*. (1998) Fisheries Sensitivity Maps in British Waters
- Ellis *et al*. (2012) Spawning and nursery grounds of selected fish species in UK waters.
- MarLIN (2020). The Marine Life Information Network; and
- National Biodiversity Network (NBN) (2015).

Citations for other sources have been included throughout the baseline, which are referenced in Section 14.

7.5 Environmental Baseline

This section characterises the natural fish and shellfish resource in waters relevant to the offshore SG1A Project. Many fish species are highly mobile and can move easily to avoid a temporary change in their environment, making them less vulnerable to disturbance. However, species which are seabed-dependent for some or all of their life-cycle, or which are not highly mobile, are typically more vulnerable to the potential direct impacts associated with disturbance. Seabed dependent species have therefore been considered in detail in the following baseline, with other fish and shellfish species also documented.

7.5.1 Protected sites

There are no protected sites which are designated due to presence of qualifying natural fish or shellfish species which overlap with the offshore SG1A Project. The River Teith SAC is a protected site within the Firth of Forth, located ~55km west of the landfall of the offshore SG1A Project, which is designated for migratory fish species that may use waters relevant to the offshore SG1A Project as migratory pathways. These species include Atlantic salmon *Salmon salar* and Sea Lamprey *Petromyzon marinus*. This SAC is considered as part of the HRA screening process which accompanies the Marine Licence application in Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012- CST-OF-LIC-DEV-REP-0002;).

7.5.2 Overview of seabed habitats and sediments

The presence of seabed-dependent species, especially those which are associated with specific sediment types, can be predicted by the characterisation of the benthic environment. The offshore SG1A Project benthic environment has been described in detail in Section 6.3 of the offshore SG1A Screening Report (LF000012-CST-OF-LIC-DEV-REP-0001). The EUNIS habitat classifications throughout and in the vicinity of the offshore SG1A export cable corridor are shown in Figure 7-1. This reflects the existing knowledge on seabed characterisations, with a progression from more sandy muds, and mixed sediments nearshore, muddy sediments throughout the majority of the Firth of Forth to coarser sediments along the western and northern parts of the offshore SG1A export cable corridor.

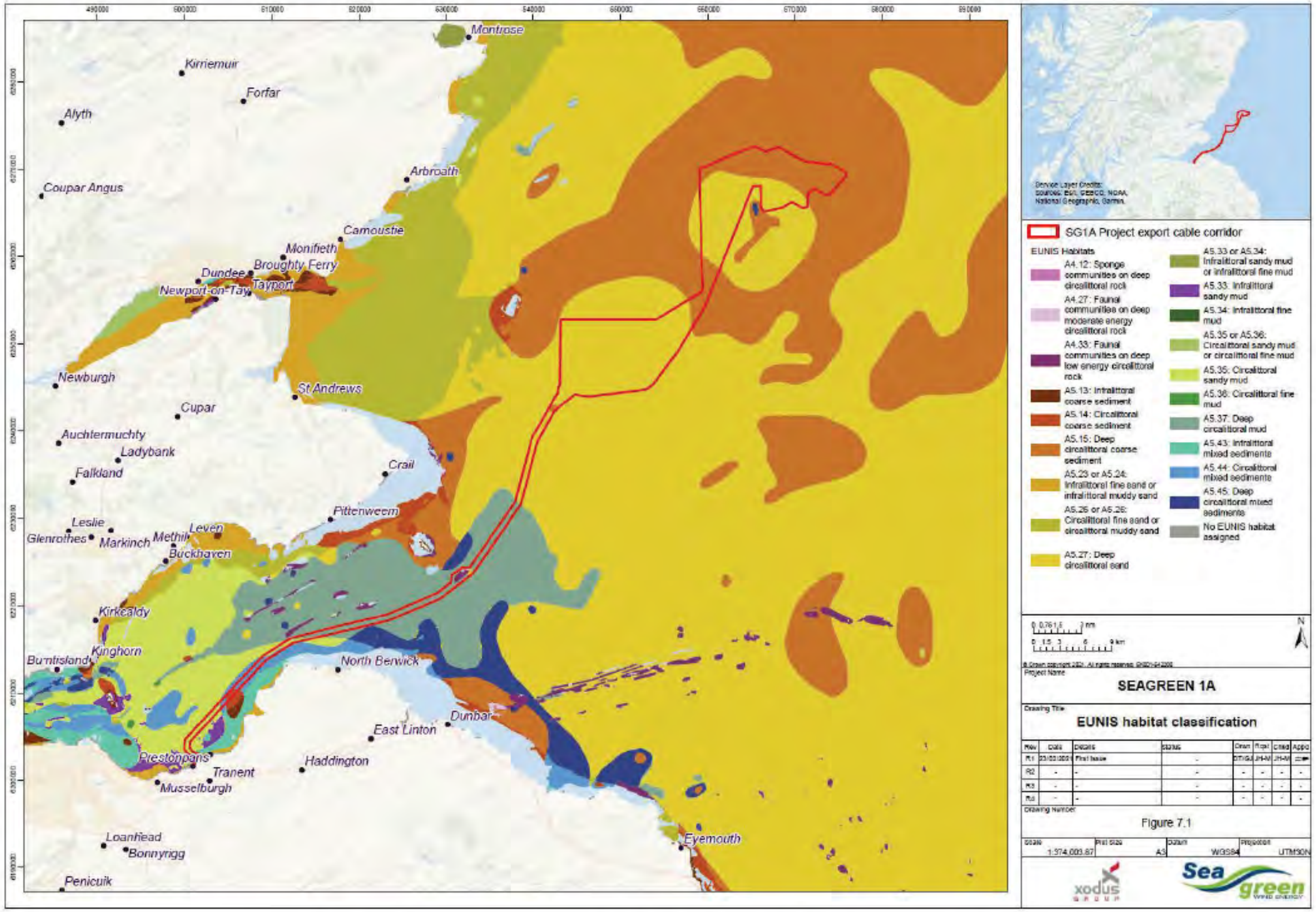

Figure 7-1 - EUNIS Seabed Habitat Classification in the Study Area (EMODnet, 2020)

7.5.3 Fish and Shellfish Assemblage

According to landings per ICES rectangle the offshore SG1A Project export cable corridor supports a number of commercially exploited fish and shellfish species, with *Nephrops*, lobster and crab comprising the majority of the landed weights from the ICES rectangles in which offshore SG1A Project is located (MMO, 2020). The average landings weights of the (2014-2018) 20 commercially exploited species (in terms of weight) from the ICES rectangles with which the offshore SG1A Project overlaps is provided in Table 7.2

Table 7.2 Average landings weights (tonnes, 2014-2018) of commercially exploited fish and shellfish from the ICES rectangles in which the offshore SG1A Project is located (MMO, 2020)

	ICES rectangle				
Species	**40E7**	**41E7**	**41E8**	**42E7**	**42E8**
Nephrops (Norway Lobster) *Nephrops norvegicus*	290.4	1171.4	7.2	56.2	2.3
European lobster *Homarus Gammarus*	22.7	142.3	180.9	252.9	763.6
Brown crab *Cancer pagurus*	135.3	161.7	77.1	326.8	4.1
Scallop *Pectinus maximus*	84.6	197.7	16.8	167.5	2.4
Whelk *Buccinum undatum*	23.2	47.6	2.0	76.9	0.6
Velvet crab *Necora puber*	55.5	31.8	1.8	25.6	8.7
Razor clam *Ensis spp*	4.4	70.5	0.0	6.3	0.0
Mackerel *Scomber scombrus*	4.3	8.6	3.1	24.9	12.6
Mixed Squid *Loligo spp* and Octopi	1.0	45.1	0.0	1.6	0.0
Clams *Mya arenaria*	12.7	16.2	0.0	7.5	0.9
Surf Clams *Mactridae*	0.0	0.1	0.2	3.4	12.1
Squid *Loligo spp*	0.0	9.8	0.0	3.5	0.0
Monks/anglerfish *Lophius sp*	0.0	13.1	0.0	0.1	0.0
Haddock *Melanogrammus aeglefinus*	0.7	1.1	0.0	1.7	5.0
Dab *Pleuronectidae sp*	0.7	1.0	0.5	0.1	0.9
Atlantic cod *Gadus morhua*	0.6	1.8	0.1	0.1	1.0
Whiting *Merlangius merlangus*	0.3	1.7	0.2	0.2	1.7
Plaice *Pleuronectes platessa*	0.7	1.7	0.0	0.1	0.0
Green Crab *Carcinus maenas*	0.2	1.0	0.1	0.1	0.1

Individual species accounts have been provided for the species below:

- Sandeel: seabed dependent, Priority Marine Feature (PMF) and Scottish Biodiversity List species, some commercial importance (mostly non-UK) and notable prey species;
- Nephrops: seabed dependent and commercially exploited;
- Scallops: seabed dependent, sedentary (king scallop) and commercially exploited;
- Herring: seabed dependent for spawning and egg maturation, commercially exploited, Scottish Biodiversity List species and PMF;
- Atlantic Salmon Salmo salmar: diadromous migratory fish species, Scottish Biodiversity List species, Annex II species under the Habitat Directive;

- See lamprey Petromyzon marinus: UK BAP species, Scottish Biodiversity List species, Annex II species under the Habitat Directive, OSPAR Annex V, PMF; and
- European eel: IUCN Red List (Critically Endangered), UK BAP species, Scottish Biodiversity List species, OSPAR Annex V, PMF.

7.5.3.1 Sandeel

Sandeel (*Ammodytes spp*) are a bony fish, and are commercially targeted in parts of the North Sea. Sandeel trawling in grounds relevant to the offshore SG1A Project including Wee Bankie and Marr Bank have been closed to commercial fishing since 2000 (Article 29a from Council Regulation No 850/88), in response to population declines largely understood to be due to overfishing and environmental change (NatureScot, 2021). Sandeel are seabed-dependent for almost their entire life-cycle (except feeding and spawning), inhabiting medium to coarse grained sandy substrates of sandbanks into which they bury to protect themselves from predators (Holland *et al*, 2005; NatureScot, 2021). Once settled, studies have shown that sandeel are mostly resident, rarely travelling over 20 miles. It is understood that sandeel rarely emerge from the seabed between September and March, except to spawn. Some species of sandeel can live for as long as 10 years, reaching maturity at around 2 years of age.

Sandeel form an important role in the North Sea food web, comprising a food source for marine birds, mammals (Frederiksen *et al*, 2006). As evidenced by existing survey data collected on behalf of Neart Na Gaoithe, the offshore SG1A Project which is located within the 12nm territorial limit is unlikely to support sandeel populations (Neart Na Gaoithe, 2014) due to the muddy substrate composition in this area (Section 7.5.2; EMODnet, 2020) which is not suitable habitat for sandeel (Greenstreet *et al*., 2010). Further offshore, where the offshore SG1A Project extends beyond 12nm, the seabed is understood to be composed of sand and coarse substrate (EMODnet, 2020) which may be more favourable sandeel habitat and is in proximity to locations where sandeel was recorded during Seagreen benthic surveys. According to the Scoping Report for the Seagreen optimised project (2017) parts of the western area of the Seagreen OWF, where the offshore SG1A Project eastern end is located, are likely to be unsuitable for sandeel, although Raitt's sandeel (*A. marinus)* were found during the Seagreen bottom trawl surveys (Seagreen, 2012).

7.5.3.2 Nephrops

Nephrops is a burrowing benthic megafauna species which is commercially exploited throughout Scottish waters and known to be present in abundance in areas relevant to the offshore SG1A Project. *Nephrops* are present in particularly high densities within the 12 nm territorial limit nearshore of the Marr Bank sandbanks, as confirmed by existing benthic surveys in the region (Inch Cape, 2011; Neart na Gaoithe, 2012; Seagreen, 2012) and recent landings weights by species (Table 7.2). Sediments along the offshore SG1A Project export cable corridor become increasingly muddy as it passes southeast of the Isle of May and into the Firth of Forth and are classified as 'Deep circalittoral mud' and 'Circalittoral sandy mud' which is the ideal habitat for *Nephrops* (Figure 7-1). *Nephrops* inhabit these muddy sediments and spend almost all their life cycles in epibenthic burrows, except for feeding and mating. *Nephrops* are understood to be relatively resilient to the effects of smothering and disturbance due to their inherent ability to burrow into substrates, and fast growth/reproductive rates (Inch Cape, 2011; 2018; Sabatini and Hill, 2008).

7.5.3.3 Scallop

King Scallop and Queen Scallop (*Aequipecten opercularis*) are present in the offshore area of the offshore SG1A Project according to survey data and landings, with King Scallop particularly commercially exploited due to being less mobile than Queen Scallop. Scallops are bivalve, sedentary, filter-feeders which settle on clean firm sand and sandy gravel (Seagreen, 2018). It is understood that scallop are not typically present in the offshore SG1A Project located in ICES 41E7 but are present in ICES 43E7 and 42E8 (Table 7.3). Scallop are potentially vulnerable during the larval phase to increased SSC or disturbance (Shumway and Parsons, 2016), but experience ambient levels of seabed disturbance in areas of commercial fishing activity from dredging and trawling which exceeds the temporary disturbance which may result from installation of the offshore SG1A cable (Section 9.5; Black and Perry, 1999; Veale et al, 2000).

7.5.3.4 Herring

Herring is a Scottish Biodiversity List species and PMF and is commercially exploited throughout the UK. It should be noted that the North Sea herring stock has fluctuated considerably over the last 100-150 years, resulting in the current monitoring and regulation applicable to the fishery (ICES, 2020). Herring stocks are categorised regionally and have varying spawning/nursery periods at different locations. The Buchan stock is understood to be of relevance to the offshore SG1A Project. Herring are pelagic but are seabed-dependent (with relatively diverse seabed type affiliation) for spawning, with eggs remaining on the seabed until larvae hatch (approximately 3 weeks in August and September for the Buchan Herring stock, Table 7.3). Data from the Working Group of International Pelagic Surveys (WGIPS, 2020) along with fisheries sensitivity data from Coull et al (1998) and Ellis et al (2012) indicates that herring stock spawning activity is primarily located to the north and south of the offshore SG1A Project (Figure 7-5).

7.5.3.5 Atlantic salmon

Atlantic salmon is an Annex II species under the Habitat Directive, a Scottish Biodiversity Species and is of cultural, recreational and commercial importance in Scotland. Atlantic salmon are diadromous spending most of their adult lives at sea, returning to freshwater rivers to spawn, and returning to the sea in April/May (Malcolm *et al*, 2015). After maturing to approximately 12cm in length at around 2 years old when they undergo a physiological change enabling them to live in sea water, when they migrate to feeding grounds mostly in the North Atlantic (NatureScot, 2020). It is assumed from the Seagreen Project (Seagreen 2012, 2018) and existing studies in the region that Atlantic Salmon may utilise the offshore SG1A Project area for migration (Seagreen, 2018; Malcolm *et al.*, 2010; Beatrice Offshore Windfarm Limited (BOWL), 2017). Atlantic salmon and the associated rod, line and net fisheries were studied in detail in the EIA for the Seagreen optimised project (Seagreen, 2018), noting an overall decline in salmon catch returns since 1990s (Seagreen, 2018).

Since 1994, data on numbers and weight of salmon caught and released, and the methods which are used in Scotland have been collected and published by region and river. However, for a number of important Scottish salmon rivers rod catch data exists from as far back as 1952.

There is a growing body of evidence showing that salmon populations across Scotland have been rapidly decreasing over the last 10 years (Atlantic Salmon catch data, Marine Scotland 2020). These downward trends have been particularly true of the spring running salmon on the east coast of Scotland and rivers relevant to the offshore SG1A Project area. There has been a recorded decrease in the number of salmon migrating into east coast rivers in February to April each year (Marine Scotland, 2020).

The latest Marine Scotland report on the salmon fishery reported that the total rod catch of salmon in 2019 was the 4th lowest since records began, with 98% of rod caught spring multi sea-winter fish (taken before 1 May) being released, as were 92% of the annual rod catch. This leaves 10% of the rod-caught salmon as caught and retained (Marine Scotland, 2019).

It has been suggested that the decline in Scottish salmon populations and in other population around the North Sea and north east Atlantic is due to factors such as increasing mortality at seas (Hanson et al., 2000). Rod catch data from rivers on the east coast of Scotland can provide insight into the general trends of salmon populations within the offshore SG1A Project Area. For the purpose of this baseline the salmon catch data from the last 10 years (2010-2019) has been used, and only the rivers in the East region are included (River Dee, River Don, River Forth, River North Esk and Bervie, River South Esk, River Tay, River Tween and River Ythan and Ugie (Figure 7-2 - Figure 7-4).

Figure 7-2 suggests that densities of multi sea winter (MSW) catches for Atlantic salmon have declined in the last 10 years on the River Tweed. The River Tay showed a steady increase in catches before rapidly declining in 2013. The River Dee also showed a slight increase in catches in 2011, but then gradually declined until 2015 where catches recovered slightly. All of the other rivers have supported consistently low catch weights over the last 10 years (Figure 7-2*).*

Figure 7-3 shows that rod catch data of one sea-winter (1SW) catches for Atlantic salmon have declined over the last 10 years for rivers Tweed, Tay, Dee, and North Esk and Bervie, while all the other rivers have consistently remained low.

When looking at the average rod catches for MSW and 1SW, Figure 7-4 shows multi sea winter (MSW) fish has generally declined since 2010 with slight increases in 2013, 2016 and 2019, however, catches remain at a low level . Overall, catch in 1SW after 2010 fell and have remained at this lower level.

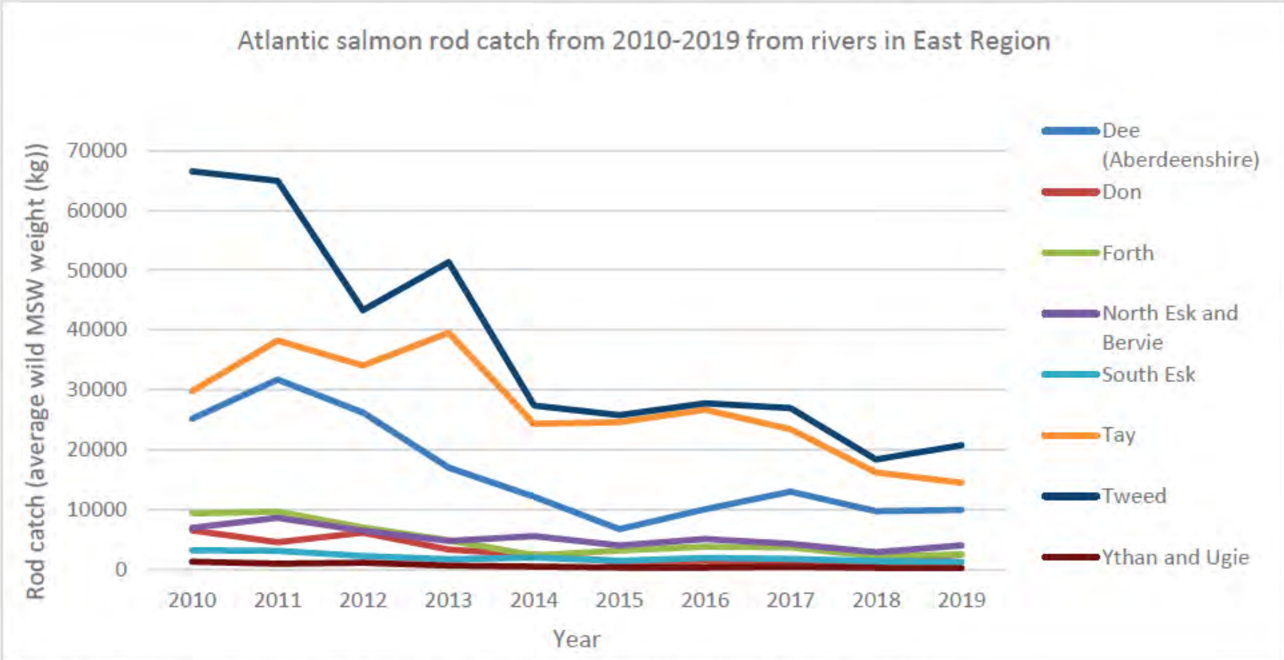

Figure 7-2 Atlantic salmon rod catches (wild MSW) in Scottish rivers from 2010-2019 (Marine Scotland, 2020)

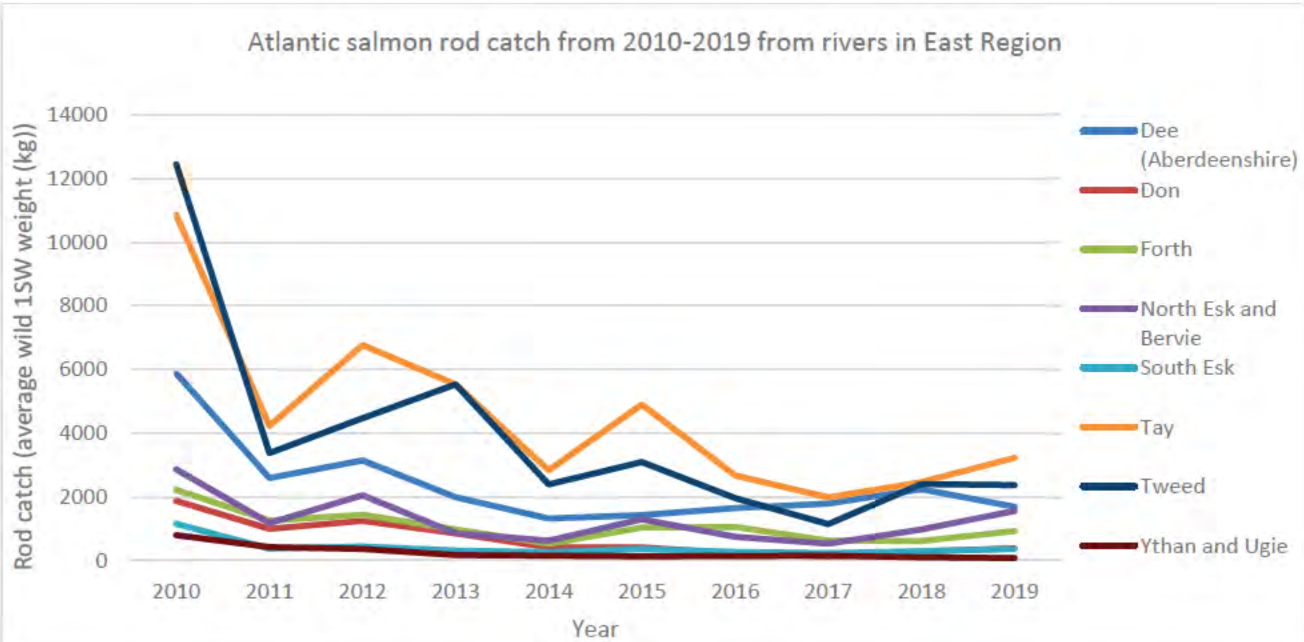

Figure 7-3 Atlantic salmon rod catches (wild 1SW) in Scottish rivers from 2010-2019 (Marine Scotland, 2020)

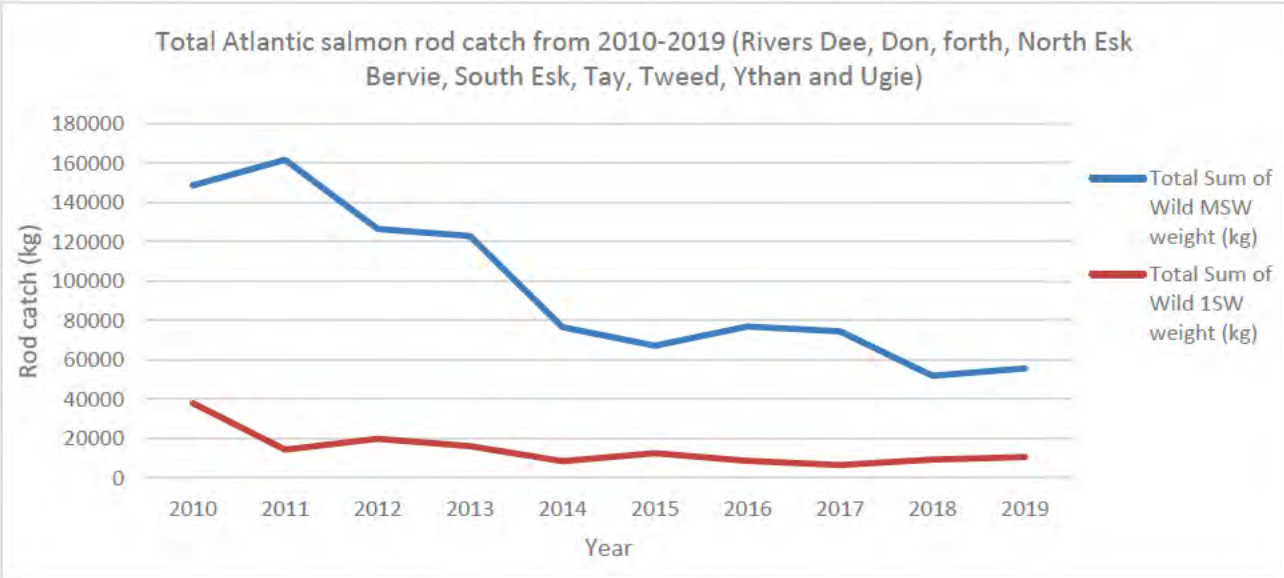

Figure 7-4 Grand total of Atlantic salmon road catches in Scottish rivers from 2010-2019 (Marine Scotland, 2020)

7.5.3.6 Sea lamprey

Lamprey belong to an ancient order of vertebrates, the Agnatha or 'jawless fish'. Lamprey have cartilaginous skeletons and a round, sucker-like disc surrounds the mouth which, in adults, carries rasping teeth, to enable parasitic feeding on fish.

Five Scottish rivers are designated as Special Areas of Conservation (SAC) for one or more of the lamprey species and they are assessed every six years (NatureScot, 2018). The sea lamprey is a designated feature of the River Teith and may use the waters in the vicinity of the offshore SG1A Project during migration. Scotland represents the northern extent of sea lamprey distribution in Europe, which is understood to be due to the cold temperatures in more northern rivers restricting breeding. The Scottish populations of lamprey are therefore important in maintaining the natural range of the three species (sea, river and Brook lamprey) both within the UK and Europe. (NatureScot, 2018)

As a result of the decline of lamprey across Europe the sea lamprey has now been given legal protection. It is listed in Annexes IIa and Va of the Habitats Directive, Appendix II of the Bern Convention, and as Long List Species I the UK BAP. Additionally, sea lamprey are a Scottish Biodiversity List species, PMF and are protected under the OSPAR Convention Annex V: Protection and conservation of the ecosystem and biological diversity of the marine area criteria (MarLIN, 2020).

The sea lamprey is the largest of the three British lamprey species, reaching approximately 1m in length (NatureScot, 2018). Like other species of lamprey, sea lamprey need clean gravel for spawning and marginal silt or sand for the burrowing juvenile ammocoetes. After spending 18 to 24 months feeding at sea, adult sea lamprey migrate up rivers in the spring and early summer, spawning from May to July (NatureScot, 2018). Sea lamprey are primarily demersal and anadromous species that are found in a wide range of riverine and offshore habitats. Sea lamprey occur offshore throughout the UK and across Europe, and has been recorded at depths of 4000m and so it is assumed sea lamprey may use waters in the offshore SG1A Project area as a migratory pathway.

7.5.3.7 European eel

European eels are critically endangered according to IUCN (2020), a Scottish Biodiversity Species, a UK BAP species, an OSPAR Annex V specie, and a PMF species. European eels are also diadromous; migrating to sea to spawn with the larvae making the return journey back to freshwater. European eel are unlikely to use waters which are relevant to the offshore SG1A Project intensively, but may pass through the area during migration. The migration of the European eel is not fully understood, and uncertainties remain on the duration and route of migration (Malcolm *et al*., 2010 and Righton *et al*., 2016). A proportion of the total European eel population, at the adult (silver eel) migratory stage, may pass through Scottish coastal waters. Waters bordering the northern coast of mainland Scotland, Orkney, Shetland and the Outer Hebrides are most likely to contain migratory eels from northern continental Europe as well as the UK. However, a potential migration route has been identified from the North Sea along the Scandinavian coast crossing into the north Atlantic to the north of Shetland, meaning that continental European eels may bypass Scottish coastal waters or that the migration routes may not be geographically confined (Malcom *et al*., 2010).

They are thought to be sensitive to EMF although research on this is inconclusive as to whether the effect causes a significant change in migratory behaviour (Gill and Bartlett, 2010; Orpwood et al., 2015). Studies on migration of European eel in Sweden indicated a small change in migration behaviour, swimming speed and navigation around a subsea cable (Love et al, 2012).

7.5.4 Spawning and Nursery Grounds

As noted in Section 7.5, species which are seabed dependent for all or some of their life stages, such as spawning, have been carefully considered within this report. The fish and shellfish species which may use areas relevant to the offshore SG1A Project and are known to be dependent on the seabed for spawning are sandeel, *Nephrops* and potentially herring. A full list of all fish and shellfish species which may use the offshore SG1A Project study area for spawning or nursery habitat is provided in Table 7.3.

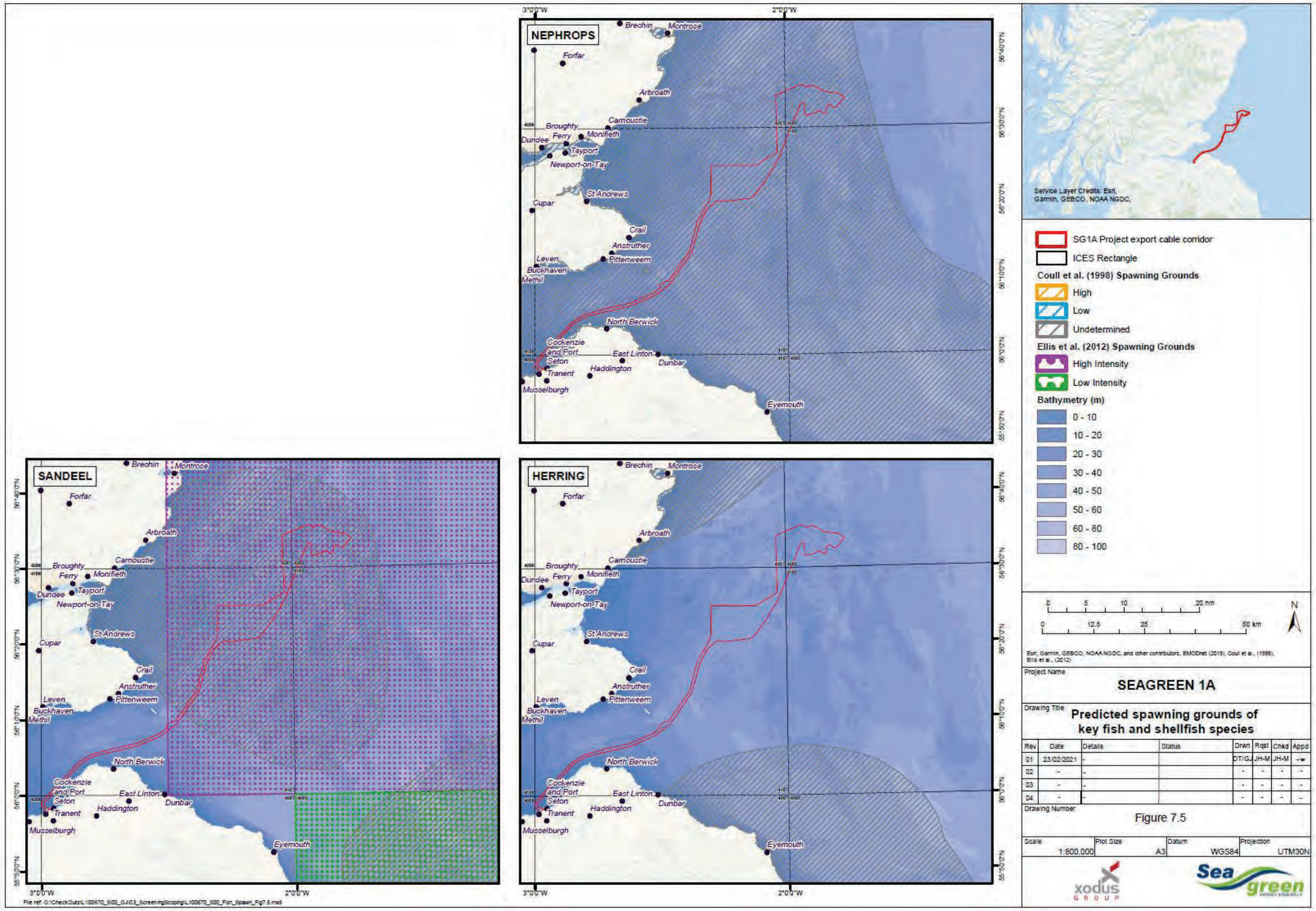

Figure 7-5 Predicted spawning grounds of key seabed-dependent fish and shellfish species in the vicinity of the offshore SG1A Project

Table 7.3 Species with spawning or nursery grounds that overlap with the offshore SG1A Project study area (Ellis et al., 2012; Coull et al., 1998)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N	N	N	N	N
Blue Whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Common Skate	N	N	N	N	N	N	N	N	N	N	N	N
European Hake	N	N	N	N	N	N	N	N	N	N	N	N
Herring	N	N	N	N	N	N	SN	S*N	S*N	N	N	N
Lemon Sole	N	N	N	SN	SN	SN	SN	SN	SN	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Nephrops	SN	SN	SN	S*N	S*N	S*N	SN	SN	SN	SN	SN	SN
Plaice	S*N	S*N	SN	N	N	N	N	N	N	N	N	SN
Saithe	N	N	N	N	N	N	N	N	N	N	N	N
Sandeel	SN	SN	N	N	N	N	N	N	N	N	SN	SN
Spotted Ray	N	N	N	N	N	N	N	N	N	N	N	N
Sprat	N	N	N	N	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Tope Shark	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	SN	SN	SN	SN	SN	N	N	N	N	N	N

(S = spawning, S*=peak spawning, N = nursery, species= high spawning intensity as per Ellis et al., 2012, species = high nursery intensity as per Ellis et al., 2012

7.6 Assessment Criteria

The assessment of Natural Fish and Shellfish Resource impacts follows the methodology which is outlined in Section 6.3, with reference to the guidance which is listed in Section 7.2.3.

The significance criteria used for assessment of the impacts on commercial fisheries are described below. Definitions of receptor sensitivity and impact magnitude are provided in Table 7.4 and Table 7.5, respectively.

Taking into account the sensitivity of the fishery and the magnitude of the impact the significance of an impact is then assessed as Major, Moderate, Minor or Negligible using the significance criteria matrix shown in Table 7.4.

Impacts which are assessed as of Moderate or Major significance are considered to be significant in EIA terms with impacts assessed as Negligible or Minor considered to be not significant.

Table 7.4 Sensitivity criteria for natural fish and shellfish

Sensitivity	Criteria
High	A receptor with a very limited ability to resist (or tolerate) a pressure and recover from any impacts induced by the pressure (resilience).
Medium	A receptor with a limited ability to resist (or tolerate) a pressure and recover from any impacts induced by the pressure (resilience
Low	A receptor with some ability to resist (or tolerate) a pressure and recover from any impacts induced by the pressure (resilience).
Negligible	A receptor which can generally resist (or tolerate) a pressure and recover from any impacts induced by the pressure (resilience).

Table 7.5 Magnitude criteria for natural fish and shellfish

Magnitude	Criteria
High	Fundamental and permanent/irreversible changes to the sum of influences acting on the conservation status of the receptor concerned that may affect its abundance and distribution within a given geographical area.
Medium	Material, permanent/irreversible changes to the sum of influences acting on the conservation status receptor concerned that may affect its abundance and distribution within a given geographical area.
Low	Detectable, temporary (throughout project duration) change to the sum of influences acting on the conservation status receptor concerned that may affect its abundance and distribution within a given geographical area.
Negligible	Detectable, temporary (for part of the project duration) change, or barely discernible change for any length of time, to the sum of influences acting on the conservation status receptor concerned that may affect its abundance and distribution within a given geographical area

Table 7.6 Significance criteria for the assessment of potential impacts to Natural Fish and Shellfish Resource

Magnitude of Impact	Sensitivity/Value of Receptor			
	High	Medium	Low	Negligible
Major/	Major	Major	Moderate	Minor
Moderate	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

7.7 Identification of Potential Impacts

Table 7.7 summarises the potential impacts which have been included in the commercial fisheries EIA process and those which are not considered further in this EIAR, in alignment with the Screening Opinion.

Table 7.7 Identification of potential impacts to natural fish and shellfish resource receptors

Potential impact	Relevant phase of Project			Assessed within the EIAR
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Habitat disturbance, loss	✓	x	✓	Yes, for sandeel, *Nephrops*, scallops and herring
Indirect disturbance due to sediment deposition (smothering) and temporary increases in suspended sediment concentrations	✓	x	✓	No
Disturbance or injury due to underwater noise	✓	x	✓	No
Effects of EMF	x	✓	x	Yes for Atlantic salmon, sea lamprey and European eel.
Barrier effects to migratory fish species	✓	x	✓	No

7.8 Embedded Mitigation Measures

The offshore SG1A Project embedded mitigation measures are presented in Section 3.8.2.5 and have been included when assessing the potential impacts to natural fish and shellfish ecology. There are no additional mitigation measures aside from those already defined, specific to natural fish and shellfish ecology.

7.9 Assessment of Impacts

7.9.1 Temporary habitat disturbance or loss during installation and decommissioning

It is acknowledged that certain fish and shellfish receptors may be vulnerable to disturbance of their habitat due to their affiliation with certain sediment types. As detailed in Section 7.5.3, based on the MMO landings data and seabed characterisation, the offshore SG1A Project is likely to support several seabed-dependent fish and shellfish species. The potential impacts of habitat disturbance has been assessed in relation to sandeel, *Nephrops*, scallops and herring (spawning/egg maturation only).

The species accounts for each of the identified species has been provided in Sections 7.5.3.1 to 7.5.3.4. Sandeel are found in sandy substrates only, and so are unlikely to be present at high densities in muddy substrates which comprise the majority of the offshore SG1A export cable corridor. Existing studies from the Seagreen and Inch Cape EIAs indicate that sandeel may be present further offshore in the northeastern area of the offshore SG1A Project, where the offshore SG1A export cable corridor will connect with the Seagreen OWF. Given the low habitat range of sandeel populations, and some existing information on low recoverability of Raitt's sandeel to disturbance, the sensitivity of this species to temporary disturbance is medium.

Nephrops are found in high densities in the muddy substrates throughout the Firth of Forth and within the offshore SG1A export cable corridor. It is understood that *Nephrops* have a relatively high tolerance to seabed disturbance due to their natural behaviour of burrowing. On the basis of this, while considering *Nephrops* habitat specificity, the sensitivity of this species to temporary habitat disturbance is therefore low.

Scallops are found in relatively low numbers within the offshore SG1A export cable corridor. Scallops are sedentary and specifically settle on clean, firm sand, fine gravel or sandy gravel which is recorded in the offshore part of the offshore SG1A export cable corridor. It is thought that scallops may have a low tolerance to habitat disturbance, primarily due to indirect impacts of disturbance such as sediment deposition, which is not assessed here. Based on their specific habitat preference, and low tolerance to seabed disturbance which may affect their recoverability, the sensitivity of scallops to temporary habitat disturbance is medium.

Herring are seabed dependent during spawning and egg maturation, and are an important commercially exploited species. The data from spawning and nursery habitat studies (Coull et al., 1998; Ellis et al., 2012) and the WGIPS (2020) shows that the Buchan herring stock which is relevant to the Firth of Forth, spawns north of the offshore SG1A Project. There is no overlap of herring spawning activity with the offshore SG1A export cable corridor. The sensitivity of this species, in relation to the stock which is proximal to the offshore SG1A Project, is therefore negligible.

During installation or decommissioning, due to the localised zone of influence of installation (6-10m) and short-term and temporary duration of the installation and any decommissioning works, the magnitude of the effect of temporary habitat disturbance is low.

The Forth and Tay region supports an active commercial fishing industry including demersal trawling, mostly targeting *Nephrops*, dredging and creeling (Section 9.5). The localised nature and short duration of any direct disturbance which may be caused by the SG1A installation or decommissioning works will be considerably less than the disturbance which is consistently recorded within the existing environment, especially in consideration of the seabed-contact fishing activity which is present.

In light of the temporary and highly localised nature of any disturbance and the low magnitude of the effect, the impact significance of temporary disturbance to habitat is assessed as **minor** for scallops and sandeel, and **negligible** for herring and *Nephrops,* and not significant in EIA terms for all species concerned. No additional mitigation is required and therefore residual impact significance remains as **minor** for scallops and sandeel, and **negligible** for herring and *Nephrops.*

7.9.2 Electromagnetic fields (EMFs) emissions from the operational offshore SG1A export cable

EMF emissions are generated from the transmission of electricity through subsea cables. The cables produce electromagnetic fields which have both electric (E) measured in volts per metre (V m-1) and magnetic components (B) measured in micro tesla (µT). While the direct electric field is mostly blocked with the use of conductive sheathing, the magnetic field penetrates most materials and therefore are emitted into the marine environment with the resultant induced electric (iE) field.

It is commonly recommended that cable burial is used to increase the distance between the cable and the electro-sensitive species (Gill *et al*., 2005; 2012). However, where burial is not possible; cable protection, e.g. concrete mattresses or rock placement increases the distance between marine species sensitive to EMF and the EMF source (Gill et al., 2020). The target DoB will be defined for the entire offshore SG1A export cable corridor prior to installation, once the installation contractor has been decided. Existing studies on EMF emissions from subsea cables have informed this section of the impact assessment. The Seagreen Offshore Transmission Asset Cable Plan (LF000009-CST-OF-PLN-0009), Seagreen Inter-Array Cable EMF study (LF000009-SWY001-REP-H12-009) and the NorthConnect EMF Chapter (Chapter 18, NorthConnect, 2020) provides information on EMF emissions from subsea cables. It is understood that from existing data, the distance which is created between benthic species and the buried or protected offshore SG1A export cable will reduce the levels of magnetic fields to 10uT when directly above the installed offshore SG1A export cable, quickly reducing to 0uT at a distance of 5m+ from the installed cable (LF000009-CST-OF-PLN-0009; LF000009-SWY001-REP-H12-009; NorthConnect, 2020; Gill et al., 2020).

Atlantic salmon, sea lamprey and European eel may use waters in the vicinity of the offshore SG1A Project as part of their migratory pathway. The precise migratory pathway of each species is the subject of ongoing research, particularly in the case of European eel. It is assumed that for the worst case scenario, all three species will use the offshore SG1A export cable as a pathway for migration and therefore may be susceptible to behavioural changes in response to EMF emissions.

Atlantic salmon possess particles that are influenced by magnetic fields (Moore et al., 1990) and it is anticipated that these structures might enable responses to magnetic fields that Atlantic salmon use to aid migration (Armstrong et al, 2015). A recent study on the migration success of Chinook salmon in San

Francisco Bay, California found that although some slight changes in behaviour were observed in relation to distances from a subsea cable, for example in relation to metal components. Overall, the migration of the individual to be largely unchanged after the installation of a 200 kV HVDC subsea cable (Wyman et al., 2018; Gill et al., 2020). Atlantic salmon, while migrating through the marine environment remain in the pelagic zone, and are not expected to be in close proximity with the benthic environment and therefore the installed offshore SG1A export cable. When migrating north to feeding grounds and south-west into the Firth of Forth to spawn, salmon will target deeper waters and are not expected to swim in nearshore shallow waters. The main area where potential impacts due to EMF may be caused to salmon is expected to be in waters of less than 20m depth and so the majority of the offshore SG1A export cable is unlikely to provide a pathway for effect of EMF (Armstrong et al, 2015). On the basis the ecological importance of the migration of salmon to the rates of reproduction, but in acknowledgement of their specific behaviours in relation to subsea cables, the sensitivity of this species to EMF emissions is medium.

There is considerably less information on sea lamprey and European eel in relation to their migratory pathways and the impacts of EMF than salmon.

It is understood that sea lamprey use electric fields to detect prey, mates and potentially in navigation (Love, et al. 2012; Gill and Bartlett, 2011;). Some laboratory studies have indicated that weak electric fields can alter swimming behaviour, but findings of both increased and decreased swimming speeds has been reported (Chung-Davidson et al, 2004; 2008). Based on the existing research showing lamprey are not sensitive to magnetic fields which are understood to be the main emission in terms of EMF from the offshore SG1A export cable (in respect of the sheath design preventing magnetic field emissions), the sensitivity of this species to the EMF emissions is negligible.

Studies by Westerberg and Lagenfelt (2008) have shown that European eel show some changes in behaviour when migrating over a subsea cable off the east coast of Sweden, by slightly slowing their swimming speed. This was not thought to cause any measurable impacts to the European eel population. It is probable that the ability to detect and orient to magnetic fields is of most use to eels during the long distance part of their migration (Allt Easach Hydro, 2017). Laboratory studies on effects of magnetic fields to eel movements, indicates eels are able to sense fields equating in intensity to the earth's geomagnetic field. For instance, a magnetic compass sense used field strength of 50.3 to 51 µT. The work of Naissbett-Jones et al. (2017) suggests that eels also have the ability to detect and respond to changes in field intensity and inclination. In their tank experiments field intensity measured along magnetic north ranged from 36.2 to 49.7 µT. The variation in eel response (swimming direction) suggests the capability to detect relatively small shifts in magnetic field intensity and inclination. Based on the recent studies of the European eel and the behavioural adaptations which have been reported to low levels of magnetic fields, this species sensitivity to the expected EMF emissions for the offshore SG1A Project is considered to be low.

In consideration of the estimated EMF emissions for the offshore SG1A Project, which will result in the operation of a single export cable, which is buried to a depth of 1 to 3m or protected to meet target DoB, and the magnitude of the impact is considered to be negligible.

In light of the above, the impact significance of EMF emissions to migratory species is assessed as **negligible** for all species and not significant in EIA terms. No additional mitigation is required and therefore residual impact significance remains as **negligible** for all species.

Table 7.8 Potential environmental impacts and mitigations for natural fish and shellfish receptors

Impact	Description of Impact	Sensitivity of receptor	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Construction (and decommissioning)								
Habitat disturbance, loss	Sandeel	Medium	Low	Minor	No additional mitigation required beyond embedded mitigation.	Low	Minor	Not significant
	Nephrops	Low	Low	Negligible	No additional mitigation required beyond embedded mitigation.	Low	Negligible	Not significant
	Scallops	Medium	Low	Minor	No additional mitigation required beyond embedded mitigation.	Low	Minor	Not significant
	Herring	Negligible	Low	Negligible	No additional mitigation required beyond embedded mitigation.	Low	Negligible	Not significant
Operation and Maintenance								
Effects of EMF	Atlantic Salmon	Medium	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant
	Sea lamprey	Negligible	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant

Impact	Description of Impact	Sensitivity of receptor	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
	European eel	Low	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant

7.10 Cumulative Impacts

7.10.1 Cumulative Impact Assessment Methodology

The assessment of cumulative impacts resulting from the projects identified in Section 6.5.3, in relation to commercial fisheries receptors is provided in this section.

The following projects will be considered in the cumulative assessment presented in this EIAR:

- The Seagreen Project (consented, pre-construction);
- Neart na Gaoithe OWF (under construction)
- Inch Cape OWF (consented);
- Berwick Bank OWF (scoping); and
- Marr Bank OWF (concept/early planning).

7.10.2 Cumulative Impact Assessment

In relation to the projects which are listed in Section 7.10.1, there is the potential for cumulative impacts on the impacts for natural fish and shellfish resource with the worst case scenario for temporary habitat disturbance being consecutive construction periods of two or more projects, with the cumulative impact resulting in potentially higher impacts due to greater duration of disturbance.

Due to the localised extent and short-term duration, and temporary nature of the offshore SG1A construction period and in consideration of the ambient disturbance which is recorded due to seabed-contact commercial fishing activity in the region, no cumulative impacts are expected to occur to any impacts in relation to any of the developments. Therefore, the significance of all impacts is expected to be the same as those assessed for the offshore SG1A Project alone, and **non-significant in EIA terms**.

7.11 Conclusion

The embedded mitigation measures outlined in Section 3.8.2.5 reduce all potential impacts so that there will be no significant impacts on natural fish and shellfish resource from the offshore SG1A Project.

8. Marine Mammals

8.1 Introduction

This section presents the marine mammal EIA of the offshore SG1A Project. The potential impacts on marine mammal receptors are identified and subject to a detailed impact assessment. Where required, mitigation is proposed, potential cumulative impacts are considered, and the residual impacts and their significance are assessed.

8.2 Legislation and Policy Context

Marine mammals are afforded varying levels of protection under international and national legislation depending upon their genus. Within UK waters, cetaceans (whales, dolphins and porpoises) are protected through the listing of European Protected Species (EPS) under Annex IV of the Habitats Directive and are provided full protection within Scottish territorial waters through the Conservation (Natural Habitats, &C.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in UK Offshore Waters. The deliberate or reckless injury or disturbance of these species is therefore prohibited within Scottish inshore and offshore waters; however, the definition of disturbance legally varies between these two jurisdictions. Table 8.1 provides the definitions of disturbance for both inshore and offshore waters relevant to the offshore SG1A Project.

Table 8.1 Definitions of disturbance offenses against EPS in Scottish inshore and offshore waters

	Area	
Definition	**Scottish Territorial Waters**	**Scottish Offshore Waters**
Applicability	Within 12 NM Limit	Outwith 12 NM Limit
Relevant Legislation	The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended)	Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended)
Definition of Relevant Offences	Regulation 39: (1) It is an offence– (a) deliberately or recklessly to capture, injure or kill a wild animal of a European protected species; (b) deliberately or recklessly– (i) to harass a wild animal or group of wild animals of a European protected species; (ii) to disturb such an animal while it is occupying a structure or place which it uses for shelter or protection; (iii) to disturb such an animal while it is rearing or otherwise caring for its young; (iv) to obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place; (v) to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or (vi) to disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; (c) deliberately or recklessly to take or destroy the eggs of such an animal; or (d) to damage or destroy a breeding site or resting place of such an animal. **(2) Subject to the provisions of this Part, it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).**	Regulation 45: (1) Subject to regulations 46 and 55, a person who— (a) deliberately captures, injures, or kills any wild animal of a European protected species, (b) deliberately disturbs wild animals of any such species, (c) deliberately takes or destroys the eggs of such an animal, or (d) damages or destroys, or does anything to cause the deterioration of, a breeding site or resting place of such an animal, is guilty of an offence. (2) For the purposes of paragraph (1)(b), disturbance of animals includes in particular any disturbance which is likely— (a) to impair their ability— (i) to survive, to breed or reproduce, or to rear or nurture their young; or (ii) in the case of animals of a hibernating or migratory species, to hibernate or migrate; or **(b) to affect significantly the local distribution or abundance of the species to which they belong.**

While pinnipeds are not EPS, they are also protected through provisions set out in Annex V of the Habitats Directive, which defines them as species of community interest, meaning that any taking of these species in the wild is subject to management measures.

Bottlenose dolphin *(Tursiops truncatus)*, harbour porpoise *(Phocoena phocoena)*, grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) gain additional protections through Annex II of the Habitats Directive, which includes provisions for their consideration in designating SACs. Additionally, seals are further protected at designated seal haul-outs, which are coastal habitat locations that seals use to breed, pup, moult and rest. Seal haul-outs are designated through the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended). All haul-outs in Scotland are protected under Section 117 of the Marine (Scotland) Act 2010.

Additionally, all marine mammal species which regularly occur within Scottish waters are designated as PMFs (Tyler-Walters *et al.,* 2016). PMF are habitats and species that are considered to be marine nature conservation priorities in Scottish waters (NatureScot, 2020c). The following list of cetaceans are also protected under Schedule 5 of the Wildlife and Countryside Act (1981): all dolphin species, all whale species and harbour porpoise.

8.3 Consultation

NatureScot provided a screening response via MS-LOT in response to the Seagreen 1A Export Cable Corridor Screening Report 2020. The responses which are relevant to marine mammals are detailed in Table 8.2.

Table 8.2 Consultation comments relevant to this section of the offshore SG1A EIAR and the SG1A Project response

Summary of comments	SG1A Project Response
Pre-construction phase impact pathways "We advise on the need to consider pre-construction activities that can emit significant underwater noise e.g. UXO clearance and some geophysical activities. Impacts will require both assessment under EPS licensing as well as effects to designated sites with marine mammal and potential diadromous fish (Atlantic salmon) features. These impacts should be considered within the EA rather than post-consent."	Impacts from geophysical survey activities and the use of noise-generating technologies will be included in this assessment (Section 8.10). At this stage UXO clearance is not likely to be required as pre-construction surveys will inform cable routeing to avoid features therefore this is not considered in the impact assessment. Should it be required post consent, then sufficient assessment will be undertaken in support of any EPS or Marine Licence application.

8.4 Data Sources

The key data sources which were used to inform the marine mammal section of this EIAR include:

- Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the Small Cetaceans in the European Atlantic and North Sea (SCANS)-III aerial and shipboard surveys, (Hammond *et al.,* 2017);
- Atlas of cetacean distribution in north-west European waters, (Reid *et al.,* 2003);
- Management Units for cetaceans in UK waters (January 2015), (IAMMWG, 2015);
- Estimated At-sea Distribution of Grey and Harbour Seals - updated maps 2017, (Russell *et al.*, 2017);

- Scientific Advice on Matters Related to the Management of Seal Populations: 2019; Report to the National Environment Research Council, (SCOS, 2019);
- At-Sea Density Maps for Grey and Harbour Seals in the British Isles (2020) dataset (Carter et al, 2020); and
- Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters (Hague *et al.,* 2020).

8.4.1 Data Limitations

The main limitations associated with the data sets are outlined below:

- In the absence of offshore SG1A Project-specific survey data, the distribution and habitat use of the cetacean species considered in this assessment have been on a regional scale, as provided in relevant literature. This may result in the overestimation of density distributions specifically within the offshore SG1A Project area where those species have greater mean densities across the wider region.
- The biogeographic populations which are under consideration have been developed for management purposes. They are spatially delineated based on the best available knowledge of species-specific population distributions; however, they do not consider movement between populations, nor do they characterise primary or secondary species ranges within the full estimated biogeographic population range. As such, assessments of population-level impacts may not be spatially representative and, in some instances, individuals occurring within the offshore SG1A Project area may be affiliated with adjacent populations.

8.5 Environmental Baseline

8.5.1 Cetaceans

Four cetacean species are known to frequently or seasonally visit the waters off the east coast of Scotland, including the Firth of Forth, which have been recorded in the region covered by the offshore SG1A Project: harbour porpoise; bottlenose dolphin; minke whale (*Balaenoptera acutorostrata*) and white-beaked dolphin (*Lagenorhynchus albirostris*). Several other species which may visit infrequently or seasonally in low abundance include: Atlantic white-sided dolphin (*Lagenorhynchus obliquidens*); killer whale (*Orcinus orca*); Risso's dolphin (*Grampus griseus*); fin whale *(Balaenoptera physalus)*; long-finned pilot whale (*Globicephala melas*); humpback whale (*Megaptera novaeangliae*); and short-beaked common dolphin (*Delphinus delphis*). However, the occurrence of these species is extremely rare and difficult to predict across the offshore SG1A Project area (Reid *et al.,* 2003; Robinson *et al.,* 2007; Robinson *et al.,* 2017; Hague *et al.,* 2020) and therefore the potential impacts to these species have not been specifically considered within this EIAR. While acknowledging this, the findings of the wider impact assessment and any resulting mitigation requirements will be equally applicable and effective for these species.

Density estimates from the most recent SCANS-III surveys indicated harbour porpoise are the most abundant species within the vicinity of the offshore SG1A Project, with an estimated density of between

0.5-0.6 animals/km^2 (Hammond *et al.,* 2017). This estimate is high compared with density estimates of bottlenose dolphin, white-beaked dolphin and minke whale (Hammond *et al.,* 2017; Table 8.3).

Biogeographic populations are used to characterise each species as they naturally occur without artificial anthropogenic boundaries (i.e. territorial marine jurisdictions). These are referred to as management units (MUs) (IAMMWG, 2015). The harbour porpoise MU covers the entire North Sea, while the white-beaked dolphin and minke whale MUs cover the Celtic and greater North Seas (IAMMWG, 2015). However, the bottlenose dolphin MU relevant to the offshore SG1A Project, known as the Coastal East Scotland MU (IAMMWG, 2015), has a much smaller, coastal distribution which is predominantly limited to the 20 m depth contour (Seagreen, 2017).

Table 8.3 Cetacean population parameters relevant to the offshore SG1A Project (Hammond et al., 2017; IAMMWG, 2015)

Cetacean name	Density estimates (animals/km^2)	Management Unit (MU) Biogeographical Population Estimate
Harbour porpoise	0.5-0.6	227,298
Bottlenose dolphin	0.025-0.050	195
White-beaked dolphin	0.20-0.25	15,895
Minke whale	0.035 – 0.040	23,528

There are no protected sites immediately adjacent to the offshore SG1A Project designated for cetaceans. The closest is the Southern Trench NCMPA, located 91.7 km north of the offshore SG1A Project, which is proposed for the protection of minke whales and the 'Southern Trench', which is a large-scale submarine feature that supports cetacean summer feeding activities (NatureScot, 2019).

Additionally, the Moray Firth SAC is located 147.7 km northeast of the offshore SG1A Project and is designated for supporting the only known resident population of bottlenose dolphins in the North Sea (JNCC, 2020b), which are affiliated with the Coastal East Scotland MU (IAMMWG, 2015). It is recognised that small sub-groups of bottlenose dolphins from the Moray Firth SAC may transit along the coastline to the Firth of Forth, though they predominantly utilise the more accessible sheltered waters of the Firth of Tay and Eden Estuary. The offshore SG1A Project is located within the southernmost extent of the Greater North Sea MU's range for bottlenose dolphins and, given their affiliation with very shallow waters, is not considered to form important habitat to this species.

8.5.2 Pinnipeds

Two species of pinniped regularly occur in the North Sea: grey and harbour seals. Scotland supports the greatest numbers of seals within the UK, providing habitat to approximately 80% of the grey seals and 81% of the harbour seals therein (SCOS, 2019).

Harbour seals which may occur within the offshore SG1A Project area are affiliated with the East Scotland seal management unit, which is a small and declining biogeographic population which has been historically concentrated within the Firth of Tay and Eden Estuary (Thompson *et al.*, 2019). Grey seals which are likely to occur in the offshore SG1A Project area are also affiliated the East Scotland seal management unit specific to that species (Russell *et al.*, 2019; Thomas *et al.*, 2019). The population sizes associated with these seal management units are 343 harbour seals and 3,683 grey seals, based on the most recent count data (i.e. 2016 – 2019; Thompson *et al.*, 2019; Thomas *et al.*, 2019).

Grey and harbour seals forage in coastal and offshore waters, depending on the seasonal distribution of their prey. However, both species tend to be concentrated close to shore, particularly during the breeding and pupping seasons which occurs from May to July for harbour seals and September to December for grey seals (Marine Scotland, 2014). Grey seals have larger foraging ranges than harbour seals, often travelling hundreds of kilometres to feed, whereas harbour seals will generally forage within 50 km of their selected haul out sites (Cronin *et al.,* 2012; Thompson *et al*., 1996).

Tagging studies indicate that at-sea habitat use by harbour seals is estimated as an average of between 0 - 1 animals/25 km^2 across the entirety of the offshore SG1A Project (mean = 0.2 animals/25 km^2; Figure 8-2; Russell *et al.*, 2017). This is very low relative to other locations in Scotland, particularly to the north and along the west coast (Russell *et al.*, 2017). At-sea usage by grey seals is also considered low across the offshore SG1A Project area compared to other regions of the North Sea (Russell *et al.*, 2017). Density estimates for grey seals are 1 - 10 animals/25 km^2 for most of the offshore SG1A export cable corridor, increasing slightly in the vicinity of North Berwick and within the northeast offshore region of the offshore SG1A Project (mean = 7.5 animals/25 km^2; Table 8.2; Russell *et al.*, 2017).

Within 20 km of the offshore SG1A Project, there is one SAC designated for the protection of grey seals (i.e. Isle of May SAC) and within 50 km one for the protection of harbour seals (i.e. Firth of Tay and Eden Estuary SAC) (Figure 8-2). These sites are located 3.9 km northwest and 30 km north of the offshore SG1A Project area, respectively (Figure 3-1). The harbour seal population within the Firth of Tay and Eden Estuary SAC has undergone unexplained catastrophic declines in the past two decades and now supports approximately 15% of the original population the site was designated to protect (i.e. approximately 40 individuals; Russell *et al.*, 2019). Whereas the Isle of May SAC is the fourth-largest breeding colony of grey seals in the UK and regularly supports approximately 5,900 animals during the breeding season (between September to December each year; JNCC, 2015; NatureScot, 2015).

Seals at designated haul outs garner strict protection under Marine (Scotland) Act 2010, and it is an offence to cause disturbance to any hauled-out seals. One designated haul-out is located in the vicinity of the landfall of the offshore SG1A Project, the Craigleith haul-out located 2 km to the south of the offshore SG1A Project. Additionally, there are four other seal haul outs within 30 km of the SG1A Project, including: Inchkeith, Kinghorn Rocks and Inchmickery, and Cow & Calves located to the southwest, and Fast Castle located to the southeast (Figure 8-1).

Due to the closest seal haul-out being located 2 km from the offshore SG1A Project, in accordance with guidance on the screening of potential impacts to this category of designated site (Marine Scotland, 2019), the development is unlikely to result in disturbance of seals within a designated haul-out. Therefore, disturbance to seals onshore are not assessed within this EIAR.

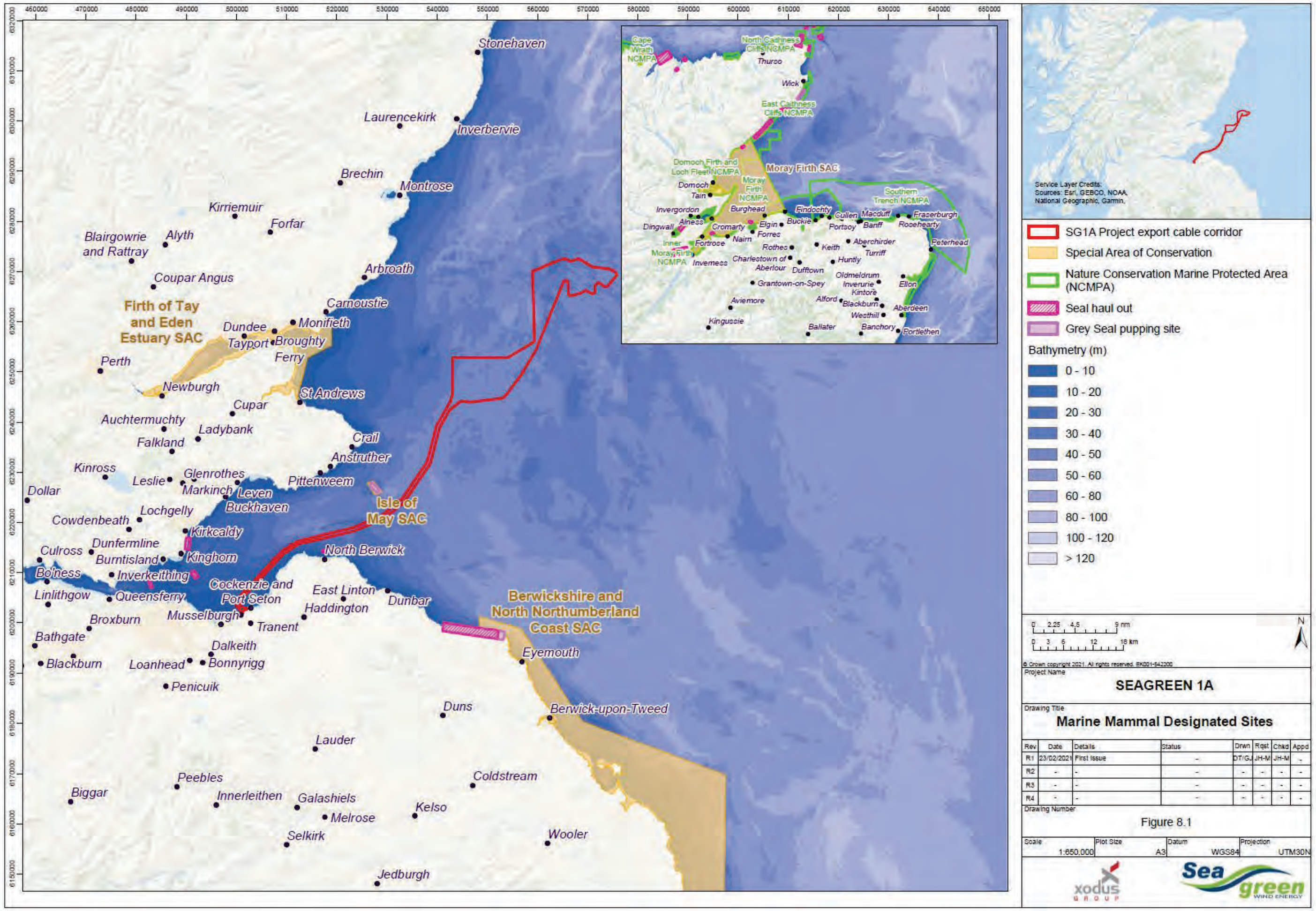

Figure 8-1 Designated sites with marine mammal designated sites relevant to the offshore SG1A Project

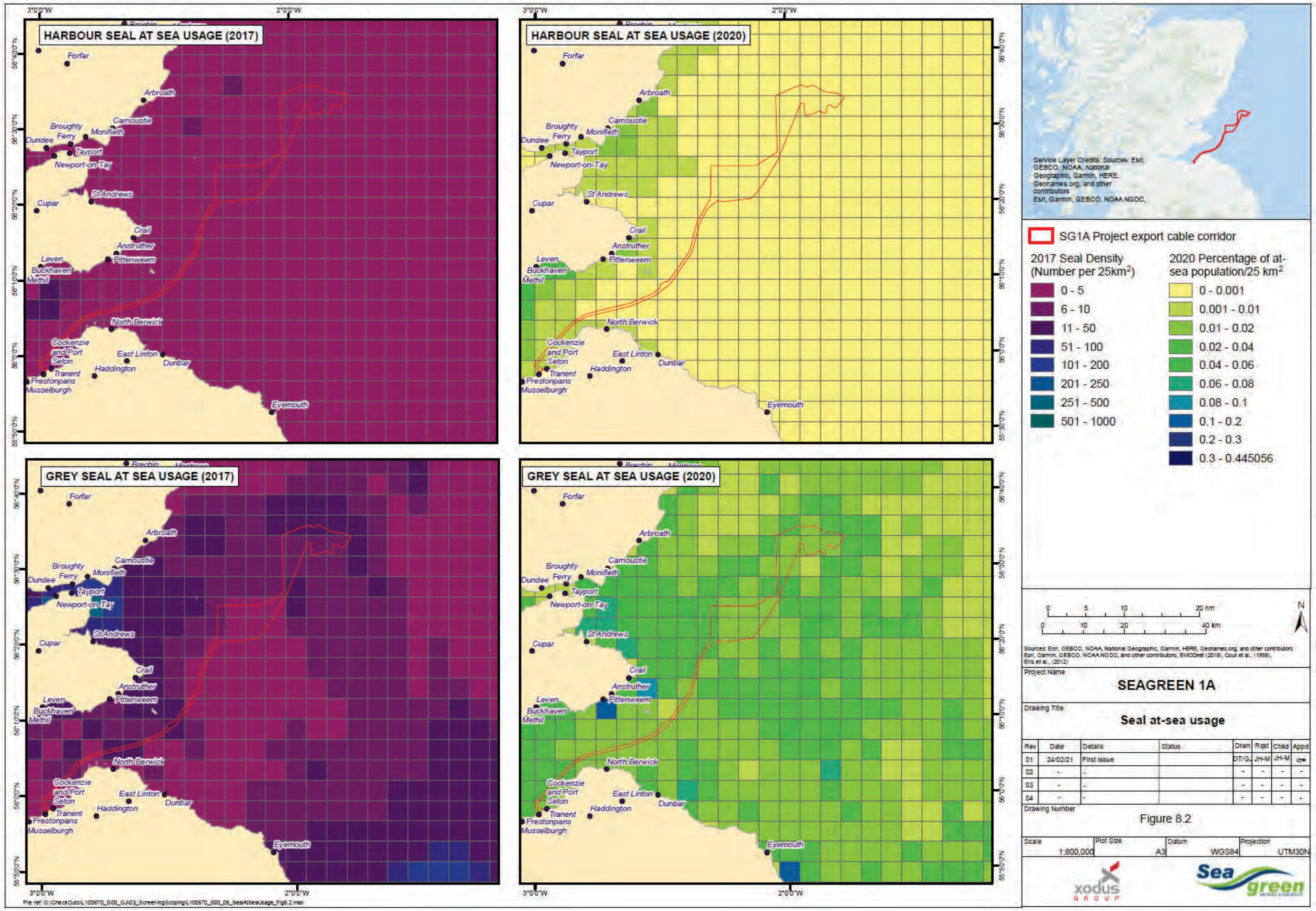

Figure 8-2 - At-sea density of grey and harbour seals (SMRU, 2021)

8.6 Assessment Criteria

The evaluation methodology has been adapted from the Guidelines for ecological impact assessment in the UK and Ireland: terrestrial, freshwater and coastal environment (CIEEM, 2016). A key consideration in assessing the effects of any development on marine mammal species is to define the areas of habitat and the species that need to be considered. This requires the identification of a potential zone of influence, which is defined as those areas and resources that may be affected by project activities. An assessment is then made on the sensitivity of a species, based upon a combination of data sources, professional judgment and knowledge of the offshore SG1A Project area and wider context.

8.6.1 Receptor Sensitivity

The sensitivity of a species receptor can be viewed as a combination of environmental integrity, either in terms of habitat use or ecological importance, and conservation status or 'value'. Species integrity has been delineated using the available data (Section 8.4) and has been summarised in the environmental baseline in Section 8.5.

The approach taken in this assessment is that a species population that is of Regional or greater importance in biodiversity conservation terms is considered to be a valued ecological receptor. Therefore, if a species population is considered to be of High Local value or less, the proposed development is not anticipated to have as great an effect on the species population as a whole. Exceptions are made if the species population or habitat area has been identified as having a high social or economic value, or if the species is legally protected (e.g. as a Schedule 1 or Schedule 5 species, or an EPS).

Table 8.4 Nature conservation receptor evaluation criteria

Sensitivity/Value	Criteria
International	An internationally important site (SAC) or a site proposed for, or considered worthy of designation; A regularly occurring substantial population of internationally important species (E.G. EPS listed on Annex IV of the Habitats Directive).
National	A nationally designated site (MPA), or a site proposed for, or considered worthy of such designation; A viable area of habitat type listed in Annex I of the Habitats Directive or of smaller areas of such habitat which are essential to maintain the viability of a larger whole; or A regularly occurring substantial population of a nationally important species, e.g. listed on Schedule 5 & 8 of the 1981 Wildlife and Countryside Act.
Regional	Areas of internationally or nationally important habitats which are degraded but are considered readily restored; Viable habitats or populations of a species identified as a PMF, or smaller areas/populations which are essential to maintain the viability of a larger area/population as a whole; Regionally important population/assemblage of an EPS, Schedule 1 and/or 5 species.

Sensitivity/Value	Criteria
	Regionally important assemblages of other species or habitats.
High Local	Locally important population/assemblage of an EPS, Schedule 1 and/or 5 species; or Sites containing viable breeding populations of species known to be county rarities, or supplying critical elements of their habitat requirements.
Moderate Local	Undesignated sites, features or species considered to appreciably enrich the habitat resource within the local context (within 2km radius from the site) and may benefit from mitigation as a good practice measure.
Low Local	Undesignated sites, features or species considered to appreciably enrich the habitat resource within the immediate environs of the site and may benefit from mitigation as a good practice measure.
Negligible	Common and widespread or modified habitats or species.

The conservation status considered in the assessment of marine mammal sensitivity is the Favourable Conservation Status (FCS), as defined by the *Favourable Conservation Status: UK Statutory Nature Conservation Bodies Common Statement* (JNCC, 2018). The approach of this assessment is to consider the value of the offshore SG1A Project area to each species under consideration, rather than the nature conservation importance of the species itself, although this is a factor in the evaluation process with the level of use of the offshore SG1A Project area (number of individuals using the offshore SG1A Project area and nature and level of use) taken into consideration.

8.6.2 Impact Magnitude

The magnitude of impacts are defined by their outcomes and durations. Table 8.5 provides an overview of the range of impact magnitudes referred to within this assessment. The impact magnitude has been assessed as either low, medium, high or negligible.

Table 8.5 Definitions of Impact Magnitude

Magnitude	Description
Negligible	Very slight change from the baseline conditions. Changes barely detectable, approximating to the 'no change' situation. Any effects likely to be reversible within 12 months and not affect the conservation status or integrity of the receptor.
Low	Minor shift away from baseline conditions. Effects will be detectable but unlikely to be of a scale or duration to have a significant effect on the conservation status or integrity of the receptor in the short term (1-5 years). Overall baseline character of site will not alter substantially.
Medium	Clear effect on the conservation status or integrity of the receptor in the short to medium term (6-15 years), although this is likely to be reversible or replaceable in the long-term (15 years plus).
High	Total loss of, or major alteration to conservation status or integrity of a receptor with situation likely to be irreversible, even in the long term. Fundamental alteration to the character and composition of the Site.

8.6.3 Impact Significance

Impact significance is a product of the receptor sensitivity/value and the magnitude of the impact on it, moderated by professional judgment. The impact significance for this marine mammal assessment has been assessed as either major, moderate, minor or negligible using the matrix in Table 8.6 . In terms of the EIA terms, only effects which are 'moderate' or 'major' are considered significant, the others constitute a non-significant effect.

Table 8.6 Impact significance matrix for marine mammal assessment

Magnitude	Sensitivity/Value				
	Negligible/Low Local	Moderate/High Local	Regional	National	International
Negligible	Negligible	Negligible	Negligible	Negligible	Minor
Low	Negligible	Minor	Minor	Minor	Moderate
Medium	Minor	Minor	Moderate	Moderate	Major
High	Minor	Moderate	Moderate	Major	Major

8.7 Identification of Potential Impacts

The offshore SG1A Screening Report provides detailed information on the process for the identification of potential impacts to marine mammal receptors during each phase. From this process, Table 8.7 summarises the potential impacts which have been included in the marine mammals EIA process and those which are not considered further in this EIAR, in alignment with the Screening Opinion.

Table 8.7 Summary of the characteristics of potential impacts to marine mammals receptors associated with offshore SG1A Project

Potential impact	Relevant phase of Project			To include to Environment Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Temporary disturbance / displacement due to noise emissions	✓	✓	✓	Yes-for noise emissions from geophysical surveys only.
Collision risk	✓	✓	✓	No
Increased sedimentation affecting ability to forage	✓	x	✓	No
Magnetic fields interfering with navigation	x	✓	x	No
Accidental pollution	✓	✓	✓	No
Disturbance at landfall	✓	x	x	No

Based on available data, the waters in the vicinity of the offshore SG1A Project support varying densities of cetaceans and pinnipeds, although the offshore SG1A Project area itself is not known to be of elevated importance to feeding, breeding, nursing or migrating marine mammals (Hammond *et al.*, 2017; Reid *et al.*, 2003; Russell *et al.*, 2017). Additionally, the highly mobile nature of marine mammals and the temporary, spatially constrained conditions of the offshore SG1A Project dramatically reduce the likelihood of interactions between offshore SG1A Project activities and these receptors.

Regardless, there remains the potential for impacts to marine mammals which may occur within the offshore SG1A Project area during the proposed activities.

8.7.1.1 Underwater Noise Impacts

Underwater noise emissions from geophysical surveys and employed technologies relating to the construction and maintenance of the offshore SG1A Project constitute the greatest potential risk of injury or disturbance to marine mammals in the vicinity of the offshore SG1A Project area (Section 3.8.2.4). Injury and disturbance from underwater noise may impact marine mammals in the following ways:

- Injury – physiological damage to auditory or other internal organs; and
- Disturbance (temporary or continuous) – disruptions to behavioural patterns, including, but not limited to: migration, breathing, nursing, breeding, foraging, socialising and/or sheltering.

To determine the potential for noise impacts to cetaceans and pinnipeds, predicted emission levels are compared to available empirically estimated thresholds for injury and disturbance. Several threshold criteria and methods for determining how sound levels are perceived by marine mammals are available (e.g. the decibel hearing threshold (dBht) method and other hearing weighted and linear measures) and each has its own advantages and disadvantages. Scottish Government (2020) guidance recommends using the injury and disturbance criteria proposed by Southall *et al*. (2007), which is based on a combination of linear (un-weighted) peak sound pressure levels (SPL) and weighted sound exposure levels (SEL) (Scottish Government, 2020b). Since the publication of this seminal paper, there has been mounting evidence of marine mammal auditory abilities in novel species which has led to amendments to the auditory thresholds for injury (NMFS, 2018; Southall *et al.*; 2019). In accordance with recent regulator feedback, these amended hearing groups and thresholds for acoustic injury have been adopted herein; and are detailed in Section 8.9.1.1.

If a noise emission is composed of frequencies which lie outwith the estimated auditory bandwidth for a given species, then disturbance or injury is extremely unlikely. To understand the potential for noise-related impacts, the likely hearing sensitivities of different marine mammal hearing groups has been summarised in Table 8.8. This table has been used as the basis for screening out certain equipment (Table 3.5) from further impact assessment.

Table 8.8 Auditory bandwidths estimated for cetaceans and pinnipeds (NMFS, 2018; Southall et al., 2019)

Hearing Group	Estimated Auditory Bandwidth
Low-frequency cetaceans (LF): (e.g. baleen whales, such as humpback whales, minke whales, fin whales, etc.)	7 Hz to 35 kHz
High-frequency cetaceans (HF): (e.g. dolphins, toothed whales, beaked whales and bottlenose whales)	150 Hz to 160 kHz
Very high-frequency cetaceans (VHF): (e.g. harbour porpoises and other 'true' porpoises)	275 Hz to 160 kHz
Phocid carnivores in water (PW): (e.g. earless or 'true' seals, such as grey and harbour seals)	50 Hz to 86 kHz

The most likely potential impact to cetaceans and seals from offshore SG1A Project activities is disturbance resulting from underwater noise generated by pre and post-installation surveys and the use of noise generating technologies during all phases of the offshore SG1A Project.

As detailed in Section 3.8.2.4, pre-construction (and post-installation) geophysical surveys will take place at predefined locations within the offshore SG1A Project using low to high frequency survey devices such as multibeam echosounders (MBES), side scan sonar (SSS) sub-bottom profilers (SBP). Additionally, subsea survey and cable installation equipment, such as ROVs, trenchers, and ploughs, may employ ultra-short baseline (USBL) technology to monitor their positions. These technologies all have the capacity to generate sounds which are audible to marine mammals, particularly high-frequency hearing specialists (e.g. harbour porpoise), therefore posing a potential risk of disturbance and injury.

However, survey activities will be limited to within the offshore SG1A Project export cable corridor, and are expected to be of short duration, meaning that potential impacts on marine mammals will be spatially and temporally limited, and are not anticipated to result in local or population-level effects. In addition, any potential impacts of pre-construction surveys to marine mammals have been fully considered and assessed as part of the EPS Licence (EPS/BS-00009030) which has been granted for the geophysical surveys.

The survey equipment identified within Section 3.8.2.4 along with the marine mammal functional hearing groups has been summarised in Table 8.9.

Table 8.9 Comparison of source levels of noise-generating survey equipment to marine mammal functional hearing ranges

Equipment	Estimated source pressure level (dB re 1 µPa @1m)	Expected source frequency	Audibility by marine mammal functional hearing group (LF, HF, VHF and PCW)
MBES	~220 peak; 213 rms	200 kHz – 400 kHz	Inaudible to all groups
SSS	245 peak; 242 rms	800 kHz	Inaudible to all groups
SBP (pinger)[8]	~223 peak; 220 rms	12 kHz	Audible to all groups
Boomer[8]	220 peak; 217 rms	200 Hz – 10 kHz	Audible to all groups
Sparker[8]	245 peak; 242 rms	200 Hz – 10 kHz	Audible to all groups
USBL[8]	~206 peak; 203 rms	31 kHz	Audible to HF, VHF and PCW

During the offshore SG1A Project's pre-construction surveys, construction, operations and decommissioning phases, the only activities which may generate underwater noise emissions with the potential to adversely impact marine mammals are pre-and post-installation surveys, routine inspections and maintenance utilising SBP, Boomers, Sparkers and the use of USBL throughout all project phases. Noise emissions during the operations and decommissioning phases will be broadly similar to those resulting from the construction phase, in which dedicated geophysical surveys are planned; however, the activities will be shorter in duration and more localised to the area(s) of maintenance and/or inspection.

To determine the scale of potential underwater noise impacts associated with the offshore SG1A Project, including estimation of the number of protected species which may be impacted, noise modelling has been undertaken. Section 8.6 outlines the underwater noise assessment approach which has been adopted in this EIA.

8.7.1.2 Collision Risk

Collision risk is another potential risk to marine mammals in the offshore SG1A Project area and may cause mortality and sublethal injury (Laist *et al.*, 2001). However, marine mammals are highly mobile and since the survey and installation vessels will be slow moving, collisions between survey vessels and marine mammals are not expected. As such, no impacts to marine mammals resulting from vessel collisions are expected, and no further assessment is necessary. Regardless of this finding, all survey and installation vessels will adhere to the provisions of the Scottish Marine Wildlife Watching Code to ensure best practice when operating around marine mammals (see Section 3.8.2.5).

[8] In the absence of rms measurements reported by equipment providers, a precautionary approach has been taken assuming that the rms SPL value is 3 dB lower than the peak SPL. In reality, the true rms SPLs are likely so be signifncantly lower.

8.7.2 Underwater Noise Assessment Criteria

8.7.2.1 Injury

Injury criteria proposed by NMFS (2018) are devised for two different types of sound:

- **Impulsive**: sounds which are short in duration (i.e. less than 1 second long) and temporary, occupy a broadband bandwidth, and have rapid rise and decay times with a high peak pressure level; and
- **Non-impulsive**: sounds which may occupy a broadband, narrowband or tonal bandwidth, can be brief, prolonged, continuous or intermittent in nature, and are not characterised by rapid rise and decay times or a high peak pressure level.

The geophysical surveys and Ultra-short Baseline (USBL) comprise acoustic equipment which emits multiple pulsed sound, as detailed within Section 3.8.2.4.

The noise emitted from the equipment listed within Section 3.8.2.4 will disperse through the water column, with sound pressure reducing as distance from the noise source increases, hence marine mammals will be exposed to a lower source pressure further from the noise source. Therefore, for the survey equipment with potential to cause injury or disturbance to marine mammals, the dispersion of noise through the water column has been modelled to assess the predicted impact ranges, in which the sound pressure levels received by marine mammals have the potential to result in injury.

A duel-metric approach has been adopted which identifies the range of potential injury to marine mammals which have been derived from the source level including the peak pressure and cumulative SELs experienced for each equipment type identified to require consideration for noise-related injury (see Table 8.9). The thresholds above which each marine mammal and pinniped hearing group may experience noise-related injury are presented in Table 8.10. These thresholds are derived from measurements of marine mammal hearing using weighting functions which account for peak hearing abilities for each hearing group (NMFS, 2018).

Table 8.10 Criteria considered in this assessment for the onset of injury in marine mammals from impulsive noise (NMFS, 2018; Southall et al.*, 2019)*

Marine Mammal Hearing Group[9]	Impulsive Noise		Non-Impulsive Noise
	Unweighted Peak Pressure (dB re 1 μPa)	Weighted Cumulative SEL (dB re 1 μPa^{2}s)	Weighted Cumulative SEL (dB re 1 μPa^{2}s)
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very high-frequency (VHF) cetaceans	202	155	173
Phocid pinnipeds (underwater)	218	185	201

[9] Hearing groups have been defined using the naming conventions provided in Southall *et al.* (2019), which are based on accepted frequency ranges commonly used in acoustics; however, the groupings and their respective criteria do not differ from NMFS (2018).

8.7.2.2 Disturbance

To consider the possibility of significant disturbance resulting from the proposed pre-construction, construction and maintenance activities, it is necessary to consider the likelihood that they would generate a non-trivial disturbance based on the sensitivities of the species present and whether the number of individuals impacted would have the potential to result population-level consequences for marine mammals.

Auditory thresholds for disturbance, as defined by the National Marine Fisheries Service (NMFS, 2014), coupled with behavioural response criteria detailed in Southall *et al.* (2007) have been adopted for the assessment of potential marine mammal disturbance from both non-impulsive and impulsive noise sources. These thresholds (provided in in SPL_{rms}) and behavioural response severity ratings are detailed in Table 8.11.

Table 8.11 Disturbance threshold criteria for impulsive sounds (Southall et al.*, 2007; NMFS, 2014).*

Behavioural Effect	Threshold Criteria SPL_{rms} (dB re 1 μPa)
Potential strong behavioural reaction (6 or more on the severity scale)	160

8.8 Embedded Mitigation Measures

Embedded mitigation measures part of the offshore SG1A Project are listed in Section 3.8.2.5. The embedded mitigation measures which are of relevance to marine mammals are as follows:

- All survey vessels will adhere to the provisions of the SMWWC to ensure best practice when operating around marine mammals;
- A marine mammal observer (MMO) will be on the geophysical survey vessel to carry out the proposed mitigation measures during the use of geophysical survey equipment (i.e. UHRS and SBP);
- The MMO will conduct a pre-shooting search of a 500 m radius mitigation zone during deployment of geophysical survey equipment with a significant risk of injury (i.e. UHRS and SBP). If a marine mammal is observed survey commencement will be delayed until 20 minutes after the marine mammal has left the mitigation zone or was last observed;
- Soft start procedures will be implemented by seismic survey equipment (i.e. UHRS), where practical, through the uniform ramping up of power. It is acknowledged that this is not possible for some SBP equipment (i.e. it is either on or off) and such instances will be ascertained by the appointed contractor; and
- For SBP, in relation to line change procedures, it is interpreted here that equipment should be turned off if line changes (or other pauses) are expected to be longer than 40 minutes, and also where practical if line changes/pauses are less than 40 minutes, with the above pre-shooting search and soft start procedures applying in both cases.

The embedded mitigation presented above has been taken into consideration in the assessment of impact significance presented below.

8.9 Underwater Noise Modelling

The following section presents the results of the underwater noise modelling which was carried out based on specific parameters of all types of geophysical survey equipment which may be used by the offshore SG1A Project. The assessment of impacts to sensitive marine mammal receptors are presented in Section 8.10

Disturbance and injury impact ranges resulting from the use of geophysical survey equipment and noise-generating technologies (i.e. USBL) have been estimated by combining the outputs of the noise modelling, with the published injury and disturbance criteria detailed in Section 8.7.2. The impact ranges are used in conjunction with publicly availably marine mammal density data to estimate the number of animals which could be affected by the use of geophysical survey devices associated with the offshore SG1A Project export cable. This methodology provides an assessment of potential marine mammal impacts in the context of regional populations and management unit. Where necessary, appropriate mitigations have been identified to reduce the magnitude of marine mammal impacts. Any identified additional mitigation measures which are implemented by the offshore SG1A Project will be aligned to industry best practice guidance, including JNCC (2017) Guidelines for Minimising the Risk of Injury and Disturbance to Marine Mammals from Geophysical Surveys. It is noted that the use of geophysical survey equipment may also require an EPS licence which has been applied for separately.

Underwater modelling has been undertaking using Xodus' SubsoniX noise model which was developed specifically for assessing environmental impacts due to underwater noise. The SubsoniX model approach is based on an extended version of the semi-empirical model developed by Marsh-Schulkin (Marsh and Schulkin, 1962). The sound propagation model uses several concepts including the following:

- Refractive cycle, or skip distance;
- Geometric divergence;
- Deflection of energy into the bottom at high angles by scattering from the sea surface;
- A simplified Rayleigh two-fluid model of the bottom for sand or mud sediments; and
- Absorption of sound energy by molecules in the water.

The following inputs are required to the model:

- Third-octave band source sound level data;
- Discreet range (distance from source to receiver);
- Water column depth and sediment layer depth;
- Sediment type (sand/mud);
- Sea state; and
- Source directivity characteristics.

The model is based on a combination of acoustic theory and empirical data from around 100,000 measurements which has been found to provide good predictions (Marsh and Schulkin, 1962).

The duel-metric assessment approach disseminated in National Oceanic and Atmospheric Administration (NMFS, 2018) has been used to estimate injury impact range from: (1) the peak SPL; and (2) the weighted cumulative SEL criteria. The SEL represents the total energy produced by a noise-generating activity standardised to a one-second interval. This enables comparison of the total energy attributed to different activities with different inter-pulse intervals. Empirically-based weighting functions (NMFS, 2018; Southall *et al.*, 2019) have been applied to the modelling outputs to account for peak hearing sensitivity for the respective marine mammal hearing groups.

The following assumptions have been applied to the models:

- Maximum reported SPLs for all equipment have been used;
- Maximum pulse length and minimum turn around has been used where provided;
- Where data is unavailable, the time between pulses has been calculated as 1.5 times the ping length;
- Vessels are moving at slow speeds; and
- Survey equipment likely to be used in the nearshore shallow water environment (i.e. <10 m) will be very high frequency to provide better resolution and will have a lower SPL, and so does not constitute a worst-case scenario.

The directivity characteristics of the sound sources are also an important factor affecting the received sound pressure levels from noise-generating activities. In geophysical surveys, source arrays are designed so that the majority of acoustic energy is directed downwards towards the ocean floor for data collection purposes. As such, the amount of energy emitted across the horizontal plane is significantly less (20 dB +) than that which is emitted directly downwards (Richardson *et al*, 1995). Due to the frequency-dependent nature of sound, the loss of pressure on the horizontal plane is more pronounced at higher frequencies than at lower frequencies (Carroll *et al*., 2017). Directivity corrections can be applied to the model outputs, which provide broadband normalised amplitudes at varying angles of azimuth[10] and dip angle[11]. Directivity corrections have been applied to the modelling outputs under the assumption that the animal is directly in-line with the vessel.

As detailed in Section 8.7.2.2, the disturbance threshold uses the SPL_{rms} metric, and hence needs to be evaluated against equipment source levels in SPL_{rms}. It is important to note that the rms value associated with the SPL_{rms} depends upon the length of the integration window used. Using a longer duration integration window results in a lower rms than produced by a shorter integration window.

An acoustic phenomenon results from the elongation of the waveform with distance from the source due to a combination of dispersion and multiple reflections. Measurements presented by Breitzke *et al.* (2008) indicate elongation of the T90 window up to approximately 800 m at 1 km. This temporal "smearing" reduces the rms amplitude with distance by elongating the rms window and has been included within the

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[10] The azimuth is taken as the angle of circumference around the boat which lies parallel to the surface of the water, progressing around the boat from port to starboard.

[11] The dip angle is taken as the angle under the boat, progressing from prow to stern.

disturbance modelling scenarios. Since the auditory organs of most marine mammals integrate low frequency sounds over an acoustic window of around 200 ms (Madsen *et al.*, 2006 and references therein), this duration was used as a maximum integration window for the received SPL_{rms}.

8.9.1.1 Potential Injury Ranges

The expected frequency range of noise emissions from the SBP and Ultra High Resolution Seismic (UHRS) (i.e. boomers and sparkers) survey equipment overlap with the hearing ranges of all marine mammal hearing groups, whilst those from USBL overlap with all but the LF cetaceans (e.g. minke whales) (Table 8.9). This means that LF cetaceans will not experience noise-generated disturbance impacts, but still have the potential to be injured by these sounds if they are operating at source pressure levels which exceed their relevant auditory thresholds for injury (Section 8.7.2.1).

Modelling of ranges at which injury impacts may result from deployment of survey equipment has been undertaken, as described in Section 8.9. Each of the proposed activities have been modelled at the deepest point of the cable corridor (64 m) and also at a shallower point near shore (15 m). Lower frequencies were applied to the UHRS inputs to represent a worst-case scenario for noise propagation within the shallower depth, though this scenario is considered unlikely. Both sets of results are included for completeness.

Example equipment has been selected for each of the technologies being assessed to exemplify the realistic worst-case scenario for each survey technique, including the maximum SPLs across source frequencies meant to encapsulate the hearing abilities of all representative hearing groups.

The modelling also includes consideration of soft-start procedures for the UHRS system, as proposed in the embedded mitigation measures (Section 3.8.2.5). It is acknowledged that soft start is not possible for some SBP equipment because it only has two operational modes: on or off. The modelling here assumes the employment of such equipment so that a realistic worst-case is presented in terms of potential injury ranges.

Two criteria define the standard duration of a soft start:

a. From the start of the soft-start until full operational power: minimum of 20 minutes; and

b. From the start of the soft-start until the start of the survey line: maximum of 40 minutes.

For the purposes of the underwater noise modelling which has been undertaken to carry out this assessment, the worst-case scenario has been assumed to include a minimum soft-start duration of 20 minutes

Regardless of duration, power should be built up gradually, in uniform stages from a low energy start-up. A 10 dB reduction from the full operational power is generally acceptable and has been modelled here as a worst-case.

Impact ranges from noise sources which are strictly behavioural in nature (i.e. disturbance) are covered in Section 8.9.1.2.

Table 8.12 Noise modelling results for injury impacts from impulsive noise sources (N/E = no exceedance of thresholds)

Activity[12]	Frequency (kHz)	Peak SPL (dB re 1µPa)	Depth (m)[13]	Weighted Cumulative SEL (Static Mammals)				Weighted Cumulative SEL (Moving Mammals)				Unweighted Peak SPL			
				VHF	HF	LF	PW	VHF	HF	LF	PW	VHF	HF	LF	PW
UHRS - Boomer (Including soft-start procedures)	0.7	220	15	N/E	N/E	6 m	N/E	9 m	N/E	1 m	N/E	4 m	N/E	N/E	1 m
	10		64	31 m	30 m	29 m	30 m	30 m	30 m	30 m	30 m	3 m	N/E	N/E	N/E
UHRS - Sparker (Including soft-start procedures)	0.2	245	15	4 m	N/E	9 m	8 m	N/E	N/E	9 m	5 m	79 m	3 m	10 m	11 m
	10		64	30 m	30 m	30 m	30 m	30 m	21 m	30 m	25 m	53 m	2 m	8 m	9 m
USBL	21	206	15	9 m	2 m	N/E	N/E	9 m	N/E	N/E	N/E	2 m	N/E	N/E	N/E
			64	30 m	4 m	N/E	2 m	25 m	1 m	N/E	1 m	3 m	N/E	N/E	N/E
SBP - Pinger	12	223	15	9 m	9 m	9 m	9 m	9 m	4 m	5 m	5 m	14 m	N/E	2 m	2 m
			64	30 m	25 m	25 m	25 m	30 m	6 m	7 m	7 m	14 m	N/E	2 m	2 m

[12] For the activities assessed below, Mitigated refers to inclusion of soft-start procedures, as specified in Section 3.

[13] These depths have been identified as representative of the nearshore and offshore depths in which surveys are likely to occur across the survey area, based on available bathymetry data.

All of the survey technologies which have been modelled have been assumed to have the potential to cause injury to marine mammals based on their respective source levels and operational frequencies (Table 8.9). As such, the assessed activities associated with the offshore SG1A Project may be potentially injurious to marine mammals without appropriate mitigations (see Section 8.8). Further assessment on the likelihood of injury to occur for specific devices is provided in Section 8.10.

Across modelling scenarios and metrics, the injury ranges were generally highest for the VHF hearing group (Table 8.9), which is represented by harbour porpoise in UK waters. Conversely, HF cetaceans (e.g. bottlenose dolphins) appeared to constitute the hearing group with the lowest potential impact ranges for both metrics when considering UHRS technologies specifically (Table 8.9). The greatest potential injury range is associated with the use of the UHRS sparker at 0.2kHz, where the Peak injury criteria for VHF cetaceans results in a 79m impact range.

Higher frequency sounds attenuate (i.e. lose power) more quickly than lower frequency sounds such that an animal would need to be much closer to the sound source for it to have the same impact. For this reason, injury ranges associated with the higher frequency equipment (i.e. the SBP and USBL) were limited to tens of metres for all species.

8.9.1.2 Potential Disturbance Ranges

Noise emissions associated with the offshore SG1A Project also have the potential to adversely affect the behaviour of cetaceans and pinnipeds in the vicinity of the noise source. As detailed in Section 8.2 and Section 8.5, disturbance impacts to cetaceans (as EPS) are relevant to any individual in Scottish inshore waters, whilst it is strictly relevant to cetacean populations in offshore waters, though this assessment has taken a precautionary approach and assessed impacts to individuals across the offshore SG1A Project area. Disturbance impacts to pinniped populations are limited to those as qualifying features of protected sites. As disturbance impacts to seals at designated haul-outs is considered terrestrial in nature, it is therefore outwith the scope of this assessment.

Significant or strong disturbance (Section 8.6; Southall *et al.*, 2007) may occur when an animal is at risk of a sustained or chronic disruption in behaviour or habitat use. An assessment of potential disturbance impacts from the SBP, USBL and UHRS activities is provided in the below. The outputs of the noise modelling assessment against the disturbance threshold (i.e. 160 dB (rms); Table 8.13) relative to the SPL_{rms} values for the survey equipment are provided in Table 8.13.

Table 8.13 Noise modelling results for disturbance impacts from impulsive noise sources across the offshore SG1A Project area

Activity	Frequency (kHz)	SPL_{rms}	Impact Radius
USBL	31	203	25 m
USBL (shallow)	31	203	20 m
UHRS - Sparker	10	242	770 m
UHRS - Sparker (shallow)	0.2	242	995 m
UHRS - Boomer	10	217	105 m
UHRS - Boomer (shallow)	0.7	217	129 m
SBP – Pinger	12	220	130 m
SBP - Pinger (shallow)	12	220	125 m

The use of geophysical survey techniques has the potential to generate a strong disturbance response in all species (as described in Section 8.7). The potential for disturbance impacts varies between activity type, however. The predicted disturbance range is much greater for the low frequency noise sources which travel further within the marine environment. The sound generated by the SBP (operating at 12 kHz) and UHRS (operating at 0.2-10 kHz) have the potential to generate disturbance impacts on the order of hundreds of metres, whilst those from the USBL (31 kHz) are expected to be limited to within 25 metres of the source (Table 8.13).

Given the distance from the Firth of Tay and Eden Estuary SAC far exceeds the expected disturbance radius of the offshore SG1A Project activities and estimates of density harbour seals across the offshore SG1A Project area are low, disturbance impacts to animals associated with this site are not assessed further. Similarly, the density of grey seals across the offshore SG1A Project area is low, although it increases slightly as it approaches the Isle of May SAC (Figure 8-2; Russell *et al.*, 2017). Whilst disturbance impacts to grey seals will be limited to waters outwith this designated site, there is potential that the proposed activities could disturb individuals associated with the site during the sensitive breeding season (i.e. September to December), given the proximity of the offshore SG1A Project to the Isle of May SAC breeding population.

8.10 Assessment of Impacts

8.10.1 Pre-Construction including Geophysical Surveys

8.10.1.1 Ultra-High Resolution Seismic (UHRS) – Boomers and Sparkers

As detailed in Section 8.9, the Sparker UHRS technology had the greatest source pressure levels of any of the equipment modelled, even when considering a soft-start ramp up of sound. The injury modelling indicated that all kinds of boomers and sparkers resulted in similar injury radii for all of the hearing groups when considering cumulative exposure for both static and moving animals. However, there was a marked difference in results when strictly considering the unweighted peak SPL metric. In this scenario, the Sparker had a maximum impact radius of 79 m for harbour porpoise in shallow (i.e. 15 m depth) waters compared to 53 m in the deepest waters within the offshore SG1A Project. This is due to refraction off the seabed generating nearly immediate cylindrical spreading of noise emissions, causing the sound pressure to travel farther along the horizontal plane of the water column more quickly.

Whilst deployment of a low frequency UHRS system (e.g. boomer or sparker) in shallow waters constitutes a worst-case scenario in terms of potential injury range which could be attributable to the survey techniques, these scenarios are highly unlikely in practice. Geophysical survey technologies generally employ higher frequency sounds in shallow waters where sound loss to absorption and transmission are much lower. As such, sound penetration below the seabed is achievable at lower powers and higher frequencies, which offer higher resolution imagery to the surveyor. Furthermore, when considering the directionality of the equipment, the impact ranges are further reduced. This is because the beam of sound generated by the equipment is directed downward towards the seabed, so the vast majority of power is contained within a roughly 40° angle from the source (the slant height of the conical noise source) to maximise penetration and the resultant imagery. Animals would need to be at the seabed and directly below the noise source to experience the full sound levels which are shown from the modelled impact ranges.

The majority of injury ranges were reduced when considering animal movement during cumulative SEL estimation. Swim speeds of the species most likely to be observed in the area have been shown to be several m/s (e.g. cruising minke whale swim speed is 3.25 m/s and harbour porpoise may swim up to 4.3 m/s) (Blix and Folkow, 1995; Otani et al., 2000). Furthermore, SNH (2016) has provided standard values for mean swimming speeds of various marine mammal species likely to occur in the offshore SG1A Project area, including harbour porpoise (1.4 m/s; Westgate et al., 1995); harbour / grey seal (1.8 m/s; Thompson, 2015); and minke whale (2.1 m/s; Williams, 2009). To offer a representative model of the predicted noise exposure ranges of marine mammals moving away from the sound source, a mean swim speed of 1.5 ms^{-1} has been used in the calculations. Considering that the surveys themselves will take place while the vessel is moving, the cumulative SELs of all equipment types are expected to be lower than the estimates from the model, based on the understanding that animals are unlikely to move with the mobile noise source at the same angle of the direction of vessel travel.

It should also be noted that the modelling scenarios are meant to define the worst-case injury ranges associated with the deployment of the offshore SG1A Project's survey equipment. The in-situ deployment of the noise-generating survey equipment will most frequently occur in waters of intermediate depths (i.e. somewhere between 15-64 m). Moreover, the frequency ranges depicted constitute the lowest and highest reasonably practicable settings for the survey activities modelled, meaning that the spread of sound in the marine environment is also likely to fall somewhere between the modelled extremes. The injury ranges anticipated to result from equipment use are thus likely to fall within the spectrum of those defined by the model outputs, thereby reducing the impact ranges associated with the low frequency survey equipment.

Due to possibility of injury to marine mammals resulting from geophysical survey activities which utilise elevated source levels, marine mammal mitigation measures specifically designed for geophysical surveys (JNCC, 2017) have been embedded into the offshore SG1A Project (Section 3.8.2.5 and Section 4). These measures include adherence to the SMWWC, with deployment of a Marine Mammal Observer (MMO) and/or Passive Acoustic Monitoring (PAM) Operator to monitor for the presence of cetaceans within a 500 m mitigation zone prior to the commencement of any surveys (JNCC, 2017; Section 4). As the potential injury radii from this survey equipment is an order of magnitude smaller than the 500m mitigation zone, the use of UHRS during the pre-construction phase of the project will not constitute a source of potential injury to any marine mammal species.

In consideration of the relevant mitigation measures, none of the modelled scenarios indicate any injury events are likely to exceed the 500 m mitigation zone. As marine mammal species would need to come within the mitigation zone, and likely follow the moving vessel or vehicles from which the survey equipment will be deployed, injury to marine mammals from survey activities will not occur when the embedded mitigation is applied. For these reasons, the UHRS survey activities are not anticipated to impair the ability of any animal to survive or reproduce, with no impact on the FCS of any species therefore impacts on marine mammals (**international value**) will be of **negligible** magnitude and this impact pathway is considered to be **minor**, **not significant**. No additional mitigation is required.

Disturbance

The number of individual cetaceans which may experience disturbance from the worst-case scenario for each activity type has been calculated in Table 8.11 below and is based on the population parameters supplied in Section 8.5 above. In these calculations, the impact range serves as a radius with which to calculate the total area of coverage for a potential disturbance event associated with each survey activity.

Table 8.14 Number of cetaceans (rounded to the nearest integer) and the maximum proportion of the population management unit (MU) for each species which may experience disturbance from impulsive survey activities, based on known population parameters and worst case estimate for each activity type[14]

Species	Estimated Density	Number of Individuals Which May Incur a Strong Disturbance			Maximum Proportion of MU Potentially Disturbed by offshore SG1A Project Activities
		UHRS – Sparker	UHRS – Boomer	SBP – Pinger	
		368.2 km^2 (62.3 km^2)	221.8 km^2 (31.2 km^2)	222.0 km^2 (31.3 km^2)	
Harbour porpoise	0.6	221	133	133	0.1%
Bottlenose dolphin[15]	0.05	3	2	2	1.5%
White-beaked dolphin	0.25	92	55	55	0.6%
Minke whale	0.04	15	9	9	0.06%

The source levels associated with the modelled geophysical survey equipment have the potential to elicit a strong behavioural response in marine mammals which could be classed as a disturbance offence to cetaceans within Scottish waters, based on the legal protections outlined in 8.2. However, none of the populations for any of the species which are known to regularly occur within the offshore SG1A Project area will incur significant impacts from disturbance in the context of their relevant biogeographic MUs (Section 8.10). It should be noted, the magnitude of impact is based on the assumption that the offshore SG1A Project will be ensonified at all times during a survey and is therefore highly conservative. In reality there will be a transient ensonified area around the equipment, and only animals within this areas will be subject to disturbance. This worst case scenario of the total area being ensonified has been used for this assessment of impacts during a geophysical survey.

Sparker technology exhibited the greatest potential disturbance radius of any equipment (i.e. 995 m), and this was greatest in shallow waters in which the lowest source frequency was modelled. The calculations of population-level impacts assumed that the entire cable corridor and its 0.5 km buffer was ensonified as a worst-case scenario to capture vessel movement (including vessel turns) across the cable corridor. In reference to the impact assessments this worst-case scenario extent has been referred to as the 'survey area'. The calculations of the number of individuals disturbed also assumed that the maximum number of individuals would overlap the offshore SG1A Project area during the geophysical surveys, based on maximum density estimates. Both of these scenarios are extremely unlikely, however, as sound will not be

[14] Area of impact has been provided for each activity type in brackets. It is calculated by adding the impact radius as a buffer to the total survey area provided in Section 8.9.1.2(i.e. 200 km^2)

[15] The area of impact relating to bottlenose dolphins has been limited to the 20 m depth contour, as this is recognised as the vertical constraint limiting the distribution of this population (Cheney *et al.*, 2013; Section 8.5). These values are provided in brackets below the primary impact ranges.

transmitted across the entire project area by a mobile vessel towing geophysical survey equipment and animals are likely to move away from the project area if there is anthropogenic activity taking place, thereby reducing the number of individuals likely to overlap project activities. Therefore, potential disturbance impacts to cetaceans will be much lower in practice.

For all of the modelled activities, these worst-case modelling assumptions still resulted in negligible levels of disturbance to all of the relevant cetacean populations. Approximately 1.5% or less of the relevant biogeographic MUs have the potential to impacted by noise-related disturbance attributable to the loudest source – the UHRS Sparker technology. The greatest disturbance impacts are associated with the UHRS - Sparker activities, where the Sparker is operating at 0.2 kHz. If this activity was taking place across the entirety of the survey area, it would potentially elicit a strong disturbance effect in 221 harbour porpoises, 3 bottlenose dolphins, 92 white-beaked dolphins and 15 minke whales (Table 8.3). Whilst this equates to insignificant proportions of each MU being potentially impacted by the project activities (Table 8.3) it still constitutes a disturbance offence against individual cetaceans under the relevant legislation for Scottish inshore waters (8.2), and as such an EPS licence will be required.

Given the transient and short-term nature of the geophysical survey and vessel activities (Section 3.8.2.4) and limited expected impacts to species populations as a whole, it is highly unlikely that any disturbance resulting from use of UHRS would negatively impact upon the FCS of any of the marine mammal species which may be present in the offshore SG1A Project area. This is on the basis that the modelled level of disturbance is both highly conservative and highly unlikely to affect the ability of any individual animal to survive or reproduce and will not have population-level impacts on any of the species considered here, including those associated with protected sites. In addition, the embedded marine mammal mitigation measures, including the commitment not to commence UHRS if marine mammals are within 500m of the survey equipment, will further reduce the potential for significant disturbance.

Given the assessment provided above, all impacts on cetaceans (**international value**) will be of **negligible** magnitude resulting in a **minor** adverse **non-significant** impact. No additional mitigation is required.

Whilst there is the potential for short-term, temporary disturbance of grey seals associated with the Isle of May SAC as a result of the offshore SG1A Project, this is not anticipated to result in any adverse impacts to the FCS of this protected population of several thousand individuals. This is due to the distance of the project from the SAC, the transient and localised nature of the potential disturbance, and the implementation of the embedded marine mammal mitigation. However, it is recognised that grey seals may be more sensitive to disturbance during their breeding period (mid October-December), and that the number of animals in the vicinity of the project may increase since they are central place foragers, and as such maintain a closer proximity to their haul-out during the breeding season to breed and provision their young. Therefore, the use of UHRS is conservatively assessed as having the potential to cause a **low** magnitude effect on the qualifying grey seal features of the Isle of May SAC (**international value**), resulting in a **moderate, significant** effect. Additional mitigation is therefore required, as detailed in Section 8.8.3.

8.10.1.2 Sub-bottom Profiler (SBP) – Pingers

Injury

As concluded in the assessment of potential impacts to marine mammal receptors to UHRS technologies, which constitutes the worst-case scenario in terms of noise-generating activity (Section 8.10.1.1), there is no potential for residual injury impacts to any marine mammal species from any of the geophysical survey equipment in consideration of the employment of the embedded mitigations provided in Section 4 and Section 8.8. Therefore, injury impacts on marine mammals (**international value**) from the use of SBP technology during the pre-construction phase will be of **negligible** magnitude and, thus, this impact pathway is considered to be **minor**, **not significant**. No additional mitigation is required.

Disturbance

Disturbance impacts to cetaceans from the deployment of the Pinger is expected to be limited to within 130 m from the sound source in the deep water environment, and 125 m nearer to shore. This is a significant reduction in the potential area which may experience noise levels exceeding the disturbance thresholds for marine mammals compared to those modelled for UHRS Sparker equipment (approximately 87% reduction from the 995 m disturbance radius for Sparkers). This equates to a worst-case potential impact of up to 1% of a relevant cetacean population across the entire survey area, which is a similar magnitude to the 1.5% which could be disturbed through the use of UHRS equipment. Considering the conservative nature of this estimate, and the implementation of embedded marine mammal mitigation for SBP (as outlined in Section 8.8.1.1), anticipated impacts on cetaceans (**international value**) will be of **negligible** magnitude resulting in a **minor** adverse **non-significant** impact. No additional mitigation is required, however an EPS licence will be necessary.

With regard to the qualifying grey seal features of the Isle of May SAC, considering the localised radius of disturbance of 130m, embedded marine mammal mitigation and the distance between the cable corridor and the SAC, it is highly unlikely that underwater noise emissions from the use of SBP will result in adverse effects to grey seals either within or outwith the breeding season. As such, the magnitude of effect is assessed as **negligible**, on a receptor of **international value**, resulting in a **minor** adverse **non-significant** impact. No additional mitigation is required.

8.10.1.3 Ultra-short Baseline (USBL)

Injury

The deployment of the USBL during the preconstruction surveys has been shown to result in an extremely limited injury range for marine mammals, even to the most sensitive species, harbour porpoise. For VHF cetaceans the worst case injury ranges are 30m considering the cumulative SEL criteria, and 3m according to the Peak criteria. For all other marine mammal hearing groups and injury criteria, the impact ranges are <5m.

As such, the worst case scenario for injury (i.e. an animal remaining static around the sound source) would be reliant on an animal following that noise source such that it remained within close proximity to it throughout and extended period in order for the cumulative exposure level to be exceeded. The deployment of USBL in 64 m depths gave the greatest potential injury radius, which was 30 m for static (i.e. respective to the equipment) harbour porpoise using the cumulative SEL metric. The likelihood of any animal remaining this close to operational equipment is extremely low when considering that the source is deployed from a moving vessel and, in some cases, is being towed at depth (e.g. a USBL may be mounted on an ROV within a few metres of the seabed). Such an interaction is unlikely over an extended period, since the animal would need to surface to breath, dive to forage and for harbour porpoise; made further unlikely considering their tendency to avoid vessels, converse to other delphinids which are more likely to approach and interact with vessels (i.e. through bow riding and slipstreaming; Roberts et al., 2019.

In consideration of the peak injury criteria, harbour porpoise would have to be within 3m of the USBL device when it was activated in order for a risk of injury to exist, which is not a realistic risk. Peak injury criteria for other hearing groups were not exceeded.

For the above reasons, there is no realistic scenario in which the risk of injury to marine mammals from the use of USBL would occur during the pre-construction surveys of the SG1A. Therefore, no marine mammal mitigation is required for the use of USBL.

As such, the magnitude of effect resulting from the potential for injury of any marine mammal receptor (**international value**) associated with the use of USBL is **negligible**. Accordingly, injury impacts from USBL deployment are found to be **minor**, **not significant.**

Disturbance

As detailed in Table 8.12, the estimated disturbance range associated with the use USBL is <30m from the sound source. Such a limited zone of disturbance does not have the potential to adversely affect any marine mammal species. As such, the magnitude of effect resulting from the disturbance of marine mammal receptor (**international value**) associated with the use of USBL is **negligible**. Accordingly, disturbance impacts from USBL deployment are found to be **minor**, **not significant.**

8.10.2 Construction, Operation and Decommissioning

Geophysical survey equipment will be utilised during the construction phase in order to monitor the cable lay and protection works. The devices used will be similar to those detailed for the preconstruction surveys, however UHRS boomers and sparkers will not be required. USBL will also be utilised to monitor the position of subsea equipment (including trenchers and ROVs) during the cable installation.

During the operational phase, routine geophysical surveys will be conducted periodically throughout the lifetime of the asset in order to monitor its condition. Survey equipment may include MBES, SSS, SBP and USBL, but the use of UHRS is not anticipated.

8.10.2.1 Sub-bottom Profiler (SBP) – Pingers

Pingers may be deployed at any point in time during the construction, operation and decommissioning phases to assist with cable installation, maintenance and repairs. In all such instances, it is likely that the

SBP equipment would be used to survey a much smaller area than during the pre-construction surveys. Furthermore, ad hoc survey periods will be reduced relative to the estimated 4-week duration characterising the pre-construction (seabed preparation) period, as will the planned 1-week post-lay cable survey. For this reason, the findings of the assessment of Pinger impacts during the pre-construction phase (Section 8.10.1.1) form a worst-case for the offshore SG1A project. It is therefore concluded that no injury marine mammal risk is associated with the deployment of SBP during the construction, operation and decommissioning phases, following the embedded mitigations described in Section 4 and Section 8.8, while disturbance to marine mammals is expected to be extremely localised and transient.

As such, the magnitude of effect resulting from the disturbance of marine mammal receptor (**international value**) associated with the use of SBP is **negligible**. Accordingly, injury and disturbance impacts from the use of SBP during the construction, operation and decommissioning phases are found to be **minor**, **not significant**, and no additional mitigation is necessary. It recognised that while minor and localised, the potential for disturbance of cetaceans, means an EPS licence may be required.

8.10.2.2 Ultra-short Baseline (USBL)

As detailed in Section 8.9.1.1 and Section 8.9.1.2, the deployment of the USBL during the preconstruction surveys results in small injury and disturbance radii for all species under consideration. The injury and disturbance radii are understood to remain the same for USBL deployment during the construction, operation and decommissioning phases of the project.

It is recognised that equipment operating USBL during construction, operation and decommissioning activities are likely to be slower moving and may be station for longer period compared to the pre-construction survey activities. However, as detailed in section 8.8.1.3, the worst-case scenario of a harbour porpoise maintaining its position adjacent a USBL device for an extended period remains unrealistic. This is due to biological constraints (i.e. the need to breathe, feed and move to thermoregulate) and behavioural characteristics (i.e. evasive behaviour around vessels) exhibited by harbour porpoise (Roberts et al., 2019).

For the above reasons, there is no realistic scenario in which the risk of injury or disturbance from the use of USBL during any of the construction, operation or decommissioning phases of the offshore SG1A project would result in material adverse effects to marine mammals. As such, the magnitude and significance of impacts associated with the use of USBL is **negligible** adverse, and no marine mammal mitigation is proposed for USBL operations. Consequently, impacts on all marine mammal receptors (**international value**) from the use USBL during the construction, operation, and decommissioning are assessed as **minor**, **not significant.**

8.10.3 Additional Mitigation

As there remains the possibility that a small number of cetaceans may experience some level of disturbance for the short period that they encounter the proposed survey activities, an EPS Licence will be obtained for the disturbance of EPS potentially resulting from the proposed geophysical survey activities.

Although the radius of disturbance does not overlap with any designated sites for the protection of marine mammals, the use of UHRS sparkers occurring in close proximity to the Isle of May SAC (i.e. within 1 km) has the potential to disturb animals during breeding season, as detailed in Section 8.8.1.1. Therefore, where practical and applicable, the use of UHRS sparkers in close proximity to the Isle of May SAC will be minimised insofar as possible during the grey seal breeding period.

Implementation of these additional mitigation measures will result in all residual effects to all marine mammal receptors (**international value**) being assessed as having a **negligible** magnitude, resulting in a **minor, non-significant** residual impact on marine mammal receptors for all phases of the offshore SG1A Project.

8.10.4 Impact summary

Table 8.15 Potential environmental impacts and mitigations for marine mammal receptors

Impact	Description of Impact	Sensitivity/Value of receptor	Magnitude	Impact Significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Construction (including pre-construction surveys)								
Geophysical surveys using UHRS	Injury - impair the ability of any animal to survive or reproduce.	International	Negligible	Minor	No additional mitigation beyond embedded mitigation	Negligible	Minor	Not significant
	Disturbance of up to 1.5% of any cetacean population.	International	Negligible	Minor	An EPS Licence to disturb cetaceans will be obtained.	Negligible	Minor	Not significant
	Disturbance of breeding seals associated with the Isle of May SAC	International	Low	Moderate	Surveys will be managed, where possible, such that activities in close proximity to the SAC are limited during the breeding season (September through December).	Negligible	Minor	Not significant

Geophysical surveys using SBP	Injury - impair the ability of any animal to survive or reproduce.	**International**	**Negligible**	**Minor**	No additional mitigation beyond embedded mitigation.	**Negligible**	**Minor**	**Not significant**
	Disturbance of up to 1% of any cetacean population.	**International**	**Negligible**	**Minor**	An EPS Licence to disturb cetaceans will be obtained.	**Negligible**	**Minor**	**Not significant**
	Disturbance of breeding seals associated with the Isle of May SAC	**International**	**Negligible**	**Minor**	No additional mitigation required beyond embedded mitigation.	**Negligible**	**Minor**	**Not significant**
USBL	Injury or disturbance of all marine mammal receptors.	**International**	**Negligible**	**Minor**	No marine mammal mitigation required.	**Negligible**	**Minor**	**Not significant**
Operation, Maintenance and Decommissioning								
Geophysical surveys using SBP	Injury or disturbance of all marine mammal receptors.	**International**	**Negligible**	**Minor**	No additional mitigation required beyond embedded mitigation. An EPS Licence to disturb cetaceans will be obtained.	**Negligible**	**Minor**	**Not significant**
USBL	Injury or disturbance of all marine mammal receptors.	**International**	**Negligible**	**Minor**	No marine mammal mitigation required.	**Negligible**	**Minor**	**Not significant**

8.11 Cumulative Impacts

The relative position of the offshore SG1A Project export cable corridor may give rise to the potential for cumulative interactions with other developments which may generate underwater noise. The following projects have been considered in this cumulative impact assessment:

- Neart na Gaoithe OWF;
- Inch Cape OWF; and
- Berwick Bank and Marr Bank OWFs.

As the construction works for the Berwick Bank and Marr Bank projects are not anticipated to overlap with the offshore SG1A Project, there are not expected to be any cumulative impacts associated with these offshore wind farms.

Due to the location of Neart na Gaoithe and Inch Cape within the potential radius for disturbance for marine mammals, noise generating activities taking place on these projects have the potential to overlap with the noise-generating survey activities taking place within the offshore SG1A Project export cable corridor. In particular, if the construction period for these projects overlaps with the survey activities of the offshore SG1A Project, this could lead to increased ambient noise levels where such activities are in close proximity. However, any such overlap will be highly temporary, as the offshore SG1A Project's survey vessel will be transient and the radius of impacts from the offshore SG1A Project activities are highly localised. Moreover, all temporary impacts from the offshore SG1A Project are considered fully recoverable and will not adversely impact any protected sites or species.

As underwater noise generating activities at other sites will also be working within the bounds of the Habitats Regulations, including ensuring the mitigation of injury and minimisation of disturbance to marine mammals, there will not be any important impacts generated by activities taking place in combination with other projects. For this reason, it is considered highly unlikely that the installation, operation or decommissioning of the offshore SG1A Project presents any potential for significant cumulative impacts on marine mammal receptors therefore cumulative impacts will be **minor adverse**.

8.12 Conclusion

As presented in Section 3.8.2.5 , Section 8.10 and considering the embedded mitigation incorporating MMO and PAM protocols for geophysical equipment with the potential to injure marine mammals (i.e. SBP and UHRS technologies), there is limited potential for impacts to marine mammals from the proposed project. There will be no injurious impacts (**non-significant**) to any marine mammals, either as part of a designated site or a managed population, as a result of the offshore SG1A Project activities once the proposed mitigation measures are applied (Section 4, Section 8.8 and Section 8.10.3). However, there remains the residual **non-significant** impact for the geophysical survey activities to result in disturbance of cetaceans, which while not being defined as significant in EIA terms, does have the potential to result in a disturbance offence under the Conservation (Natural Habitats, &C.) Regulations 1994 (as amended). Where there is a possibility of disturbing an individual cetacean, it is necessary to apply for an EPS Licence in Scottish Territorial Waters to ensure that such an offence is not committed. It is important to note that any such disturbance is expected to be limited to one or a few individuals and will therefore not result in any adverse impact to the FCS of any cetacean species or species population.

Similarly, there is potential for the use of UHRS sparkers to result in disturbance of grey seals which intersect the offshore SG1A Project area whilst occupying the Isle of May SAC during the breeding season. As such, it is proposed that the use of UHRS sparkers in close proximity to this site during the grey seal breeding period are minimised insofar as possible. In this way, impacts to the protected features of this site will be reduced to **minor, non-significant.**

9. Commercial Fisheries

9.1 Introduction

This section presents the commercial fisheries EIA of the offshore SG1A Project. The potential impacts on commercial fisheries receptors are identified and subject to a detailed impact assessment. Where required, mitigation is proposed, potential cumulative impacts are considered, and the residual impacts and their significance are assessed.

9.2 Legislation and Policy Context

The following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on to commercial fisheries:

9.2.1 Fisheries Legislation and Policy

As of January 2021, the UK left the European Union (EU), and as such the EU regulations and policy which apply to EU member states are no longer applicable in UK waters (within 200nm of the coast). A number of EU regulations and policies have been retained, termed 'retained EU law'.

The reformed Common Fisheries Policy (EC, 2014) is no longer applicable to UK waters, including Scottish waters (out to 200nm from the Scotland mainland). The UK is now a sovereign independent coastal state with the right to manage the resources in its waters. As an independent coastal state, the UK government is responsible for managing the UK's territorial waters (out to 12 nautical miles) and the Exclusive Economic Zone (out to 200 nautical miles or the median line with other states). Following the departure of the EU the UK has the ability to change the access of non-UK fishing vessels to UK waters.

Marine Scotland manages the licencing, compliance, management and regulations for commercial fishing vessels operating in Scottish waters. This includes the management of inshore fisheries active within 12nm of the coast.

9.2.2 Quota allocation in Scotland

Fish quotas are the amounts of fish of different species that may be legally landed by the UK as a Coastal State. The UK Government is the allocating authority for UK fish quotas. The UK Government apportions UK fish quotas amongst the four UK Fisheries Administrations (i.e. Scotland, England, Wales and Northern Ireland) pro-rata to the Fixed Quota Allocation (FQA) units associated with the licences administered by each Administration. After receiving quota from the UK, Scottish Government allocates quota to fishermen licenced in Scotland according to the FQA method. The Scottish Government (Marine Scotland) issues most of its allocations to Fish Producer Organisations (POs), of which there are 10 administered directly by Marine Scotland. POs are quota management and marketing organisations made up of member fishing vessels.

Marine Scotland monitor uptake and 'close' fisheries (i.e. prohibit further landings of defined species through the varying of fishing licences) when POs have taken their allocation.

The landings of vessels that are not PO members (known as the "non-sector" in the case of over 10 metre vessels, and the "10 metre and under" fleet) are managed directly by the Scottish Government. Vessels in these groups fish against catch limits set by the Government, which may be monthly or quarterly. These limits are enforced within the respected fishing licences.

9.2.3 Guidance:

The following guidance and legislation will be taken into consideration as part of the assessment of potential impacts on to commercial fisheries

- Best practice guidance for fishing industry financial and economic impact assessments (UK Fisheries Economics Network (UKFEN), 2012);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010);
- Fishing and Submarine Cables - Working Together (International Cable Protection Committee (ICPC), 2009);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014); and
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015).

9.3 Consultation

The offshore SG1A Project has carried out extensive consultation. This included a particular emphasis on ensuring commercial fisheries stakeholders were consulted on the offshore SG1A Project. The key commercial fisheries stakeholder comments to the offshore SG1A Screening Report, and where they are addressed in this EIAR, are provided in Section 5. In light of the COVID-19 pandemic, all consultation was carried out by email, phone and teleconference. A summary of the commercial fisheries consultation which was carried out is provided in Table 9.1.

Table 9.1 Commercial Fisheries Stakeholder Consultation

Consultee	Method of communication
SFF	Email, teleconference, offshore SG1A Screening Report consultation comments

North and East Coast Inshore Fisheries Group	Email, teleconference, offshore SG1A Screening Report consultation comments
Pittenweem FMA	Email, telephone, teleconference, offshore SG1A Screening Report consultation comments
Scottish White Fish Producers Association	
Cockenzie and Port Seton Fisheries Association	Email, telephone
Dunbar Fishermen's Association	Email, telephone
North Berwick Fishermen's Association	Email, telephone
Montrose and Arbroath Static Gear Association	Email, telephone
St Andrews Inshore Fishermen's Association	Email, teleconference
Under 10m Association	Email, teleconference
Communities Inshore Fisheries Alliance	Email
Fishing vessel operator 1 (Arbroath)	Email, telephone
Fishing vessel operator 2 (Port Seton)	Email
Fishing vessel operator 3 (Port Seton)	Telephone
Fishing vessel operator 4 (Port Seton)	Telephone
Fishing vessel operator 5 (Pittenweem trawler)	Telephone
Fishing vessel operator 6 (Burnmouth/Eyemouth)	Email, telephone
District Fishery Offices (Anstruther, Eyemouth and Aberdeen)	Email
The Forth and Tay Commercial Fisheries Working Group (CFWG)	Email
Distribution list fishing vessel operators and representatives from Eyemouth, Dunbar, Burnmouth, North Berwick, Port Seton, Pittenweem, Arbroath	Email

9.4 Data Sources

A variety of publicly available desk-based data sources have been used to inform the commercial fisheries baseline. In addition, where applicable reference was made to the existing EIAs which have been produced in the Forth and Tay region (Inch Cape, 2011; 2018; Seagreen 2012; 2018; Neart Na Goithe, 2012) along with the Berwick Bank OWF Scoping Report (Berwick Bank, 2020).

The key data sources used to inform the commercial fisheries section include:

- Fisheries statistics per ICES Rectangle (Marine Management Organisation (MMO), 2019);
- Average intensity (effort) of fishing for Nephrops and crustaceans with bottom trawls (ICES/Marine Scotland, 2020);
- Average intensity (effort) of fishing with bottom trawls (ICES/Marine Scotland, 2020);
- Average intensity (effort) of fishing for with dredges (ICES/Marine Scotland, 2020);
- Data collected during consultation with commercial fisheries stakeholders;
- SWFPA member gear locations; and
- Automatic Information System (AIS) data of commercial fishing vessel tracks.

9.5 Environmental Baseline

The offshore SG1A Project is located in ICES Division IVb (Central North Sea). ICES rectangles provide a standardised spatial scale by which commercial fishing activity is monitored. ICES rectangles have therefore been used to delineate the commercial fisheries study area of ICES rectangles 40E7, 41E7, 41E8, 42E7 and 42E8 (Figure 9-1). Where relevant, commercial fishing activity from outside of the defined study area have been referred to for context.

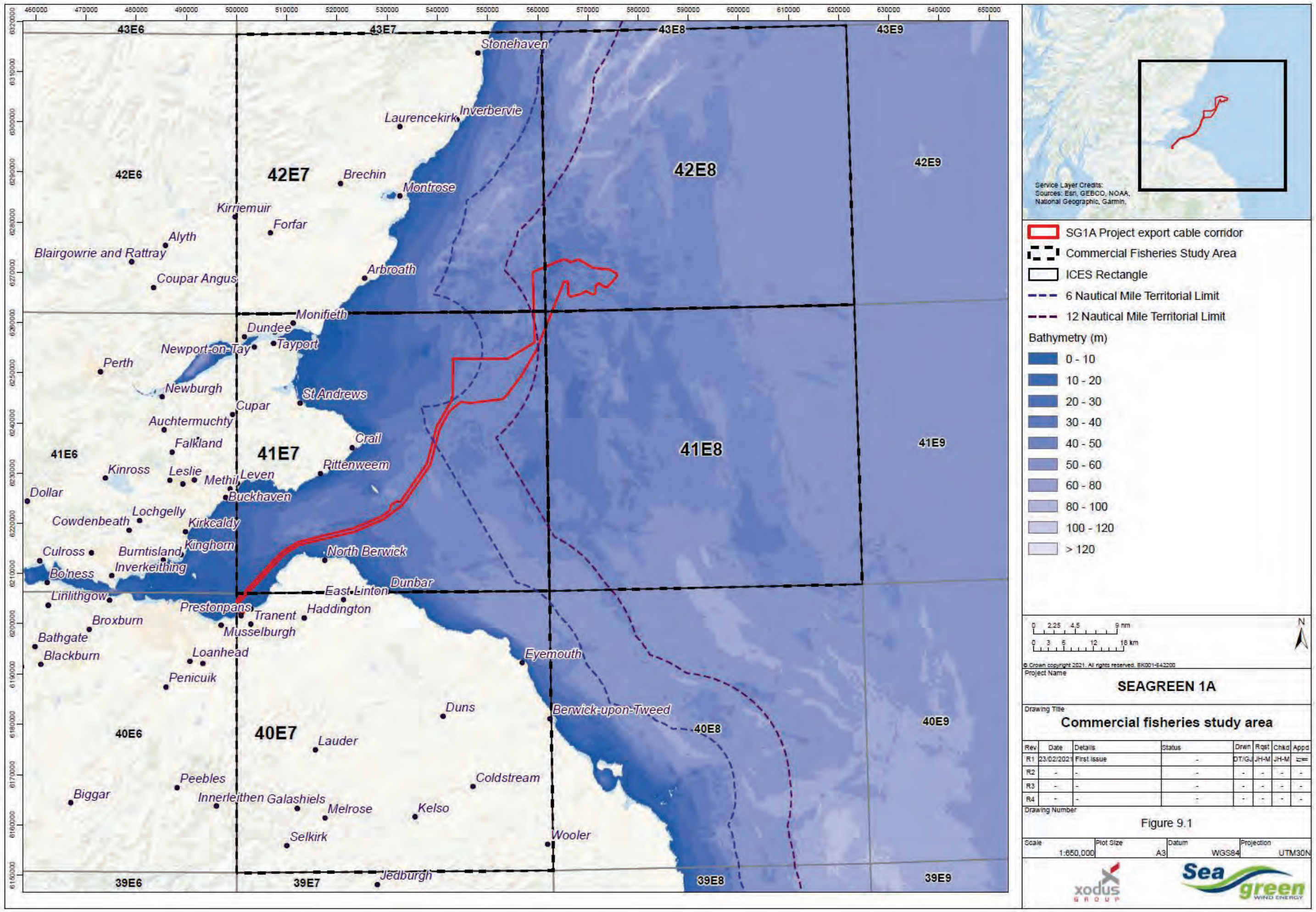

Figure 9-1 Commercial fisheries study area

Landings values from 2014 to 2018 per ICES rectangle have been used to calculate the annual average by vessel length, fishing method and species (Figure 9-2 to Figure 9-4). In the study area, overall average landings values are higher in ICES 41E7 compared with the surrounding ICES rectangles.

Average landings values by vessel length (< 10m and >10m in length) show that vessels of over 10m comprise the majority of landings values from ICES 41E7 (Figure 9-2) Proportionately more landings values from vessels of over 10m are recorded in the offshore ICES rectangles 40E8, 41E8, 42E8; (Figure 9-2), than those nearshore. As shown in Figure 9-3, the fishing method which comprises the majority of average landings values from ICES rectangle 41E7 is demersal trawls (average £5,093,438), followed by pots/traps and dredging at comparatively low values. The average value of demersal trawls from ICES 41E7 accounts for almost all of the average landings value of *Nephrops* from ICES 41E7 (average £5,112,492). Further analysis of the landings values by fishing method and vessel length illustrate that the majority (80.9%) of the landings values by demersal trawl from ICES 41E7 are from vessels of over 10m in length (MMO, 2020). Figure 9-3 indicates that average landings values are similar between ICES rectangles of vessels operating pots/traps from ICES 41E7, 40E8 and 42E7, with pots/traps comprising the majority of landings values recorded from 42E7 where the north western boundary line of the offshore SG1A Project is located. As shown in Figure 9-3, in ICES 42E8 where the north eastern offshore section of the offshore SG1A Project is located, most average landings values are recorded by dredging vessels which target scallops, at comparatively lower values than the prominent fishing methods operated in surrounding ICES rectangles.

As noted above and shown in Figure 9-4, landings values by species indicate that *Nephrops* comprise the highest proportion of average landings values in ICES 40E7 and 41E7. Demersal trawlers also record comparably lower landings values of squid, primarily from ICES 42E7 and 42E8. Lobsters and to a lesser extent crab which are targeted by vessels operating static fishing gear, comprise the majority of landings values from ICES 40E8 and 42E7 (average £1,986,283 in 40E8 and £2,184,989 in 42E7). Scallops are recorded in the landings values at low levels in ICES 40E8, 41E7, 41E8 and 42E7, and comprise higher proportionate average value of landings from ICES 42E8 (average £1,738,641). Razor clams are also landed to a lesser degree from ICES 41E7, 42E7 and 40E7. Other species which are landed from the study area include demersal fish species such as haddock, monkfish and plaice and pelagic species such as mackerel and herring (MMO, 2020).

Average fishing intensity (effort) for three mobile fishing methods has been presented in Figure 9-5 to Figure 9-7. In relation to activity by fishing vessels operating demersal trawls which target *Nephrops*, in accordance with the landings values detailed above, there is an area of high intensity activity in ICES 41E7, especially within the 6 nm territorial limit of Scotland. This activity corresponds with the existing seabed characterisation (Sections 7.5) which shows muddy sediment types, favoured by *Nephrops* as predominant habitat, in this area. Figure 9-6 shows the average fishing intensity (2009-2016) by vessels operating scallop dredges and indicates that there are areas of moderate scallop dredging activity in the north eastern proportion of the offshore SG1A Project, which overlaps with ICES 41E7, 42E7 and 42E8. Most vessels operating scallop dredges in the study area are over 15 m in length, and many are nomadic, meaning they operate across the North Sea including intensively in the English Channel, to opportunistically fish in a pattern which corresponds to the cyclical and fluctuating nature of scallop density in a location over time.

Scottish White Fish Producers Association (SWFPA) static fishing gear locations have been plotted between December 2019 – June 2020 (Figure 9-8) and July 2020 – February 2021 (Figure 9-9). SWFPA vessel fishing locations are predominantly concentrated towards the Seagreen OWF, with minimal activity along the offshore SG1A Project export cable corridor within 6 nm of the coast and the inner Firth of Forth.

AIS data was collected from the last year (December 2019 to December 2020) and has been filtered by speed (1.5 – 4 knots) to represent fishing activity in the offshore SG1A Project study area. The AIS tracks show the same distribution of activity as the VMS effort data (Figure 9-6 and Figure 9-7), indicating *Nephrops* trawling is most intensive within 6 nm of the coast, and scallop dredging is for the most part focused further offshore in ICES 42E8 (Figure 9-10 and Figure 9-11).

Georeferenced photographs of plotters from onboard *Nephrops* vessels which work out of Pittenweem indicate a similar distribution of activity by this fleet, focussed on muddy substrates within 6 nm of the coast (Figure 9-12).

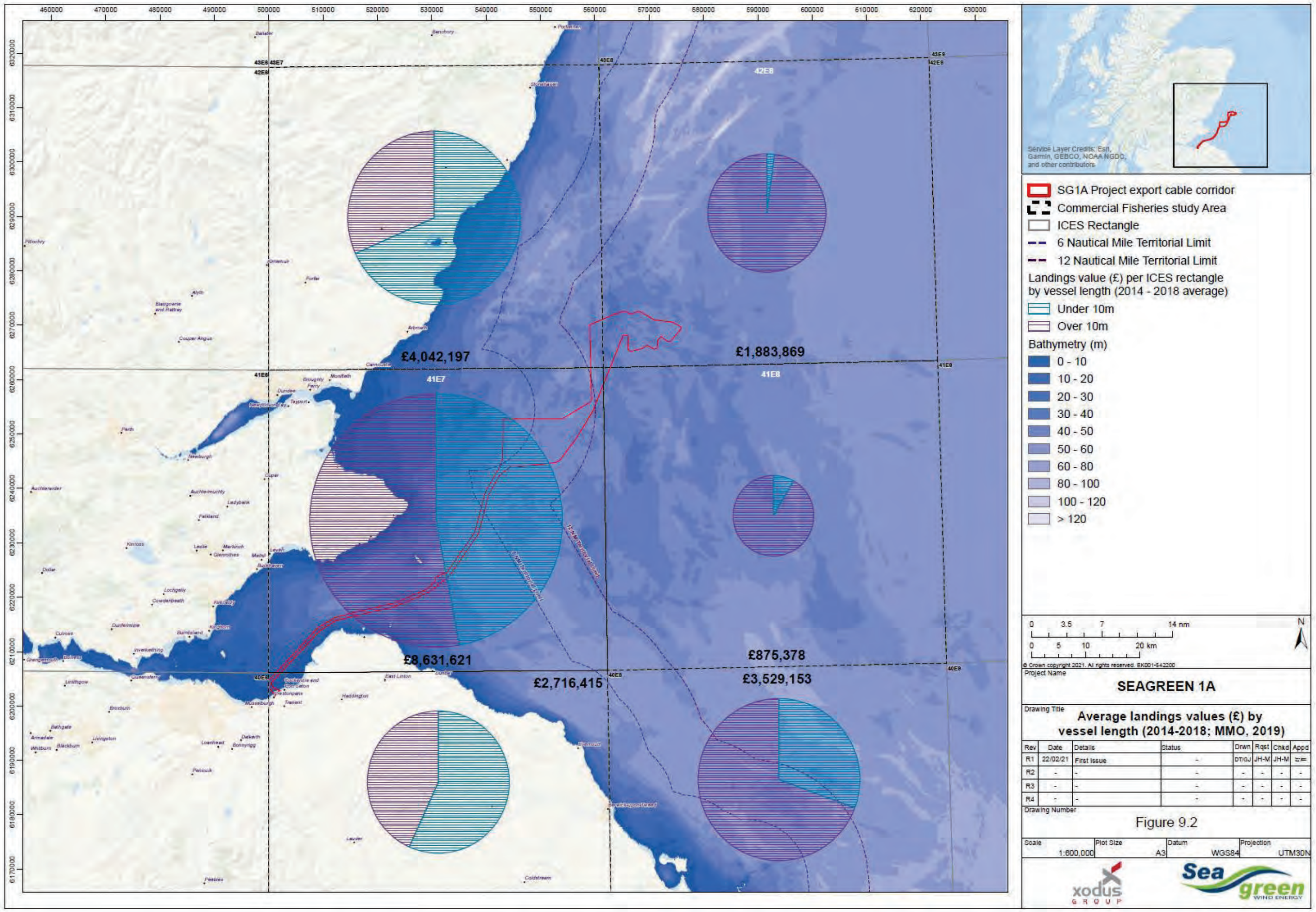

Figure 9-2 Average landings values (£) by vessel length per ICES rectangle (2014-2018; MMO, 2019)

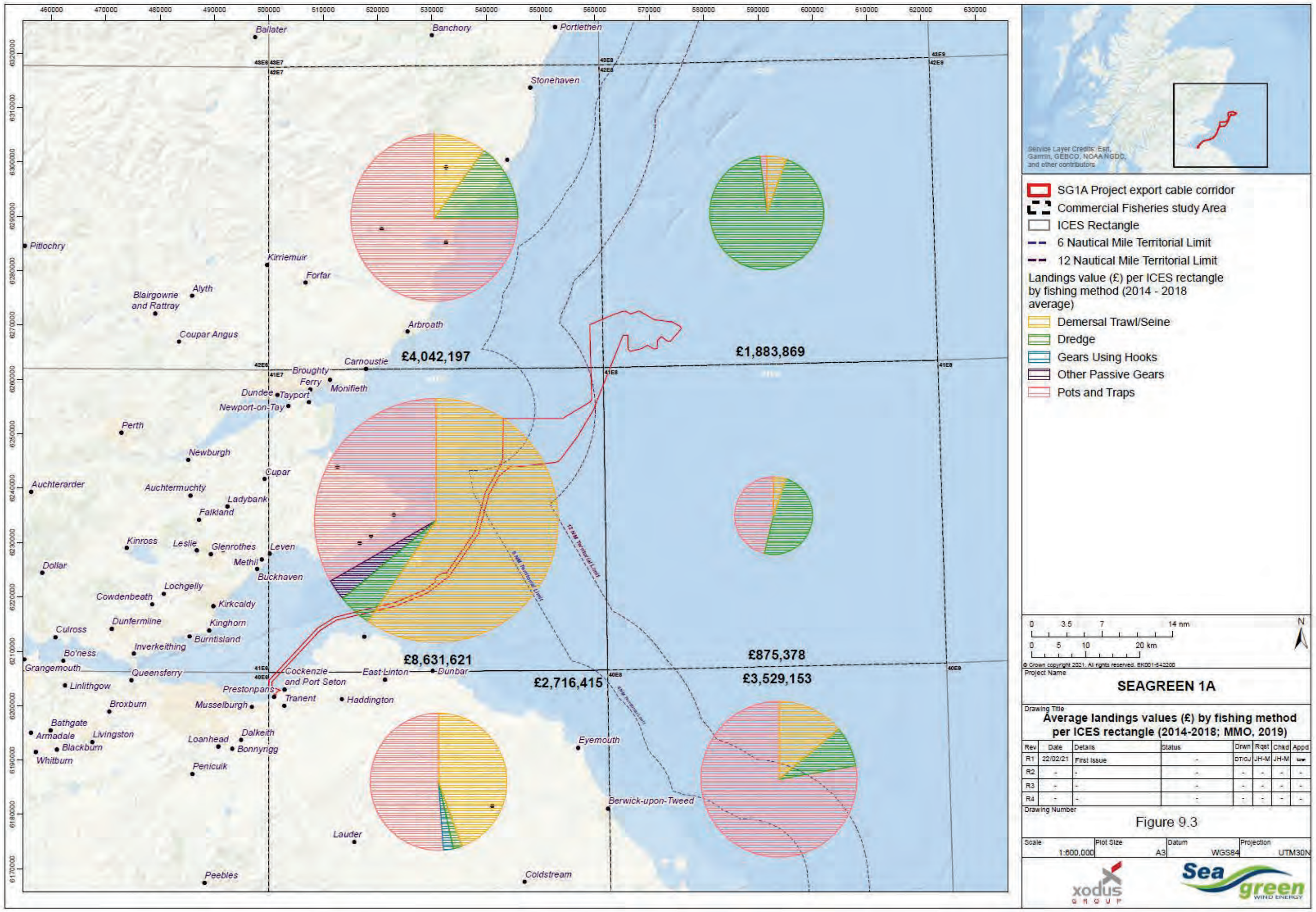

Figure 9-3 Average landings values (£) by fishing method per ICES rectangle (2014-2018; MMO, 2019)

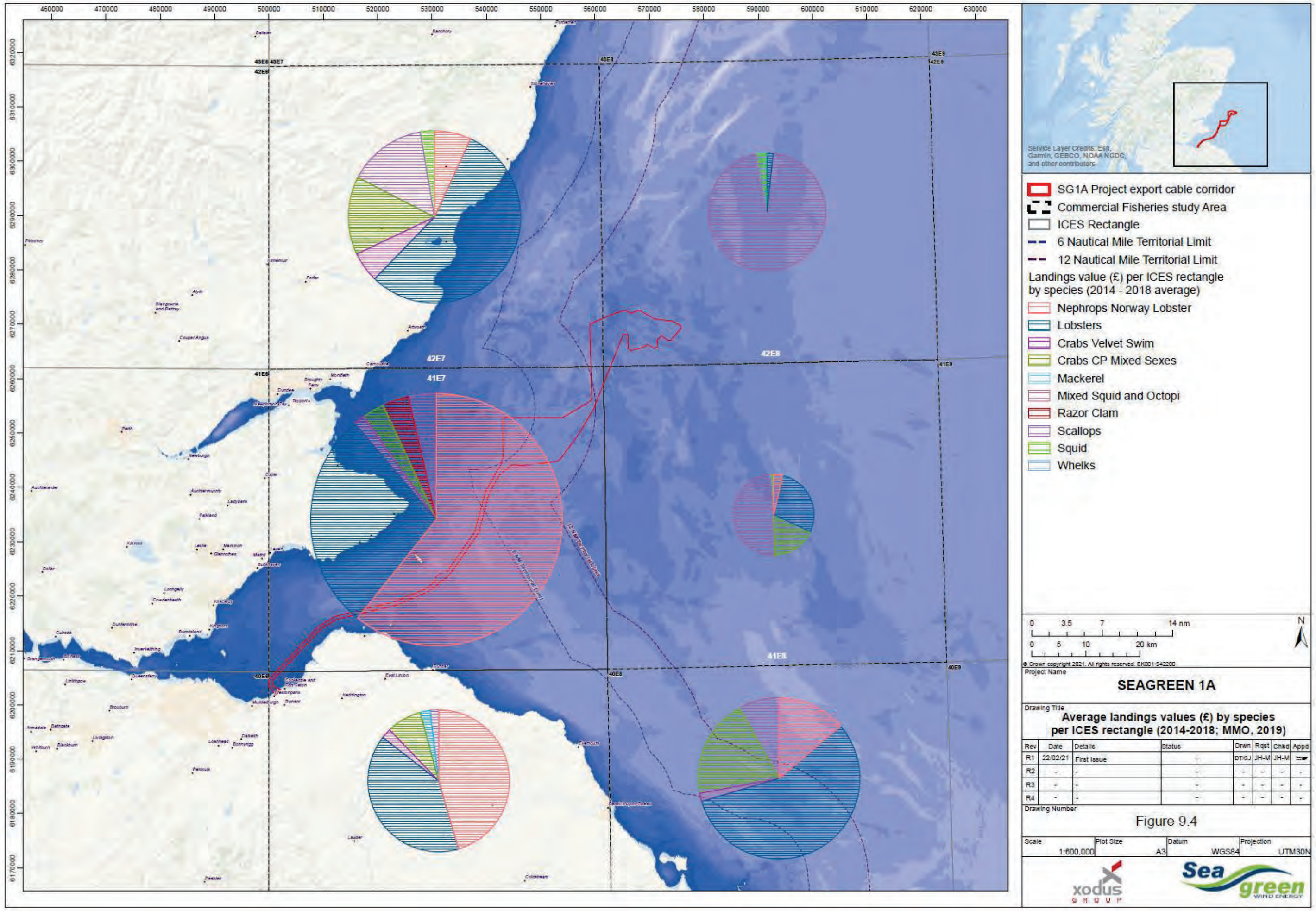

Figure 9-4 Average landings values (£) by species per ICES rectangle (2014-2018; MMO, 2019)

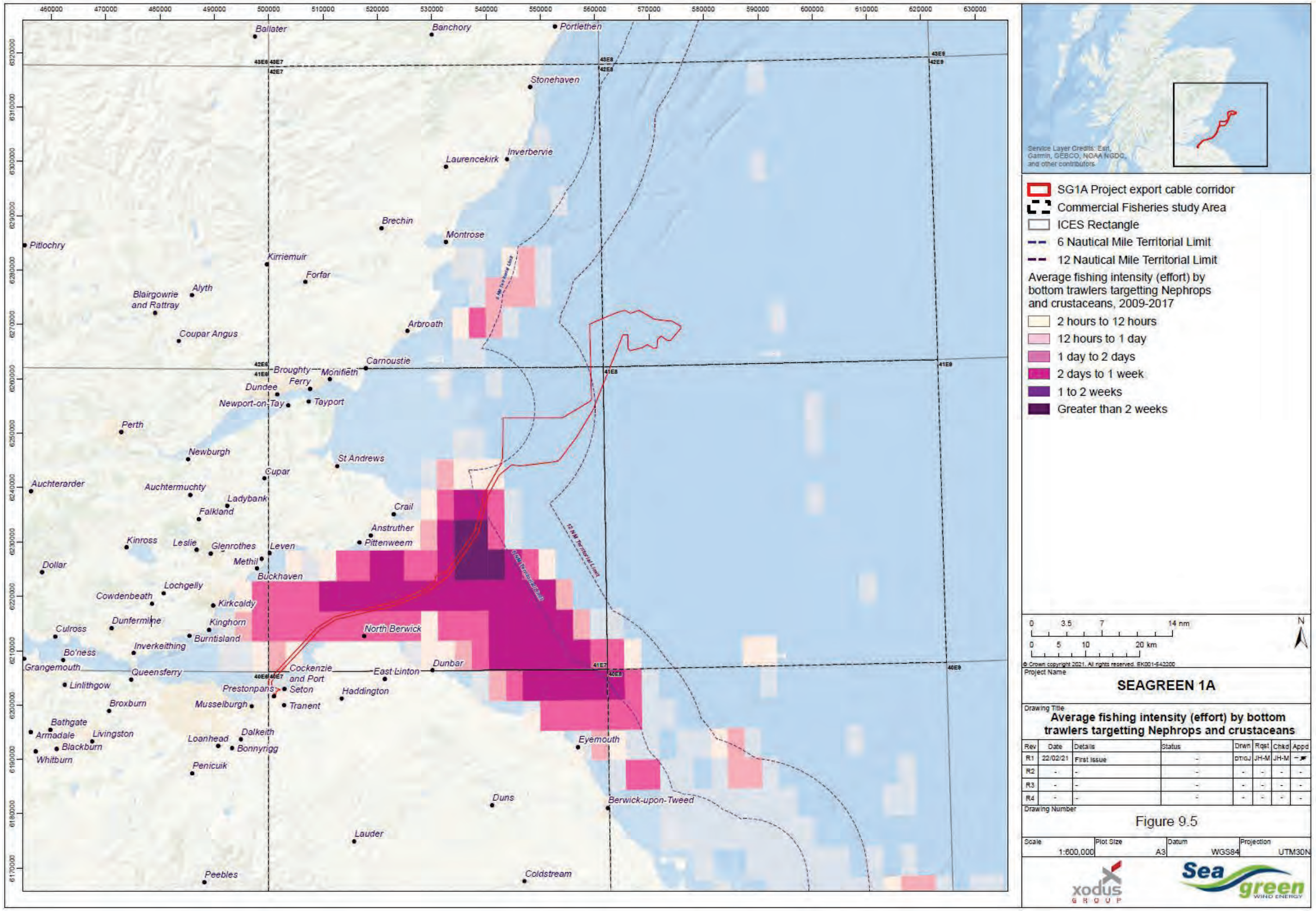

Figure 9-5 Average fishing intensity (effort) by bottom trawlers targeting Nephrops and crustaceans (Marine Scotland, 2020)

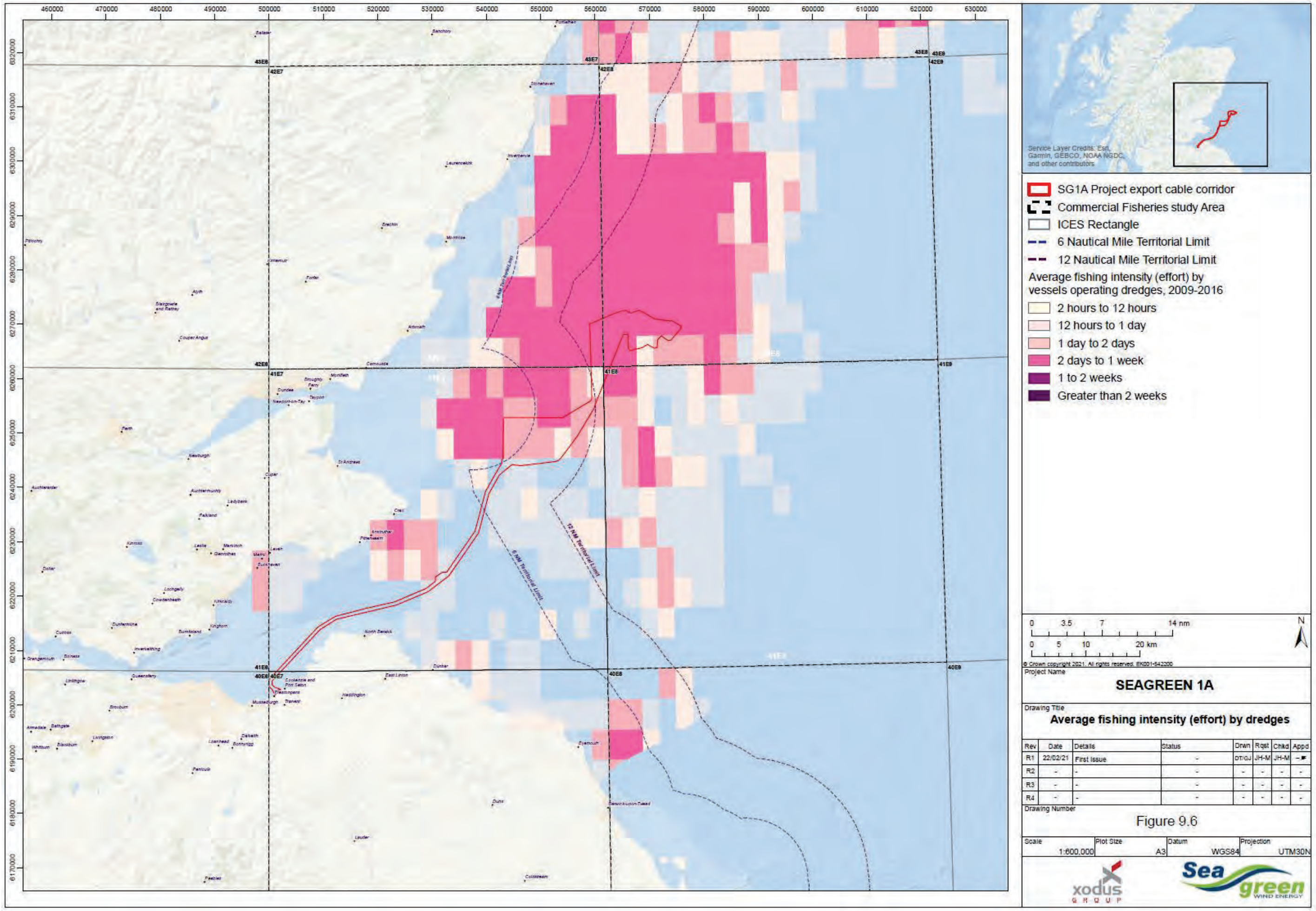

Figure 9-6 Average fishing intensity (effort) by dredges (Marine Scotland, 2020)

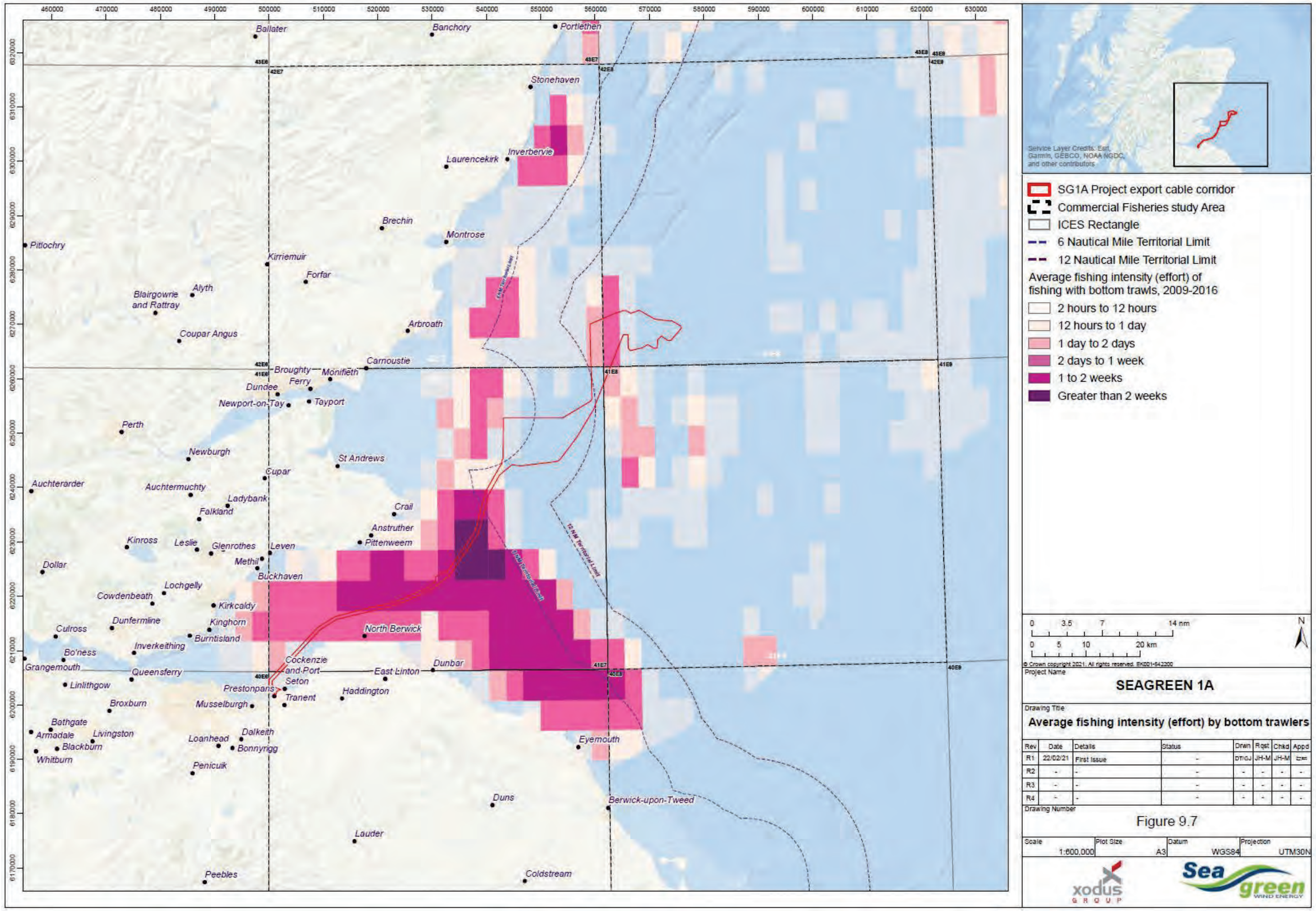

Figure 9-7 Average fishing intensity (effort) by bottom trawlers (Marine Scotland, 2020)

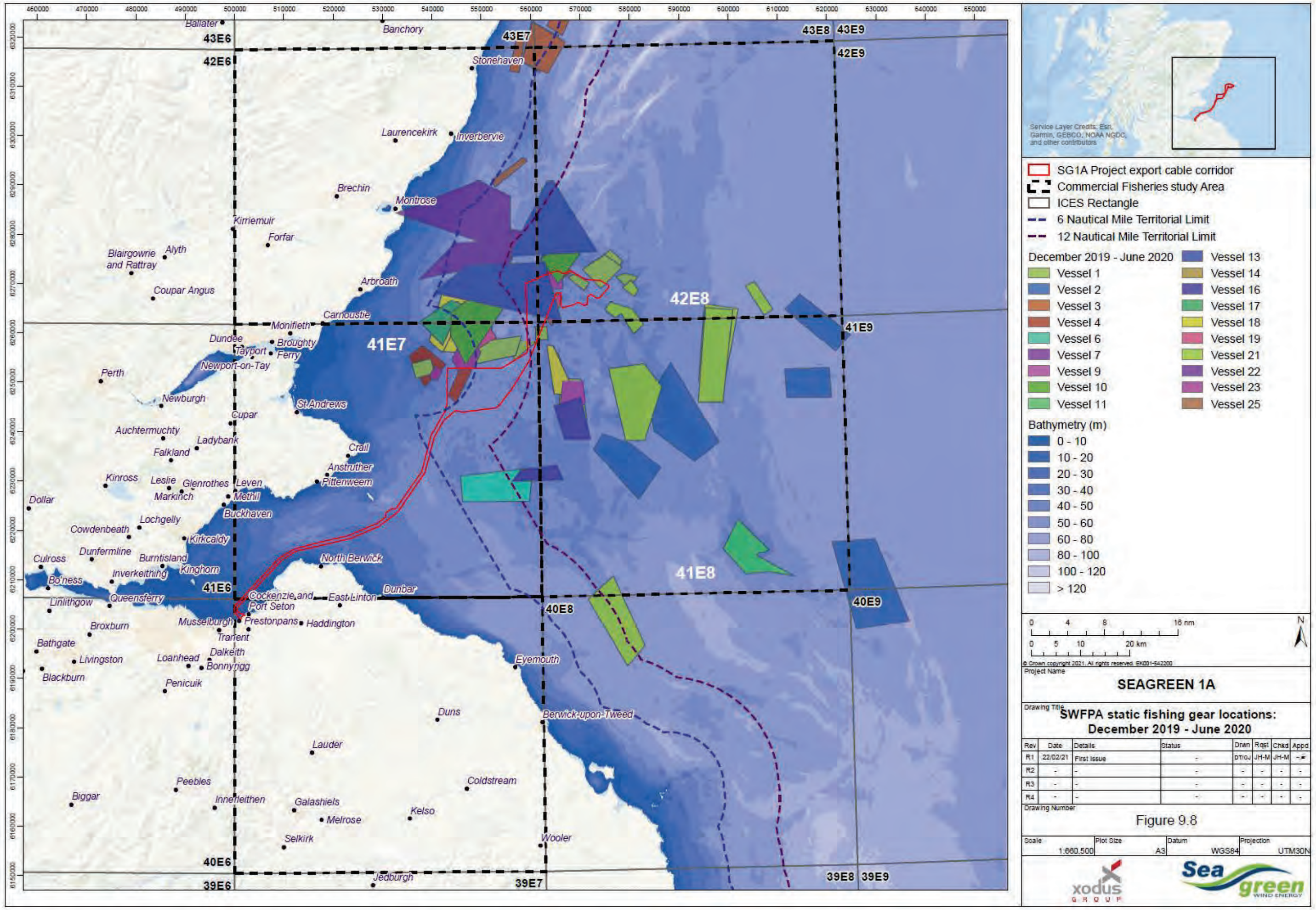

Figure 9-8 SWFPA static fishing gear locations: December 2019 - June 2020 (Source, SWFPA, 2021)

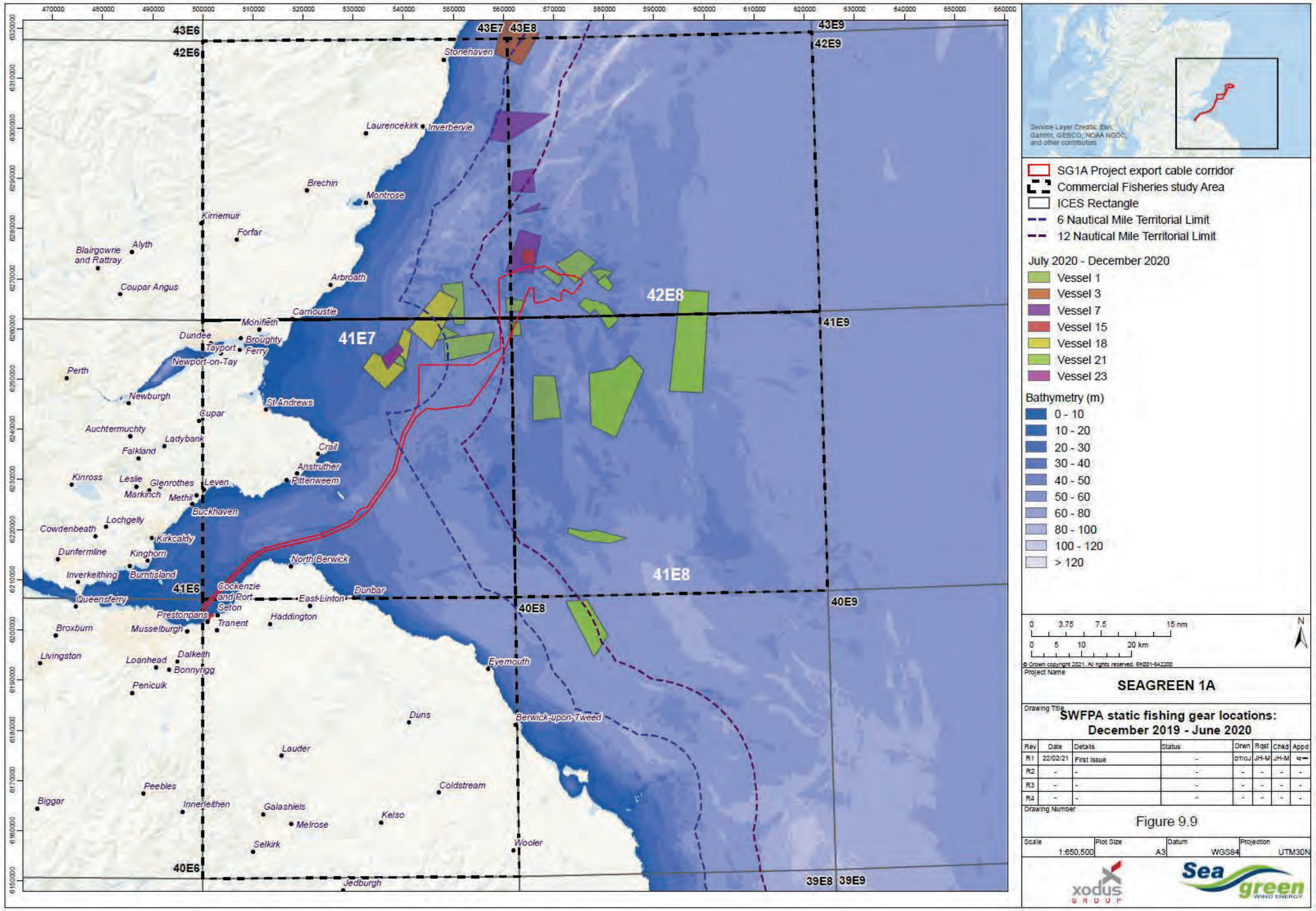

Figure 9-9 SWFPA static fishing gear locations: July 2020 - February 2021 (Source, SWFPA, 2021)

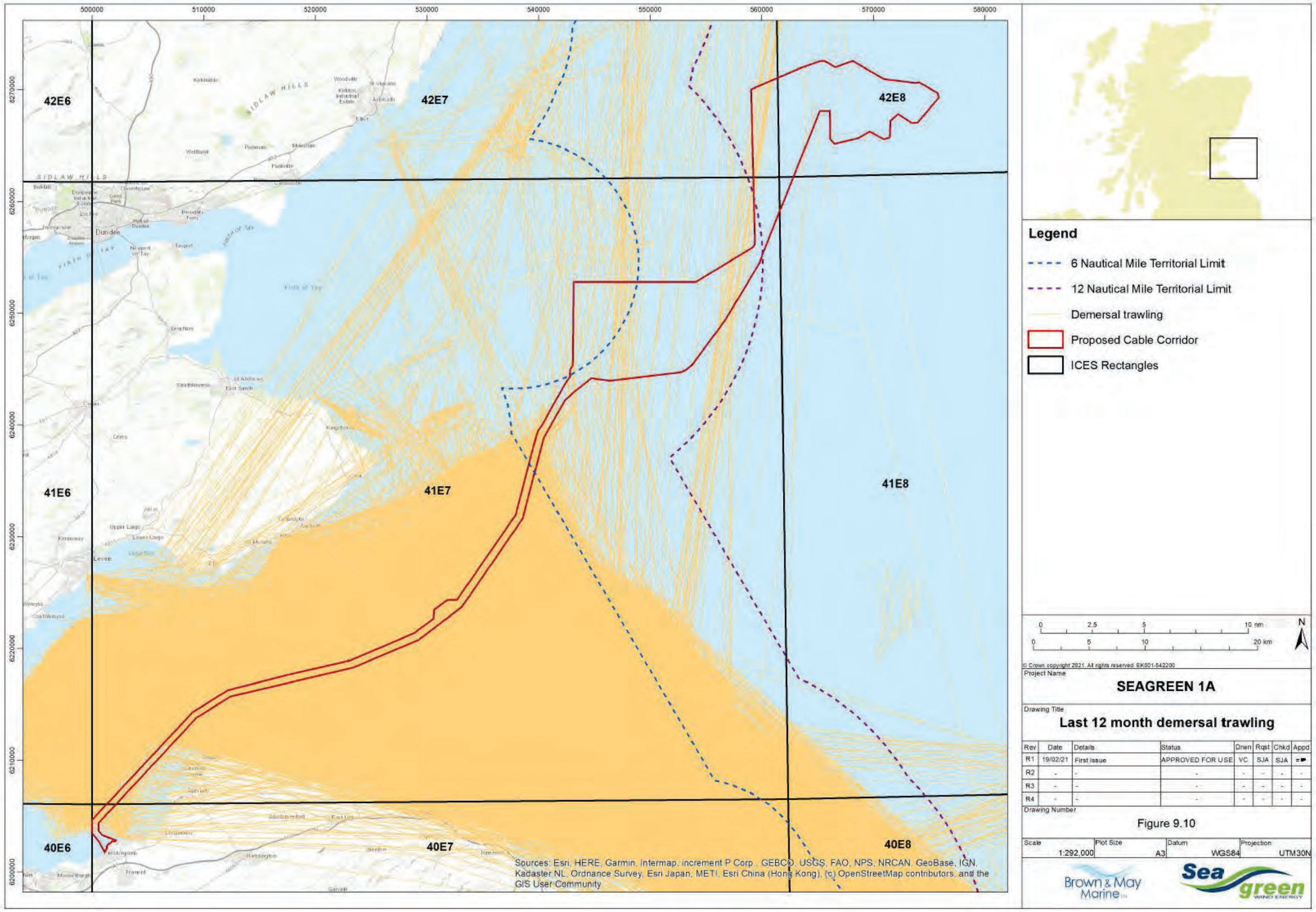

Figure 9-10 AIS vessel tracks from April 2019-March 2020 of demersal trawling vessels of 15m length and over (Source: BMM, 2021; Marine Traffic, 2021)

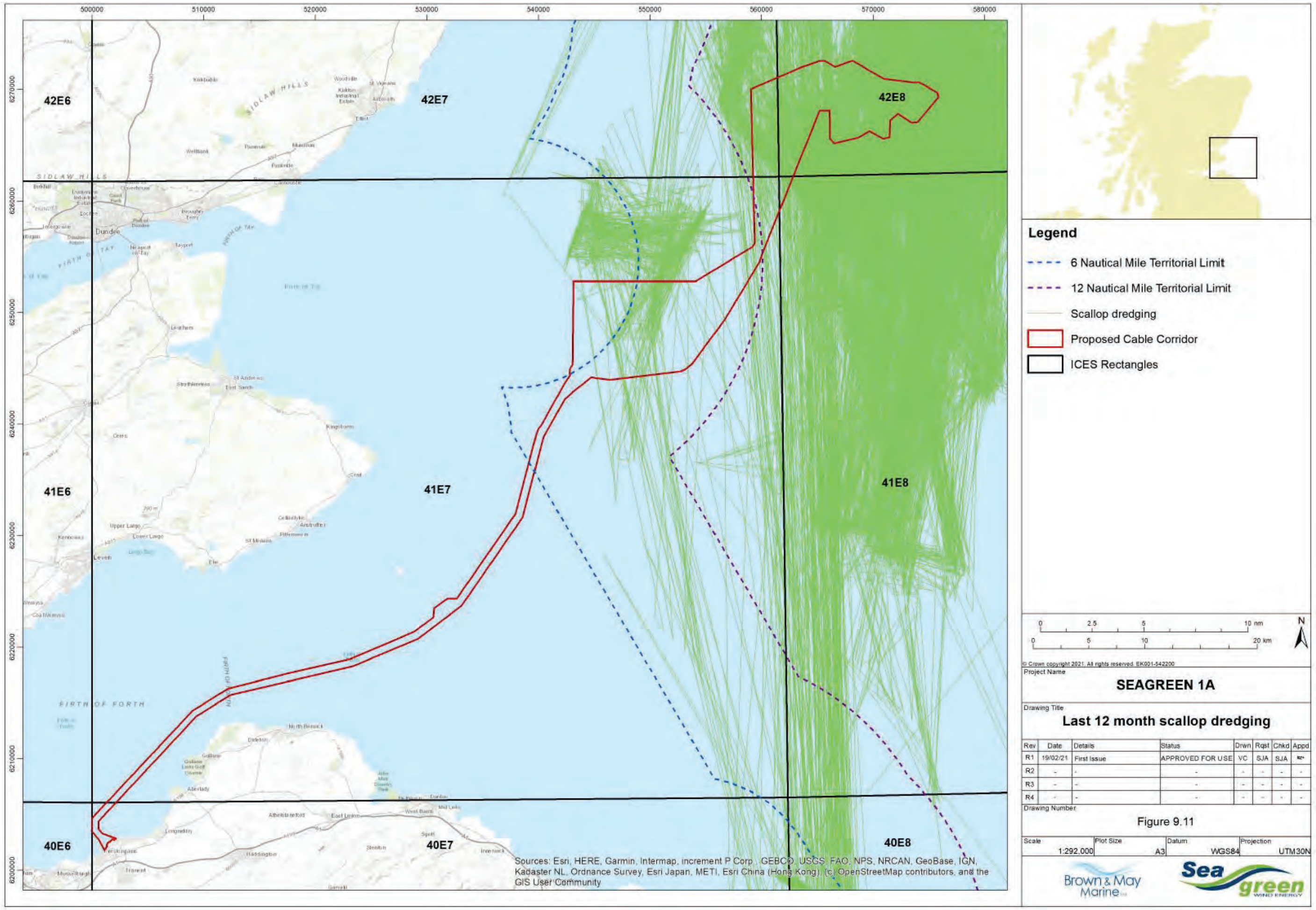

Figure 9-11 AIS vessel tracks from April 2019-March 2020 of scallop dredging vessels of 15m length and over (Source: BMM, 2021; Marine Traffic, 2021)

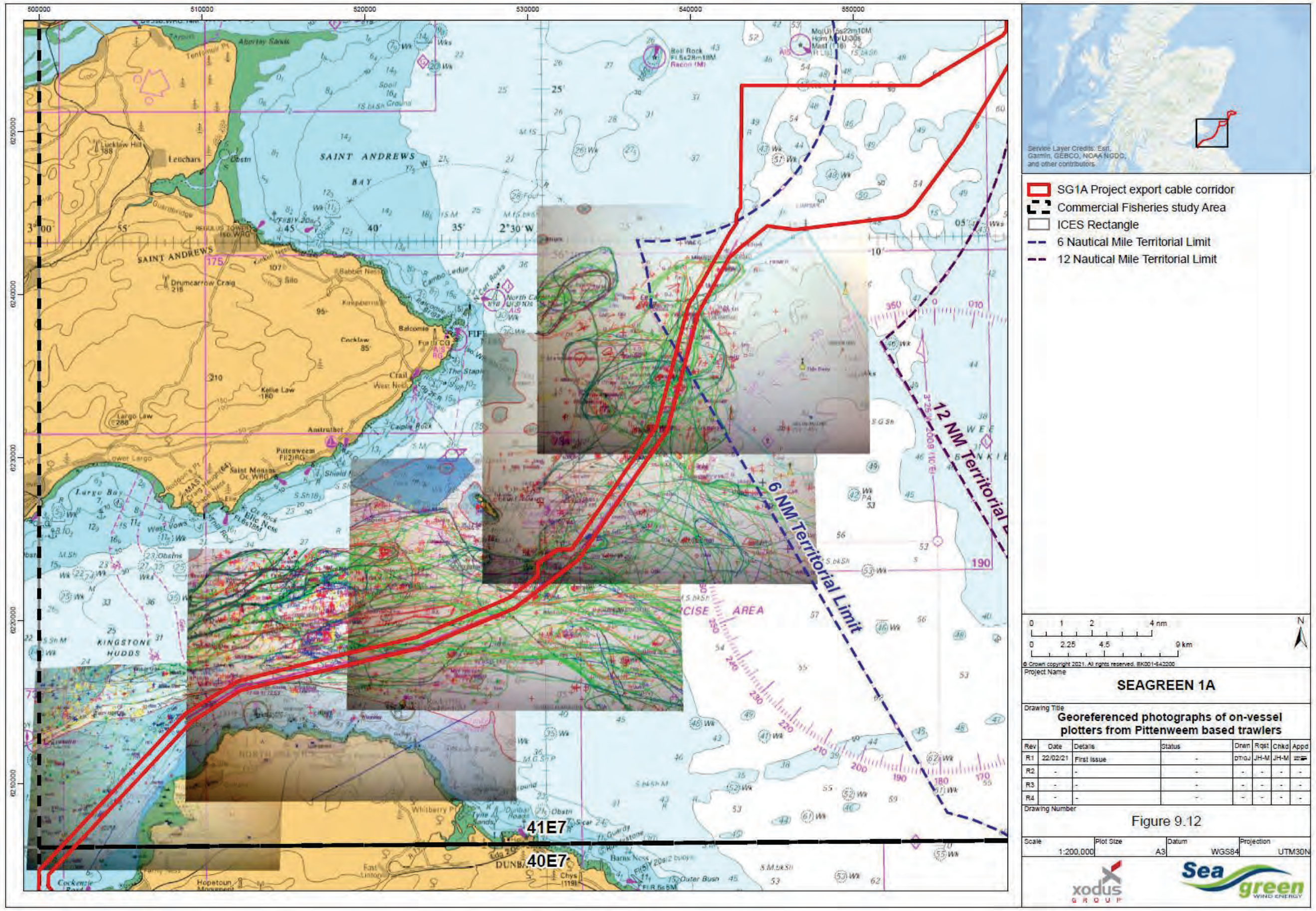

Figure 9-12 Georeferenced photographs of on-vessel plotters of Pittenweem Nephrops trawlers from consultation

9.6 Assessment Criteria

9.6.1 Commercial Fisheries Impact Assessment Methodology

The commercial fisheries impact assessment for the offshore SG1A Project follows the principles of the approach set out within Section 6.3.

The significance of potential impacts has been evaluated using a systematic approach, based upon identification of the sensitivity to the offshore SG1A Project activity, together with the predicted magnitude of the impact. An exception to this is the assessment in respect of safety issues for fishing vessels which, in line with the methodology described in Section 10.6 (Shipping and Navigation), has been carried out using a risk assessment approach.

The assessment carried out for commercial fisheries follows the same overall key principles used for assessment by existing developments. A number of amendments have however been introduced in terms of assessment methods. These are outlined below.

In order to recognise the different sensitivities of vessels which operate demersal trawl gears vs scallop dredgers and nomadic vessels, the assessment of impacts in respect of loss or restricted access to fishing grounds and associated displacement on the scallop fishery has been undertaken separately for each category of vessels, where relevant.

In order to provide a fit for purpose and clear assessment, the definitions of sensitivity and magnitude have been refined and simplified, to take account of key parameters relevant to commercial fisheries. Receptor sensitivity has been defined avoiding the use of terms such as adaptability, tolerance and recoverability (all terms relevant to biological receptors rather than commercial fishing). In addition, in order to provide context in terms of impact magnitude, where appropriate, account has been taken of the relative importance to each fishery of the area affected by each potential impact.

It should be noted that there is no guidance currently available in relation to the definition of receptor sensitivity and impact magnitude, specific to the assessment of impacts on commercial fisheries receptors. Whilst the application of a systematic receptor sensitivity and impact magnitude approach to determine impact significance helps guide the assessment, it is difficult to apply standard definitions of sensitivity and magnitude consistently across the range of impacts requiring assessment in respect of commercial fisheries. Furthermore, impacts of offshore cable developments upon commercial fishing activities cannot be easily categorised following this approach. Therefore, to a large extent, commercial fisheries assessments are qualitative and need to rely on expert judgement.

9.6.2 Significance Criteria

The significance criteria used for assessment of the impacts on commercial fisheries are described below. Definitions of receptor sensitivity and impact magnitude are provided in Table 9.2 and, Table 9.3 respectively.

Taking into account the sensitivity of the fishery and the magnitude of the impact the significance of an impact is then assessed as Major, Moderate, Minor or Negligible using the significance criteria matrix shown in Table 9.4.

Impacts which are assessed as of Moderate or Major significance are considered to be significant in EIA terms with impacts assessed as Negligible or Minor considered to be not significant.

As previously mentioned, the impacts of offshore cable developments upon commercial fishing activities cannot be easily categorised and as a result, the application of significance criteria to the assessment, whilst guided by the significance criteria matrix (Table 9.4), is largely qualitative and based upon professional judgement.

Table 9.2 Definition of receptor sensitivity levels for commercial fisheries receptors

Sensitivity Level	Description
High	Limited operational range and/or limited gear/target species versatility. High dependence upon a single fishing ground.
Medium	Moderate extent of operational range and/or limited gear/target species versatility. Dependence upon a limited number of fishing grounds.
Low	Extensive operational range and/or some gear/target species versatility Ability to fish a number of fishing grounds.
Negligible	Extensive operational range and high gear/target species versatility. Vessels are able to exploit a large number of fishing grounds.

Table 9.3 Definition of magnitude of potential impacts on commercial fisheries receptors

Magnitude Level	Description
High	The area affected by the impact sustains high levels of activity by the fishery and covers a large or moderate extent of its grounds; and/or The impact is permanent.
Medium	The area affected by the impact sustains medium/high levels of activity by the fishery and covers a moderate extent of its grounds; and/or The impact is long term.
Low	The area affected by the impact sustains medium/low levels of activity by the fleet and covers a small extent of its grounds; and/or The effect is short to medium term.
Negligible	The fleet has very little or no history of fishing in the area affected; and / or The impact is short term.

Table 9.4 Significance Criteria Matrix

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

In instances where the offshore SG1A Project poses a potential health and safety risk to fishing vessels and their crews, the significance criteria outlined in Table 9.4 are not considered adequate. In these instances, impacts are assessed in terms of potential risk in line with the criteria used in Section 10.6 (Shipping and Navigation) of this EIAR (Table 9.4 and Table 9.5).

Table 9.5 Significance Criteria Matrix for health and safety risk to fishing vessels (Source: Section 10 (Shipping and Navigation)

Frequency					
Frequent	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
Reasonably Probable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
Remote	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
Extremely Unlikely	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
	Negligible	Minor	Moderate	Serious	Catastrophic
	Severity				

Table 9.6 Significance Rankings (Source: Section 10 (Shipping and Navigation)

	No Impact	No impact on shipping and navigation.
	Broadly Acceptable	Risk As Low As Reasonably Practical (ALARP) with no additional mitigations or monitoring required above embedded mitigations. Includes impacts that have no perceptible effect (effect would not be noticeable to receptors).
	Tolerable (with or without mitigation)	Risk acceptable, but may require additional mitigation measures and monitoring in place to control and reduce to ALARP.

	Unacceptable	Significant risk, mitigation or design modification required to reduce to ALARP.

9.6.3 Assessment Limitations

Commercial fishing is a dynamic industry which is subject to change over time. This may be for a number of reasons, for example fluctuations in landings, the distribution of target species and status of targeted stocks, changes in legislation and management policies, economic constraints such as fuel costs and crew availability, or weather restrictions. As a result, the assessment of potential impacts to commercial fisheries receptors is constrained by the existing baseline.

In addition, it should be noted that the assessment provided within this section is given on a fishery by fishery basis. Whilst it is recognised that the distribution of fishing activity and dependence on fishing grounds in areas relevant to offshore SG1A Project would vary between individual vessels within the same fishery, it is not possible within the scope of this assessment to consider the extent of impacts on a vessel by vessel basis.

9.7 Identification of Potential Impacts

The offshore SG1A Screening Report provides detailed information on the process for the identification of potential impacts to commercial fisheries receptors during each phase. From this process, Table 9.7 summarises the potential impacts which have been included in the commercial fisheries EIA process and those which are not considered further in this EIAR, in alignment with consultation responses received on the offshore SG1A Project Screening Report.

Table 9.7 Identification of potential impacts to commercial fisheries receptors

Potential impact	Relevant phase of Project			Assessed within the EIAR
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Temporary loss or restricted access to fishing grounds	✓	✓	✓	Yes
Displacement of fishing activity into other areas	✓	x	✓	Yes
Interference with fishing activity	✓	x	✓	No
Increased steaming times	✓	X	✓	No
Safety issues for fishing vessels, including allision and collision and potential for snagging with project infrastructure	✓	✓	✓	Yes

Potential impact	Relevant phase of Project			Assessed within the EIAR
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Impacts to commercially exploited species	✓	✓	✓	Yes, for sandeel, *Nephrops*, scallops and herring (in Section 7)

9.8 Embedded Mitigation Measures

The embedded mitigation which will be implemented as part of the offshore SG1A Project design and development is provided in Section 3.8.2.5 and those specific to commercial fisheries are listed below.

- Adherence with the provisions of the International Regulations for the Prevention of Collision at Sea (COLREGs) for all contracted vessels, including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre;
- A defined procedure for dropped objects, and defined claim processes for loss/damage to fishing gear/vessels which is thought to be attributable to offshore SG1A activities; and
- Production of a CBRA and Cable Plan (CaP), which will include details on the planned approach for tasks such as post-installation and cable burial inspection surveys.

Further information on embedded mitigation measures which relate to navigational safety are provided in Section 9.8, Table 4.1.

9.9 Assessment of potential impacts

As detailed in Section 9.7, in line with the offshore SG1A Screening Report and Screening Opinion, the following potential impacts to commercial fisheries receptors during the construction, operation and decommissioning phases of offshore SG1A Project have been assessed in this section of the EIAR:

- Construction & Decommissioning:
  - Adverse impacts to commercially exploited fish and shellfish species (see Section 7.9: Natural Fish and Shellfish Resource, this impact is not discussed further in Section 9.9);
  - Temporary loss or restricted access to fishing grounds;
  - Displacement of fishing activity into other areas; and
  - Safety issues for fishing vessels
- Operation:
  - Impacts of EMF to fish and shellfish species (see Section 7: Natural Fish and Shellfish Resource, this impact is not discussed further in Section 9.9);
  - Long-term loss or restricted access to fishing grounds;
  - Displacement of fishing activity into other areas; and

- Safety issues for fishing vessels

Decommissioning will be carried out in adherence with legislation and guidance at the time. The offshore SG1A Project will produce a decommissioning plan which will be submitted for approval by the Scottish Ministers. It has been assumed, as confirmed during stakeholder consultation, that the impacts which may be caused by decommissioning will be similar and no greater in terms of magnitude than those defined during construction. On this basis it is assumed that the impacts which are assessed in relation to the construction period are the same for the decommissioning period, with no changes to the significance.

9.9.1 Assessment of impacts during construction & decommissioning

9.9.1.1 Temporary loss or restricted access to fishing grounds

In relation to the potential impacts of temporary loss or restricted access to fishing grounds, for the construction and decommissioning phase, any effects on commercial fisheries receptors are expected to be temporary, short term (a small number of months) and localised to the 500m safety zones which are required around installation or survey activities, and will be mitigated through the measures outlined in Section 9.8.

As detailed in Section 9.5, there is a variety of commercial fishing activity which is supported by waters within and in close proximity to the offshore SG1A export cable corridor. Demersal trawling, and especially *Nephrops* trawling represents the highest proportion of landings values and VMS effort. Scallop dredging also occurs at the north-eastern part of the offshore SG1A export cable corridor, to a lesser degree. The majority of fishing vessels operating *Nephrops* trawl are over 10m in length, with peaks in activity between spring and the autumn of each year. Most *Nephrops* trawlers operate from local ports such as Port Seton, Pittenweem, Dunbar and North Berwick. In relation to scallop dredgers, many vessels are nomadic, with large operational ranges, and are active throughout the UK waters. Few vessels operate static gear in the waters relevant to the offshore SG1A Project. Most operate in the vicinity of the northeaster end of the offshore SG1A export cable corridor, largely based out of Arbroath. A small number (1 full-time and 4 part-time) of vessels operating static gear work nearshore to Port Seton, mostly within 1nm of the coast (as confirmed during consultation with the Port Seaton Harbour Master and local fishing vessel operators).

In relation to scallop dredgers and *Nephrops* trawlers, on the basis of their large operational ranges compared with the small area of a temporary loss/change to fishing grounds and considering that vessels operating these mobile fishing methods have flexibility in where they fish, the sensitivity of the receptor is considered to be negligible for scallop dredging vessels and low for *Nephrops* trawlers.

In relation to vessels which operate static fishing gear, by nature of the fishing methods which are used, this fleet has less flexibility in terms of where they can fish and the implications of relocation efforts which may be requested by the offshore SG1A Project. Most vessels operating static gear have smaller operating ranges compared with vessels operating mobile gears. In recognition of their typically small vessel size which limits this fleet’s flexibility, the sensitivity of static fishing gear operators is medium.

For mobile fishing methods, the worst case scenario for temporary loss or restricted access to fishing grounds is anticipated to be only applicable to safety zones around installation activities (500m), of which 2 are expected to be present at any one time. Access to fishing grounds are expected to resume for both fleets following construction, under the assumption that the offshore SG1A Project has provided the fishing vessel operators with sufficient information in which to plan their passage. Guard vessels will be in place to ensure commercial fishing vessels are aware of any construction activities which are restricted in manoeuvrability. In the case of the vessels which operate mobile gears, the magnitude of the impact is considered to be negligible for scallop dredgers and low for *Nephrops* trawlers compared with the fishing grounds which are available to these fleets.

In relation to static fishing methods, the worst case scenario for temporary loss or restricted access to fishing grounds is anticipated to be applicable throughout the offshore SG1A Project installation activities (i.e. the entire offshore SG1A export cable corridor), which will be the extent of the request for relocation of static gear. On the basis of the area of potential gear relocation, but in consideration of relatively narrow installation corridor, the magnitude of the impact is medium.

As described in the Project Description (Section3), the offshore SG1A Project will involve the construction and operation of a single export cable which overlaps considerably with the proposed Inch Cape OWF export cable corridor, within which installation and operation of six export cables have previously been consented. The presence of installation vessels, safety zones or installed infrastructure associated with the offshore SG1A Project will comprise a small proportion of the available fishing grounds for vessels operating mobile gear.

On the basis of the negligible to low sensitivity, and negligible to low magnitude of impact, in relation to vessels operating scallop dredges and *Nephrops* trawls, and in consideration of the additional mitigation measures detailed in Section 9.8 which reduces the magnitude of impact on all receptors to negligible, plus the expectation that fishing vessels will be able to resume access to fishing grounds following completion of construction (more details on this are provided in Section 9.9.2). The potential residual impact significance of temporary loss or restricted access to fishing grounds during construction is assessed as **negligible** significance in relation to both scallop dredgers and *Nephrops* trawlers, and is not significant in EIA terms.

In relation to static fishing gear vessel operators, due to this fleet's lower capacity to alter their fishing activity in response to disruption, and often more constraints in relation to weather static fishing gear vessels have a lower tolerance to temporary restricted access to fishing grounds. For fishing vessels operating static gear, a comparatively higher proportion of their available fishing grounds may be affected by the offshore SG1A Project due to relocation of static fishing gear being required in order to maintain safe working operations for the offshore SG1A Project vessels. On the basis of the medium sensitivity and medium magnitude of the impact, the potential impact significance to static gear fishing vessels before any additional mitigation is **moderate**. However, where applicable evidence-based additional mitigation in line with FLOWW guidance (2014, 2015) is expected to mitigate the impact to static gear fisheries. In addition, information on the areas of the offshore SG1A construction works and the duration will be promulgated by the company FLO in a timely manner. Any disruption to static fishing vessel operators will be short-term, temporary and localised to the footprint of the offshore SG1A export cable at the maximum. The magnitude of the impact of temporary loss or restricted access to fishing grounds in consideration of the additional mitigation measures which are listed in Section 9.9.39.8, can be reduced from medium to low. Therefore, the potential residual impact significance to static fishing gear fleets is assessed as **minor,** and not significant in EIA terms.

9.9.1.2 Displacement of fishing activity into other areas

There is the potential that due to the effects of the temporary loss or access (Section 9.9.1.1) to fishing grounds which may occur during construction and decommissioning phases, fishing activity may be temporarily displaced to surrounding areas. It is assumed that this would be temporary, short term and localised due to the reasons outlined in Section 9.9.1.1. Displacement of fishing activity can cause a competition for space and fishing areas both within a fleet (e.g. static fishing gear being relocated to areas where existing static fishing gear is typically set) and between fleets (e.g. static fishing gear being relocated into areas of scallop dredging or demersal trawling). The displacement of fishing activity is assessed with direct reference to the assessment of loss or restricted access to fishing grounds, as the latter can lead to the first. It is not expected that static fishing gear will be relocated typically to areas where *Nephrops* trawling is carried out, due to the lower abundance of crab and lobsters in these areas. In addition, static fishing gear operators typically avoid areas of demersal trawling or scallop dredging activity as there is a chance of damage to static gear by these mobile methods. It is understood that some displacement of static fishing gear may be unavoidable during periods when fishing gear relocation is required. The majority of the Firth of Forth supports demersal trawling, and comparatively lower activity by static fishing vessel operators is recorded. On this basis, it is assumed that the sensitivity of static fishing gear vessel operators to displacement of fishing activity into other areas is medium. In relation to mobile fishing vessel operators such, the sensitivity to displacement of fishing activity into other areas is low for *Nephrops* trawlers and negligible for scallop dredgers. For both static and mobile fishing vessel operators, the magnitude of the impact of displacement of fishing activity into other areas is low in light of the temporary and localised nature of displacement. On this basis, the impact significance of displacement of fishing activity into other areas is assessed as **minor** for static fishing vessel operators and *Nephrops* trawlers, and **negligible** for scallop dredgers.

9.9.1.3 Safety issues for fishing vessels

The safety issues associated with construction include the collision of fishing vessels or gear with installation vessels, and the snagging of gear on areas of laid but unburied (exposed) cable or dropped objects. Safety risks associated with potential for collision with construction vessels are addressed in Section 10.9.

In relation to the offshore SG1A export cable installation, there is potential for areas which are not yet buried, and are exposed on the seabed to be snagged by fishing vessels which require seabed contact (e.g. scallop dredging, demersal trawling, and to a lesser extent anchoring and hauling of static gear). In addition, dropped objects may create snagging risks. Commercial fisheries stakeholders will be informed of any areas of exposed and unburied cable via the mitigation such as circulation of information through Notices to Mariners. A company FLO will be in place for the duration of installation and will coordinate communications with the fishing industry. Guard vessels and an OFLO will also be on site during installation to aid offshore communications and warnings of any hazards associated with the offshore SG1A Project installation.

It is anticipated that the offshore SG1A Project export cable corridor installation and associated works will take place between Q2 and Q3 of 2023. The seabed preparation and cable installation operations are expected to take four weeks per operation, while the landfall works including trenchless installation could take up to two months. Cable pull in, placement of external protection and post-lay survey are expected to take one week each. The estimated maximum number of installation vessels which will be on site at any time is 2, plus smaller support and guard vessels.

The frequency of this impact is considered to be **Extremely Unlikely**, taking into account all mitigation. Since this impact could lead to significant damage to one of the vessels involved, and potential injury to crew members, the severity is ranked as **Serious**, resulting in an overall ranking of **Tolerable,** and therefore within acceptable limits.

9.9.2 Assessment of impacts during operation

9.9.2.1 Long-term loss or restricted access to fishing grounds

Following the completion of installation, there will be little potential for long term losses or restricted access to fishing grounds. The primary reason for loss or restricted access to fishing grounds during this phase will be in order to enforce safety zones around any maintenance vessels, or if an area of the cable becomes exposed and requires a safety zone and guard vessel until it is buried. In relation to vessels which operate static gear, it is expected that resumption of access to fishing grounds will occur immediately following installation and protection. In light of the static fishing vessel fleets relatively small operational range, the sensitivity of this receptor to long term loss or restricted access to fishing grounds is medium.

Pre-construction, SG1A will undertake a Cable Burial Risk Assessment when ground investigation results are available. This will determine the appropriate target cable burial depth to achieve sufficient protection of the offshore SG1A export cable from any activity which crosses the offshore SG1A Project and which may pose a risk to cable integrity, including scallop dredging and trawling for *Nephrops*. Scallop dredging vessels tow dredges which rake the seabed in order to dredge scallops and other shellfish. *Nephrops* trawlers tow demersal nets, with a smaller mesh and lighter footrope to for example demersal trawlers which target squid. It has been confirmed during consultation that the majority of demersal trawlers targeting *Nephrops* and other demersal species use rockhopper gears, which have bobbins attached to aid trawling over uneven or rocky grounds. For scallop dredging vessels, in consideration of their large operational ranges the sensitivity to long term loss or restricted access to fishing grounds is low and for vessels operating demersal trawls, and local *Nephrops* trawling vessels with smaller operational ranges than dredges, the sensitivity to long term loss or restricted access to fishing grounds is medium.

The estimated minimum burial depth has been assigned at this stage to be between 1 and 3 m. The offshore SG1A Project will endeavour to maximise burial depth and has estimated this will be achieved for a minimum of 80% of the offshore SG1A export cable corridor. In cases where burial is not possible, for example due to unsuitable ground conditions, cable protection, such as rock placement will be used. The target DoB of the offshore SG1A export cable corridor will be defined when the offshore SG1A installation contractor is in place, in consideration of the ground conditions. In addition, micro-routing will be used where possible to maximise burial. The target DoB will be confirmed within the Cable Plan. The achieved burial depths and a subsequent assessment of any areas of concern will be carried out following a high specification geophysical survey. The protection measures which are used to protect the offshore SG1A export cable will be confirmed post installation.

Rock replacement is the preferred method of protection, on the basis of commercial fisheries consultation. It is expected that any rock placement will be in line with industry standards in its composition and design which have been accepted and developed in consultation with fisheries representatives (Section 9.8). In addition, in instances where sections of cables are exposed, a full protocol will be initiated, including distribution of the nature and location of the exposure to fisheries stakeholders and applied recommended safety zones.

The installed offshore SG1A export cable and any associated areas of protection will be issued to Kingfisher and available on KIS-ORCA. In addition, the final as laid offshore SG1A export cable route will be detailed, with accompanying coordinates within a Notice to Mariners which will be sent to fisheries stakeholders by the FLO.

On the basis of the extensive consultation process which has been carried out and will continue with fisheries stakeholders, SG1A commit to carrying out a single over trawl survey within 12 months of the completion of the offshore SG1A export cable installation and any protection. This survey will provide fishing vessel operators, especially those with seabed contact fishing gears, with sufficient information to aid in their passage and trawl plans.

In light of the highly localised extent of any maintenance vessels which may be needed, and the sporadic and short term duration of maintenance works, along with the extensive mitigation measures which have been committed to by the offshore SG1A Project, the magnitude of impact of long term loss or restricted access to fishing grounds for the offshore SG1A export cable during operation is low, reducing to negligible with additional mitigation.

Therefore, the potential residual impact significance of long term loss or restricted access to fishing grounds is assessed for vessels operating static gear as **negligible**. For vessels operating scallop dredges the impact is considered to be **negligible**, and for vessels operating demersal trawls including *Nephrops* trawlers, the impact is considered to be **negligible**. The potential impact of long term loss or restricted access to fishing grounds is therefore not significant in EIA terms.

9.9.2.2 Displacement of fishing activity into other areas

As detailed in Section 9.9.1.2, displacement of fishing activity into other areas is directly associated with the impact of operational loss or restricted access to fishing grounds. On the basis that loss or restricted access to fishing grounds during the operation phase will be limited to safety zones around maintenance activities and areas of remediation where an exposure of the SG1A occurs. Guard vessels will be in place where relevant, and an onshore FLO will be contracted if required, which will ensure the timely notification of any maintenance or remediation works via Notice to Mariners, and Kingfisher. The sensitivity to displacement of fishing activity for all fleets is assumed to be the same if not less than the sensitivity of fleets to loss or restricted access to fishing grounds. Therefore, the sensitivity of vessels operating scallop dredges to displacement of fishing activity is low. In relation to demersal trawl vessels including those operating *Nephrops* trawls the sensitivity to displacement of fishing activity is medium. For vessels operating static fishing gear the sensitivity to displacement of fishing activity is medium.

In light of the highly localised extent of potential displacement, and the sporadic and short term duration of maintenance works, along with the extensive mitigation measures which have been committed to by the offshore SG1A Project, the magnitude of impact of displacement of fishing activity into other areas for the offshore SG1A export cable during operation is low, reducing to negligible with additional mitigation.

Therefore, the residual impact significance of displacement of fishing activity into other areas is assessed for vessels operating static gear as **negligible**. For vessels operating scallop dredges the impact is considered to be **negligible**, and for vessels operating demersal trawls including *Nephrops* trawlers, the impact is considered to be **negligible**. The potential impact of displacement of fishing activity into other areas is therefore not significant in EIA terms

9.9.2.3 Safety issues for fishing vessels

The safety issues associated with operation include the collision of fishing vessels or gear with maintenance vessels, and the snagging of gear on areas of cable which become exposed. Safety risks associated with potential for collision with operation and maintenance vessels are addressed in Section 10.9. The criteria for assessment for safety issues has been defined in Section 10.6.

There is potential for areas of cable to become exposed over time, in particular in areas where the seabed is especially mobile and where there is intensive demersal trawling or scallop dredging. In addition, dropped objects may create snagging risks. Commercial fisheries stakeholders will be informed of any areas of exposed and unburied cable via the mitigation such as circulation of information through Notices to Mariners. A company FLO will be in place to coordinate communications with the fishing industry. Guard vessels and an OFLO will also be on site if required during maintenance works where the works vessel is restricted in its ability to manoeuvre, to aid offshore communications and warnings of any hazards associated with the offshore SG1A Project installation.

Maintenance activities are expected to be required infrequently, and post-installation surveys plus an overtrawl survey where required will provide detailed information on the condition and location of the offshore SG1A export cable, any mechanical protection which is required and the status of burial material.

This will also ensure any areas of concern are identified. This information will be shared with fisheries stakeholders as detailed in Section 9.8

Once the cable is installed, the depiction of the cable on nautical and Kingfisher charts (as detailed in Section 9.8) may discourage fishing in the cable's vicinity; however evidence shows this is not always the case with installed cables as often it is assumed they are adequately protected against over-trawling. The planned cable protection is assumed to provide effective mitigation.

The frequency of this impact is considered to be **Extremely Unlikely** assuming the cables are marked on navigational charts and suitably protected via burial (target depths between 1 m and 3 m) or other protection measures, and the severity **Serious**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

A summary of all impacts which have been considered in this EIAR is provided below in Table 9.8.

Table 9.8Commercial Fisheries impact summary

Impact	Description of Impact	Sensitivity of receptor	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Construction (and Decommissioning)								
Temporary loss or restricted access to fishing grounds	Impact to Static fishing gear vessels	Medium	Medium	Moderate	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Low	Minor	Not significant
	Impact to Scallop dredgers	Negligible	Negligible	Negligible		Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Low	Low	Minor		Negligible	Negligible	Not significant
Displacement of fishing activity into other areas	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Low	Minor	Not significant
	Impact to Scallop dredgers	Negligible	Low	Negligible		Low	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Low	Low	Negligible		Low	Negligible	Not significant
Safety issues for fishing vessels	Fishing vessels	Extremely Unlikely	Serious	Tolerable	No additional mitigation beyond embedded mitigation	Tolerable		Not significant
Operation								

Impact	Description of Impact	Sensitivity of receptor	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Long term loss or restricted access to fishing grounds	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Negligible	Negligible	Not significant
	Impact to Scallop dredgers	Low	Low	Negligible		Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Medium	Low	Minor		Negligible	Negligible	Not significant
Displacement of fishing activity into other areas	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Negligible	Negligible	Not significant
	Impact to Scallop dredgers	Low	Low	Negligible		Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Medium	Low	Minor		Negligible	Negligible	Not significant
Safety issues for fishing vessels	Fishing vessels	Extremely Unlikely	Serious	Tolerable	No additional mitigation beyond embedded mitigation	Tolerable		Not significant

9.9.3 Additional Mitigation

The offshore SG1A Project will be implementing several additional mitigation measures specifically to minimise the potential impact of the offshore SG1A Project to commercial fisheries receptors, and in direct response to concerns which have been raised by fisheries stakeholders during consultation. The offshore SG1A Project has ensured reference to guidance has been made to maximise the effectiveness of these mitigation measures. Where ‘additional mitigation’ is referred to in the assessment presented in Section 9.9, it is referring to the mitigation listed below.

SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the following mitigation measures:

- Appointment of a FLO to maintain proactive consultation with the fishing industry;
- Adherence to best practice guidance with regards to fisheries liaison (e.g. FLOWW, 2014; 2015);
- Timely and efficient distribution of Notice to Mariners (NtM), Kingfisher notifications and other navigational warnings of the location, expected duration and nature of works associated with the offshore SG1A Project;
- The appointment of Offshore Fisheries Liaison Officers (OFLOs) on board SG1A contracted vessels, as appropriate;
- Notification to the UK Hydrographic Office (UKHO) and Kingfisher of the proposed works /installed cable to facilitate the promulgation of maritime safety information and updating of nautical /admiralty charts and publications;
- Following review of the post-installation survey where areas of concern or where the target DoB is not achieved a geophysical survey will be carried out. (e.g. high-resolution multi-beam echo sounder, side scan sonar, video) in areas of the offshore SG1A export cable where target burial is not achieved. The resulting in 3D digital terrain maps and 2D cross sections of protection and the adjacent seabed and to make this available to fishermen.
- If required, and in consideration of the data which is collected during the geophysical survey, SG1A will carry out a single over trawl survey within 12 months of the installation and any protection works being completed. The locations and the extents of the over trawl surveys will be informed by the geophysical survey results, through currently available fishing activity data and through further postconstruction consultation with fisheries stakeholders and agreed with MSLOT.
- SG1A will conduct a detailed over trawl survey specification that will include a description of the appropriate vessel to undertake the survey, the type, specifications and rigging configuration of the trawl to be deployed and the towing pattern to be followed. The parameters to be assessed would also be defined along with acceptable limits relative to normal towing characteristics. SG1A will not undertake any further investigation in this respect where it is confirmed that the target depth of burial (DoB) has been achieved. The offshore

SG1A Project proposes to discuss and confirm the full details of the over trawl survey approach with Marine Scotland, in consultation with fisheries stakeholders.

- SG1A will carry out a risk assessment for the need for guard vessels during works; or in the event of a cable exposure during operational phase of the cable's life. Where required, guard vessels will be confirmed through a standard
- An evidence-based cooperation payment policy will be in place for static fishing gear operators which are requested to relocate fishing gear from the offshore SG1A Project, where relevant, in accordance with FLOWW guidance (2014, 2015).

Where 'additional mitigation' is referred to in the assessment presented in Section 9.9, it is referring to the mitigation listed above.

9.10 Cumulative Impacts

9.10.1 Cumulative impact assessment methodology

The assessment of cumulative impacts resulting from the projects identified in Section 6.5.3, in relation to commercial fisheries receptors is provided in this section.

The following projects will be considered in the cumulative assessment presented in this EIAR:

- The Seagreen Project (consented, pre-construction);
- Neart na Gaoithe OWF (under construction)
- Inch Cape OWF (consented);
- Berwick Bank OWF (scoping); and
- Marr Bank OWF (concept/early planning).

9.10.2 Cumulative Impact Assessment

This section provides an assessment of the potential cumulative impact on the impacts detailed in Section 9.9 in relation to the offshore SG1A Project.

In relation to the projects which are listed in Section 9.10.1, there is the potential for cumulative impacts for commercial fisheries both in the case of concurrent and consecutive construction periods of two or more projects, with the cumulative impact resulting in potentially higher impacts due to intensity or area of impact and duration respectively. However, given the embedded and additional mitigation measures of the offshore SG1A Project, and the expectation that other developments will also adhere to industry standard mitigation measures, it is not expected that the offshore SG1A Project will give rise to any cumulative impacts.

Due to the localised extent and short-term duration, and temporary nature of the offshore SG1A construction period and in consideration of all additional mitigation which will be implemented, no cumulative impacts are expected to occur in relation to any of the developments detailed Section 9.10.1. Therefore, the significance of all impacts is expected to be the same as those assessed for the offshore SG1A Project alone, and **not significant in EIA terms**.

9.11 Conclusion

The embedded mitigation measures outlined in Section 3.8.2.5 and additional mitigation measures outlined in Section 9.9.3 reduce all potential impacts so that there will be no significant impacts on commercial fisheries from the offshore SG1A Project.

10. Shipping and Navigation

10.1 Introduction

This section reports the outcome of the assessment of significant impacts arising from the offshore SG1A Project on shipping and navigation. The proposed offshore SG1A Project export cable corridor that forms the basis of this assessment is described in Section 3.

Where cumulative impacts arise as a result of impacts of the proposed offshore SG1A Project export cable corridor and the impacts of other projects in the area, these have also been identified and assessed in Section 0.

The full Navigational Risk Assessment (NRA) is contained in Appendix D: Offshore SG1A Navigational Risk Assessment of this EIAR. This EIA section considers the potential impacts associated with the following activities:

- Shipping;
- Anchoring; and
- Fishing.

10.2 Legislation and Policy Context

This assessment has taken into consideration the current legislation, policy and guidance relevant to shipping and navigation.

10.2.1 Legislation

The following legislation has been considered in this assessment:

- United Nations Convention on the Law of the Sea (UNCLOS) (UNCLOS, 1982);
- Submarine Telegraph Act (1885);
- International Regulations for Preventing Collisions at Sea (COLREGS) 1972/78 (International Maritime Organization (IMO), 1972/78), as implemented in the UK through Merchant Shipping Notices; and
- Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974), as amended, as implemented under UK legislation by The Merchant Shipping (Safety of Navigation) Regulations 2002 (Merchant Shipping Safety, 2002).

10.2.2 Primary Guidance

Impacts on shipping and navigation receptors are assessed using a Formal Safety Assessment (FSA) compliant with IMO guidelines. The primary guidance document used during the assessment is therefore given below:

- Revised Guidelines for FSA for Use in the Rule-Making Process [MSC-MEPC.2/Circ.12/Rev.2] (IMO, 2018).

10.2.3 Secondary guidance

The secondary guidance documents used during the assessment are listed below:

- MGN (Marine Guidance Note) 543 Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MCA, 2016)[16];
- International Association of Marine Aids to Navigation (AtoN) and Lighthouse Authorities (IALA) Recommendation O-129 on the Marking of Man-Made Offshore Structures, Edition Two (IALA, 2013).

10.2.4 Marine Policy

EN-1 Overarching National Policy Statement ('NPS') for Energy (2011)

The EN-1 Overarching NPS for energy sets out the Government's policy for major energy infrastructure. Within this policy, the impact of marine developments on military activities due to the presence of danger and exercise areas located across the UK Continental Shelf ('UKCS') is considered. This impact is assessed in this section following review of the baseline data which identifies military defence exercise areas in proximity to the offshore SG1A Project export cable corridor.

National Marine Planning

Marine planning in Scotland's inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles) is governed by the Marine (Scotland) Act 2010, an Act of the Scottish Parliament and by the Marine and Coastal Access Act 2009, an Act of the UK Parliament, respectively. The two Acts (referred to as the Marine Acts) establish a legislative framework for marine planning to enable demands on marine resources to be managed in a sustainable way across all of Scotland's seas.

Scotland's first statutory marine plan, the National Marine Plan was adopted and published in March 2015. Full details of the National Marine Plan are provided in Section 2.3.1.

Regional Marine Planning

Eleven Scottish Marine Regions have been created which cover sea areas extending out to 12 nautical miles. The offshore SG1A Project lies within the Forth and Tay region.

10.2.5 Local Policy

Harbour Authorities and Vessel Traffic Service Areas

Forth Ports Limited exercises jurisdiction over all the waters of Firth of Forth and the River Forth. Approximately 31km of the export cable corridor lies within the limit of authority of Forth Ports Ltd. Forth

[16] At the time of writing, an updated version of MGN 543 is out for consultation and expected to be published later in 2020, superseding MGN 543.

Ports use a Vessel Traffic Service (VTS) to monitor shipping activity within the Firth of Forth and covers the area out to the port limits.

10.3 Consultation

Details of the proposed offshore SG1A Project were presented to a number of shipping and navigation consultees at two separate meetings on the 14th and 19th January 2021. Consultees included representatives from Maritime & Coastguard Agency (MCA), Cruising Association (CA), Royal Yachting Association (RYA), UK Chamber of Shipping (UKCOS), Forth Ports and the Northern Lighthouse Board (NLB). Table 10.1 presents the key points.

Table 10.1 Consultation comments in relation to the Shipping and Navigation section of the offshore SG1A Project Screening Response and EIAR

Organisation	Comment	SG1A Project Response
RYA	Larger recreational vessels more likely to carry AIS, while day sailors are unlikely to broadcast on AIS. Recreational vessels can appear anywhere in the area however, it is not considered to be an issue with the SG1A Project.	Impact on recreational activities during construction assessed in 10.9.1.1 , which takes into consideration that AIS data does not cover all recreational craft.
MCA	It was queried whether consultation with harbour authorities will take place.	Consultation with Forth Ports and Northern Lighthouse Board was carried out and is summarised in Table 10.1.
UKCOS	It was queried if 10 years of MAIB statistics was sufficient and if any more data could be collected from their database.	The MAIB analysis (presented in Appendix D) is intended to provide a general indication as to whether the study area is of low or high risk in terms of maritime incidents. The most recent 10 years was used as being representative of the current status in terms of technology and safety standards.
UKCOS	The decommissioning plan was queried.	Impacts associated with decommissioning are outlined in Section 10.9.1.3 (and in Appendix D). Decommissioning will be subject to a separate assessment at the time.

Organisation	Comment	SG1A Project Response
UKCOS	It was raised there has been previous consultation relating to capital and maintenance dredging associated with offshore wind farms and the special protection area for the outer Firth of Forth and St Andrews Bay. It was noted that the project may require HRA approval and further assessments.	Impacts on aggregate / maintenance dredging included in Section 10.9.1.1 (and Appendix D). An NCA Report, assessing effects on designated sites, has been produced to support the offshore SG1A Project Marine Licence Application (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012-CST-OF-LIC-DEV-REP-0002)).
RYA	The potential issue of Unexploded Ordnance (UXO) within the Firth of Forth which remain from WW2 was raised.	UXO surveys carried out as part of the pre-installation works.
CA	CA members will mainly be transiting on passage from Arbroath down to Holy Island. No major issues were anticipated.	Impact on recreational activities during construction assessed in Section 10.9.1.1.
Forth Ports	It was stated there are no concerns with the proposed cable and that good communication, including Notices to Mariners and frequent calls, during the works will be key.	Ongoing communication with Forth Ports and the offshore SG1A Project is planned.
Forth Ports	It was clarified that Forth Ports use a Vessel Traffic Service (VTS) to monitor shipping activity within the Firth of Forth and covers the area out to the port limits. It was also noted that whilst they can see beyond this, the official area covered by the VTS is within port limits.	The port limits are presented within the navigational features (Section 10.5.1).
Forth Ports	It was noted that the proposed cable route crosses the main channels in the approach to ports, but most commercial traffic tends to keep to the north of the proposed SG1A Project. Vessels most likely to transit into Cockenzie and around the Southern extents of the cable will be fishing and recreational craft.	Impact on disruption to vessel routeing/timetables during construction assessed in Section 10.9.1.1. Impact on fishing and recreational activities during construction assessed in 10.9.1.1.
Forth Ports	It was raised that there are ports/docks at Inverkeithing, Methil, Kirkcaldy etc. (associated with Fife and Kirkcaldy) to be aware of. It was noted that only a small amount of vessel traffic is associated with these areas.	Ports are presented within the navigational features (Section 10.5.1).

Organisation	Comment	SG1A Project Response
Forth Ports	It was stated that Forth Ports are alerted if any vessels stop within the exclusion zone surrounding the existing gas pipeline in the area, as they have designated monitoring for the pipeline using radar/AIS.	The existing gas pipeline is presented in Section 10.5.1. Any impact associated with external protection regarding the pipeline crossing is assessed in Section 10.9.1.2.
NLB	No specific concerns were raised with the proposed SG1A Project as long as it is clear of any anchorage areas and does not impact any future developments at Cockenzie.	Anchorage areas relative to the offshore SG1A Project are presented in Section 10.5.1. Impact on a vessel dragging anchor onto the proposed cable are outlined in Section 10.9.1.1 and 10.9.1.2. No impact on future developments at Cockenzie are anticipated as the cable will be installed using a trenchless installation technique at landfall.
Forth Ports	It was stated that Forth Ports are regularly consulted during any construction works taking place within the Firth of Forth.	Ongoing communication with Forth Ports and the offshore SG1A Project is planned.

10.4 Data Sources

The main data sets used in this assessment are given below in Table 10.2.

Table 10.2 Data Sources

Organisation	Data Type	Details of Data Available
Anatec	AIS Data	Twelve months of AIS data from January to December 2019.
Vessel Monitoring System	Satellite VMS Fishing Activity data	Two years of VMS data (2018 and 2019)
Royal National Lifeboat Institution (RNLI)	Maritime Incident data	RNLI data logs details of incidents it responds to, including the cause of incident. Data were available from 2008 to 2017.
MAIB	Maritime Incident data	MAIB data were available from 2008 to 2017. All UK commercial vessels and non-UK vessels within a UK port or the UK 12nm Territorial Waters & carrying passengers to a UK port, are required to report accidents to the MAIB.

Organisation	Data Type	Details of Data Available
United Kingdom Hydrographic Office (UKHO)	UK Admiralty Charts	Admiralty charts are nautical charts issued by the UKHO. Charts used for the assessment include: 190: Montrose to Fife Ness including the Isle of May 734: Firth of Forth Isle of May to Inchkeith 735: Firth of Forth Approaches Leith and Burntisland 1407: Montrose to Berwick-upon-Tweed 2: United Kingdom and Ireland
UKHO	Admiralty Sailing Directions	Admiralty Sailing Directions, North Sea (West) NP 54, 10th Edition, 2016
Crown Estate Scotland	Offshore Wind Farms	The Crown Estate: Offshore Wind (dated January 2021)

10.4.1 Data Limitations

The main limitations associated with the data sets are outlined below.

- AIS equipment carriage is not mandatory for all vessels. Military vessels and smaller craft such as fishing vessels below 15 m in length and recreational craft are not required to carry AIS, and therefore will be under-represented within the analysis.
- Trials carried out by Anatec in the North Sea found that a minority of fishing vessels do not broadcast on AIS at all times, especially when engaged in fishing, thus coverage of fishing vessels may be under-represented.

10.5 Existing Baseline Description

This section details the baseline environment by identifying navigational features and shipping and marine activity using various data sources which are considered relevant to the offshore SG1A Project (outlined in Table 10.2). This baseline is reported on more fully within Appendix D: Offshore SG1A Navigational Risk Assessment.

10.5.1 Navigational Features

There are numerous navigational features within the area of the offshore SG1A Project export cable corridor (see

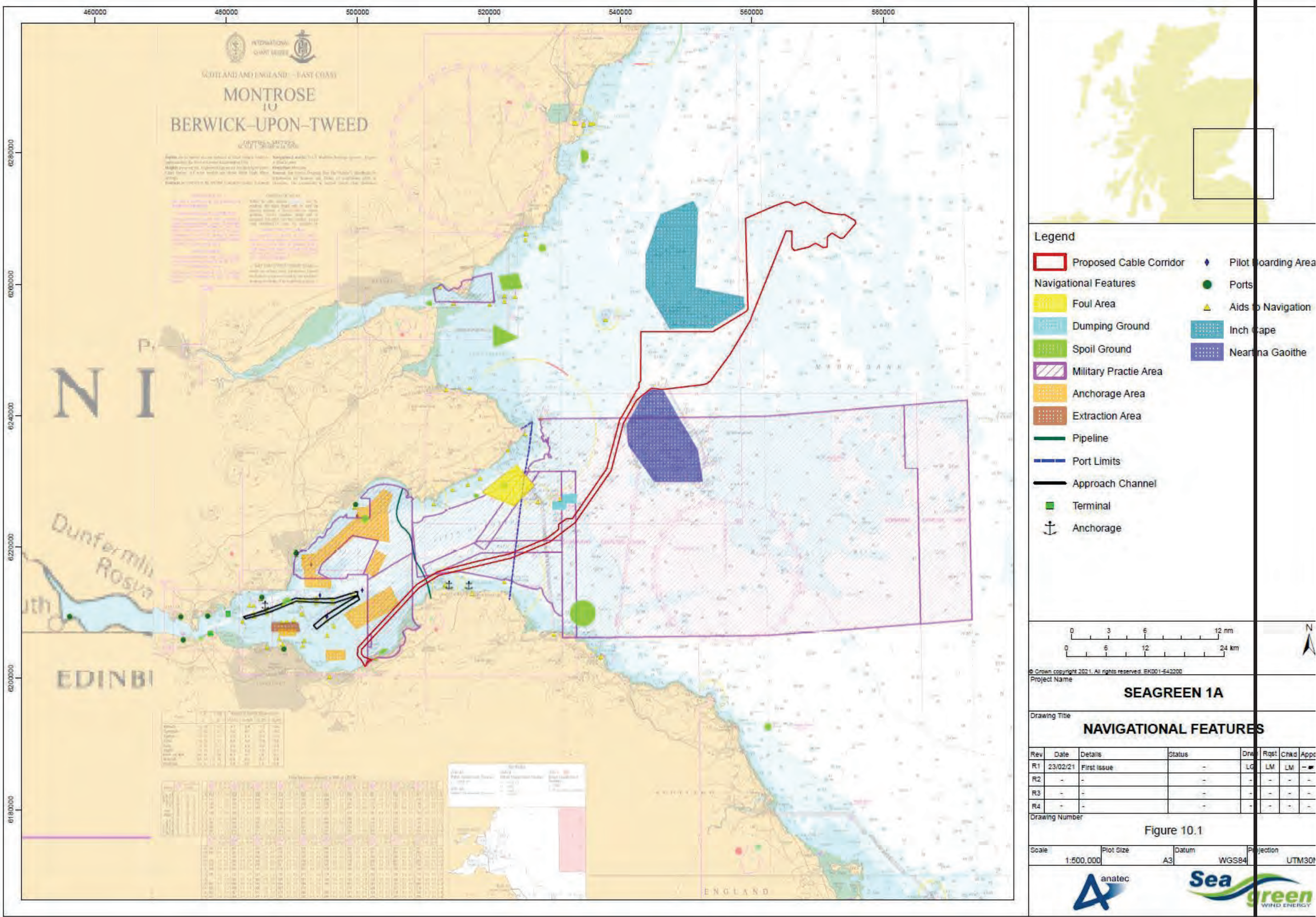

Figure 10-1).

There are various ports and terminals in close proximity to the offshore SG1A Project export cable corridor. Within the Firth of Forth are the ports of Leith, Rosyth and Grangemouth, the oil terminal at Hound Point and the gas terminal at Braefoot. The most important commodities are oil, petro-chemicals and liquefied gases, which pass through the port of Grangemouth and the two marine terminals at Hound Point and Barefoot.

Forth Ports Burntisland, Kirkcaldy and Methil make up the Fife satellite ports, providing a variety of high-value services to their tenants and surrounding business communities. This includes the capability and capacity for handling dry bulk, decommissioning, oil & gas, agriculture, renewables, breakbulk, and paper & forest products.

Forth Ports Limited exercises jurisdiction over all the waters of Firth of Forth and the River Forth. Approximately 31 km of the offshore SG1A Project export cable corridor lies within the limit of authority of Forth Ports Ltd.

Leith approach channel is located approximately 3 nm north-west of the offshore SG1A Project export cable corridor and the Forth Deep Water Channel which runs through the North Channel is approximately 4nm north of the offshore SG1A Project export cable corridor.

There are five pilot boarding areas in proximity to the offshore SG1A Project export cable corridor. Pilotage is compulsory within the Forth area for:

- Vessels carrying 12 or more passengers;
- Vessels of 45 m or more bound for the North Channel and Forth Deep Water Channel;
- Vessels of 45 m or more carrying dangerous cargoes and all other vessels of 80m or more bound for the Leith Channel;
- Vessels of 45 m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Methil; and
- Vessels of 45 m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Kirkcaldy.

A number of designated anchorage areas and anchor berths are located in the Firth of Forth and along the east coast of Scotland, one of which intersects the proposed offshore SG1A Project export cable corridor.

The proposed offshore SG1A Project export cable corridor intersects a number of Ministry of Defence (MOD) practice and exercise areas (PEXA), including submarine exercise and firing practice areas. No restrictions are placed on the right to transit the firing practice areas at any time. Exercises and firing only take place when the areas are considered to be clear of all shipping.

Neart na Gaoithe is the closest consented wind farm site in proximity to the proposed offshore SG1A Project export cable corridor, located 200 m to the south. Construction on Neart na Gaoithe began in August 2020.

The Inch Cape development area is located 600 m north of the proposed offshore SG1A Project. The proposed cable corridor is adjacent to the consented (but not yet constructed) Inch Cape Offshore Wind Farm cable corridor route to minimise disturbance across the Forth and Tay area.

There are two charted ammunition dumping grounds (disused) approximately 1km north of the proposed offshore SG1A Project. There is also a foul area located approximately 4nm north of the proposed offshore SG1A Project, on the western side of the Isle of May.

There is one historical extraction area approximately 5nm north-east of the proposed offshore SG1A Project. There are no current licensed aggregate extraction areas for Scotland.

There is one gas pipeline that intersects the offshore SG1A Project, stretching across the mouth of the Firth of Forth.

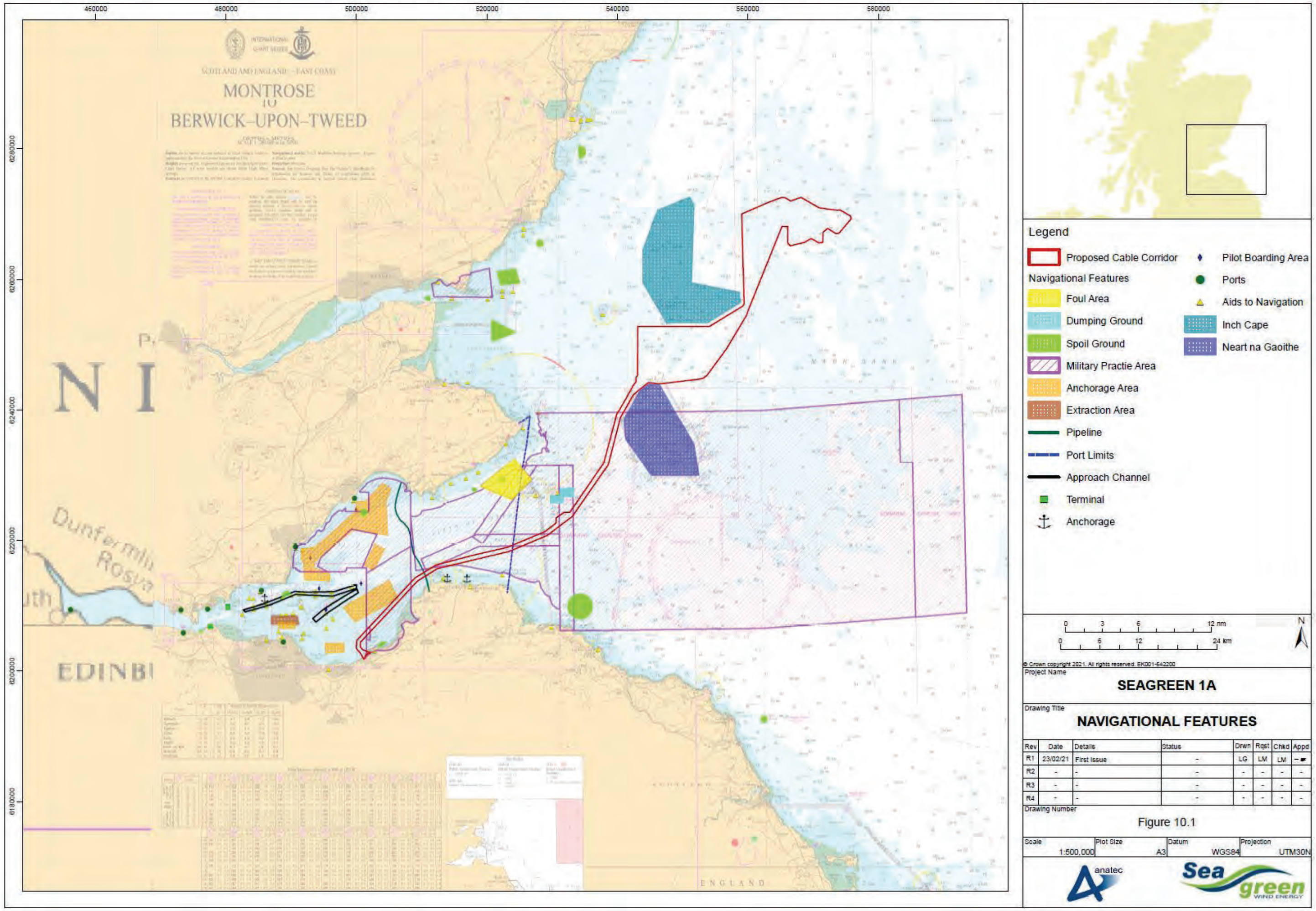

Figure 10-1 Navigational Features

10.5.2 Maritime Incidents

Incident data recorded by the MAIB and the RNLI between 2008 and 2017 was reviewed. A total of 46 unique incidents were recorded by the MAIB and 348 unique incidents were recorded by the RNLI within 5 nm of the proposed offshore SG1A Project export cable corridor.

The most frequently recorded incident types recorded by the MAIB included machinery failure (52%) followed by hazardous incidents (22%). Vessels frequently involved in maritime incidents recorded were fishing vessels (63%) and dry cargo (11%).

Machinery failure (30%) was the most frequently recoded incident type by the RNLI in the 5 nm study area, followed by person in danger (28%). The majority of incidents recorded in the study area involved a person in danger (24%), followed by fishing vessels (23%).

10.5.3 Marine Traffic

A total of twelve months AIS data from January to December 2019 was used to inform the baseline shipping analysis (full analysis is provided in Appendix D: Offshore SG1A Navigational Risk Assessment).

A study area was defined as a 5 nm buffer around the offshore SG1A Project export cable corridor.

There was an average of 34 unique vessels recorded per day within the study area during the 12-month period. July was the busiest month with an average of 49 unique vessels per day. The quietest month recorded was January with an average of 17 vessels per day.

The tracks of all vessels recorded on AIS within the study area during the study period are presented in Figure 10-2, colour coded by vessel type. The most common vessel type recorded within the offshore SG1A Project study area was fishing vessels which accounted for 32% of the overall distribution, followed by tankers (26%) and cargo vessels (19%). Figure 10-3 presents the vessel type distribution, based on unique vessels per day.

It is noted that recreational craft and small fishing vessels less than 15 m in length may be under-represented due to AIS carriage requirements. In addition, there may be some loss of coverage further offshore, especially in the winter period, due to the range from the AIS receivers.

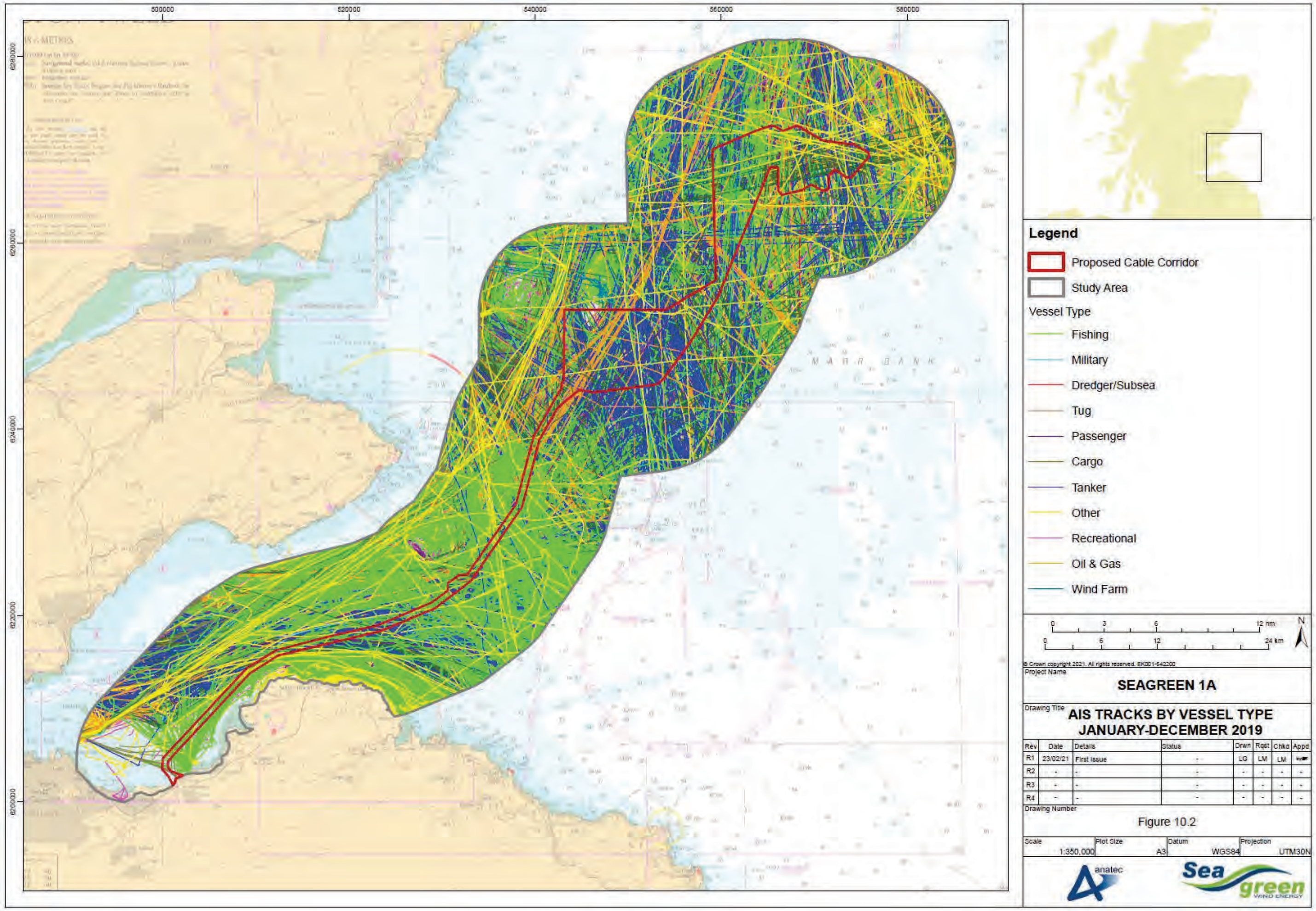

Figure 10-2 AIS tracks by vessel type January- December 2019

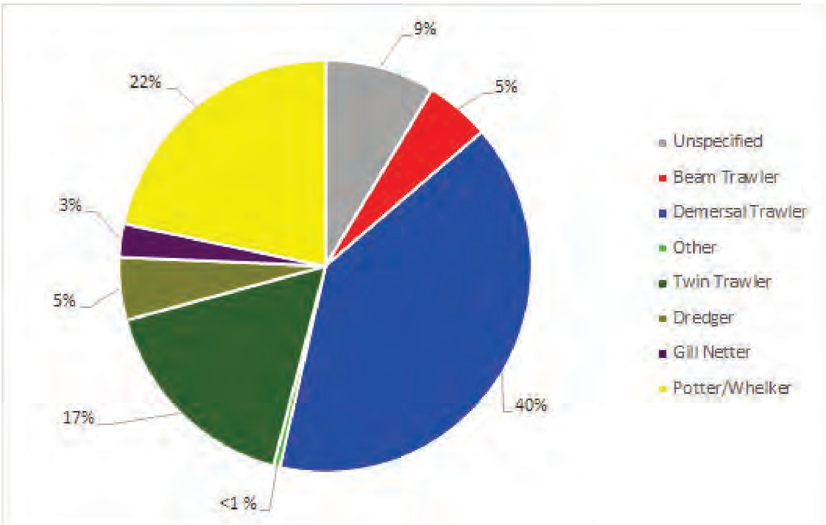

Figure 10-3 Vessel Type Distribution

The average vessel length recorded in the study area was 73 m. The largest vessel recorded was a 336m crude oil tanker transiting to Hound Point oil terminal within the Firth of Forth. The average vessel draught recorded in the study area was 6m. As noted above, smaller draught vessels (recreational craft and fishing vessels) are likely under-represented in the above graph, and the average draught is therefore likely to be smaller.

Deadweight Tonnage (DWT) is not broadcast on AIS and, where possible, has been researched separately by Anatec based on the ship identity information. In some cases, approximations were based on the vessel type and dimensions (mainly for small fishing vessels and recreational craft estimated to be less than 500 DWT). It was seen 41% of vessels recorded in the summer were identified or estimated to have a DWT less than 100 and can be seen transiting the entire study area. This is reflective of the high number of small fishing vessels in the study area.

High density within the study area can be associated with vessel cargo and tankers entering / exiting ports within the Firth of Forth such as Grangemouth, Rosyth and Leith and the terminals at Braefoot and Hound Point (see

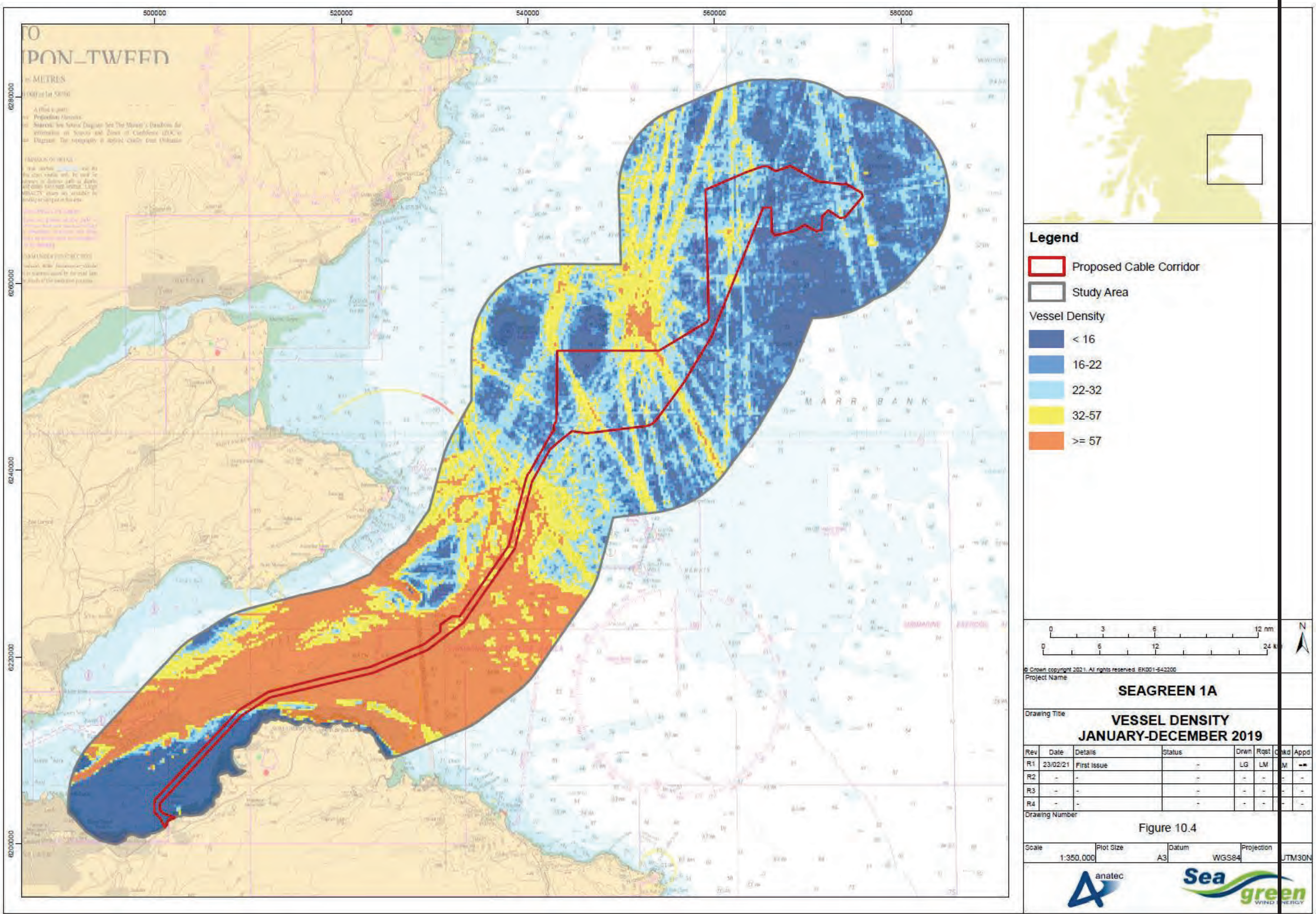

Figure 10-4). Low density areas can be seen in coastal waters within the Forth Ports limits and further offshore.

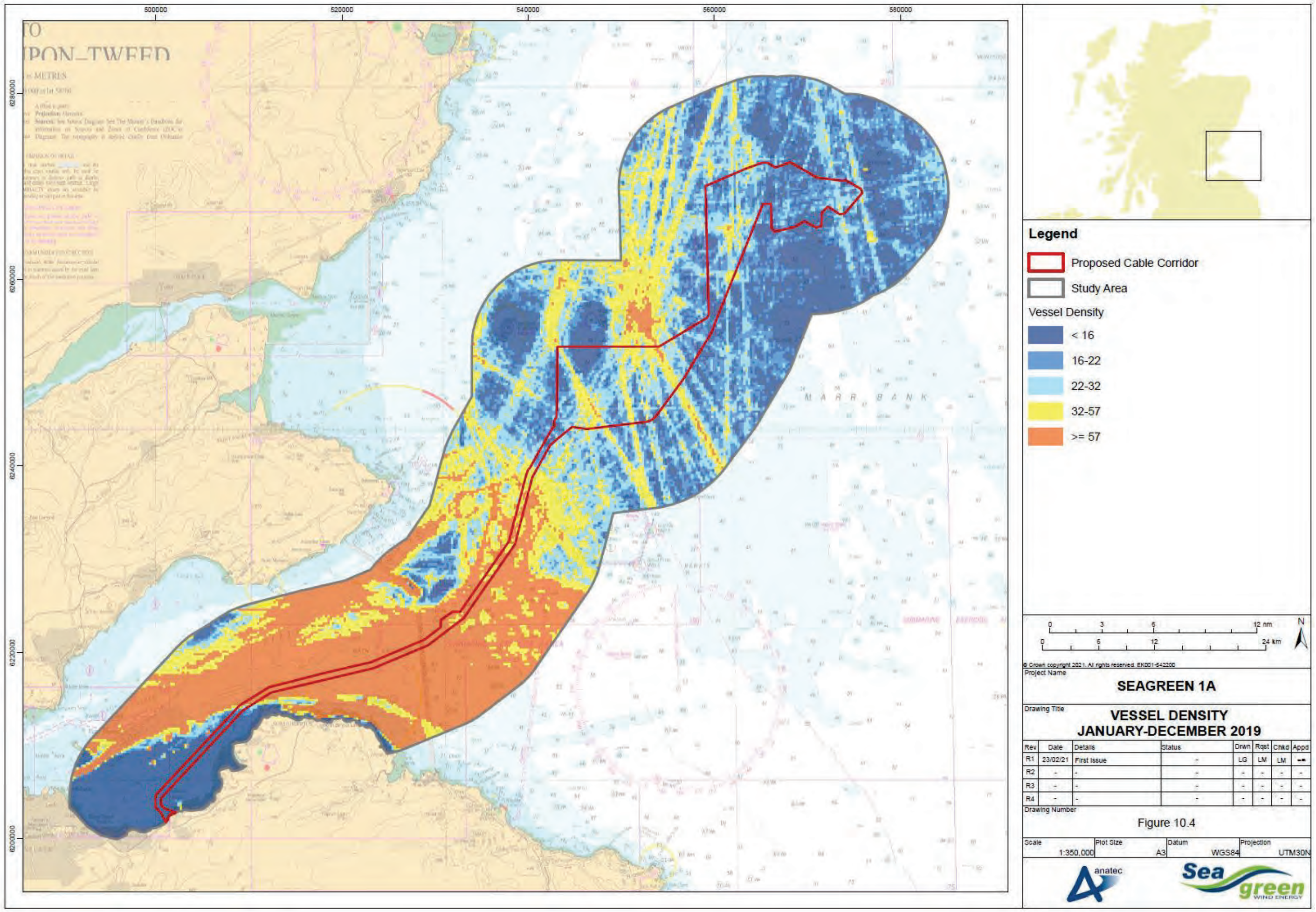

Figure 10-4 Vessel density January-December 2019

10.5.4 Anchoring Activity

There was an average of two unique vessels per day recorded at anchor within the study area during the twelve-month study period. The tracks of vessels at anchor are presented in

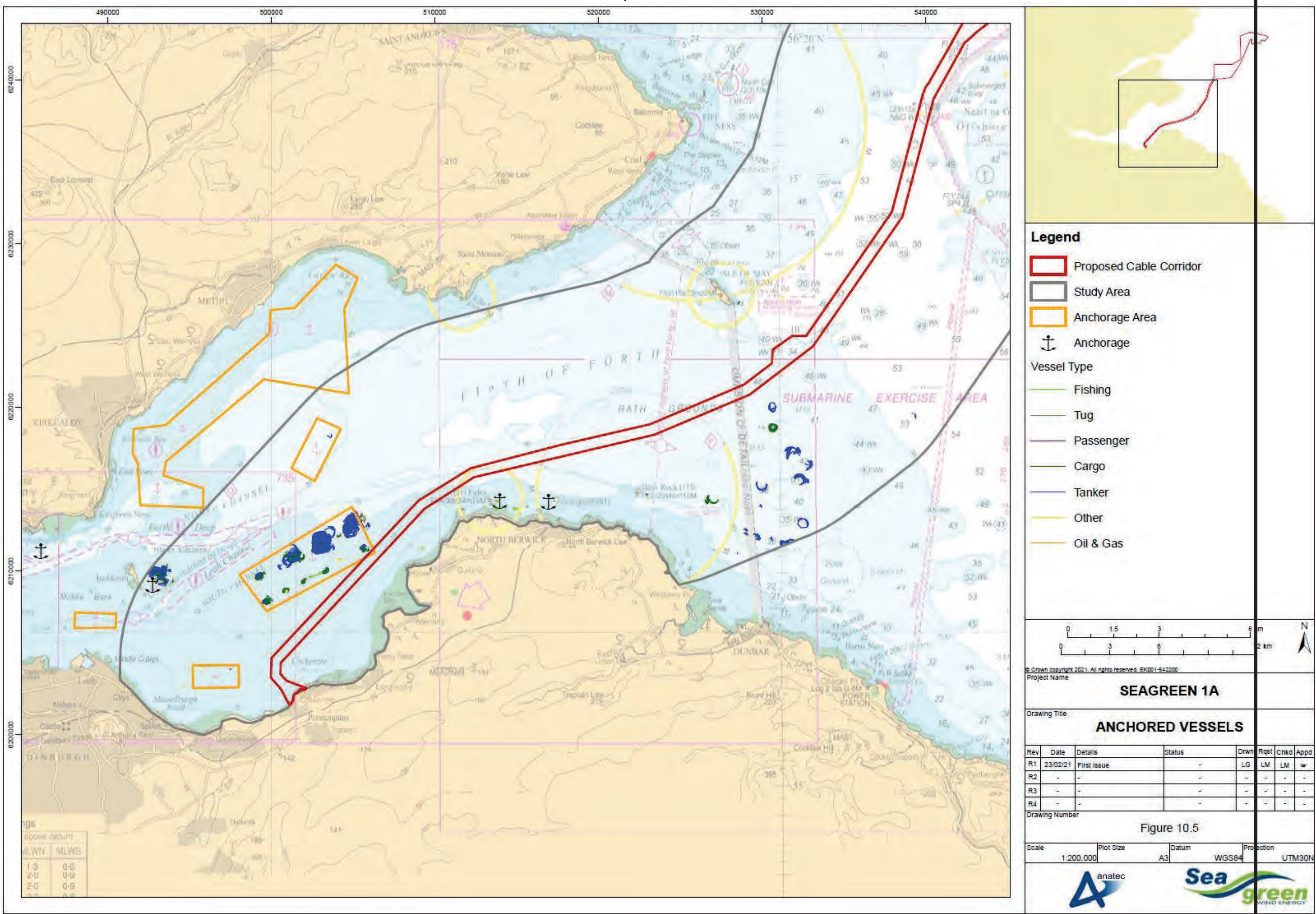

Figure 10-5. The majority of anchored vessels were tankers (65%) and cargo vessels (27%) transiting to destinations such as Grangemouth, Hound Point and Leith. The majority of anchored vessels recorded in the study area were associated with designated anchorage areas close the cable corridor and in a popular area just outside port limits.

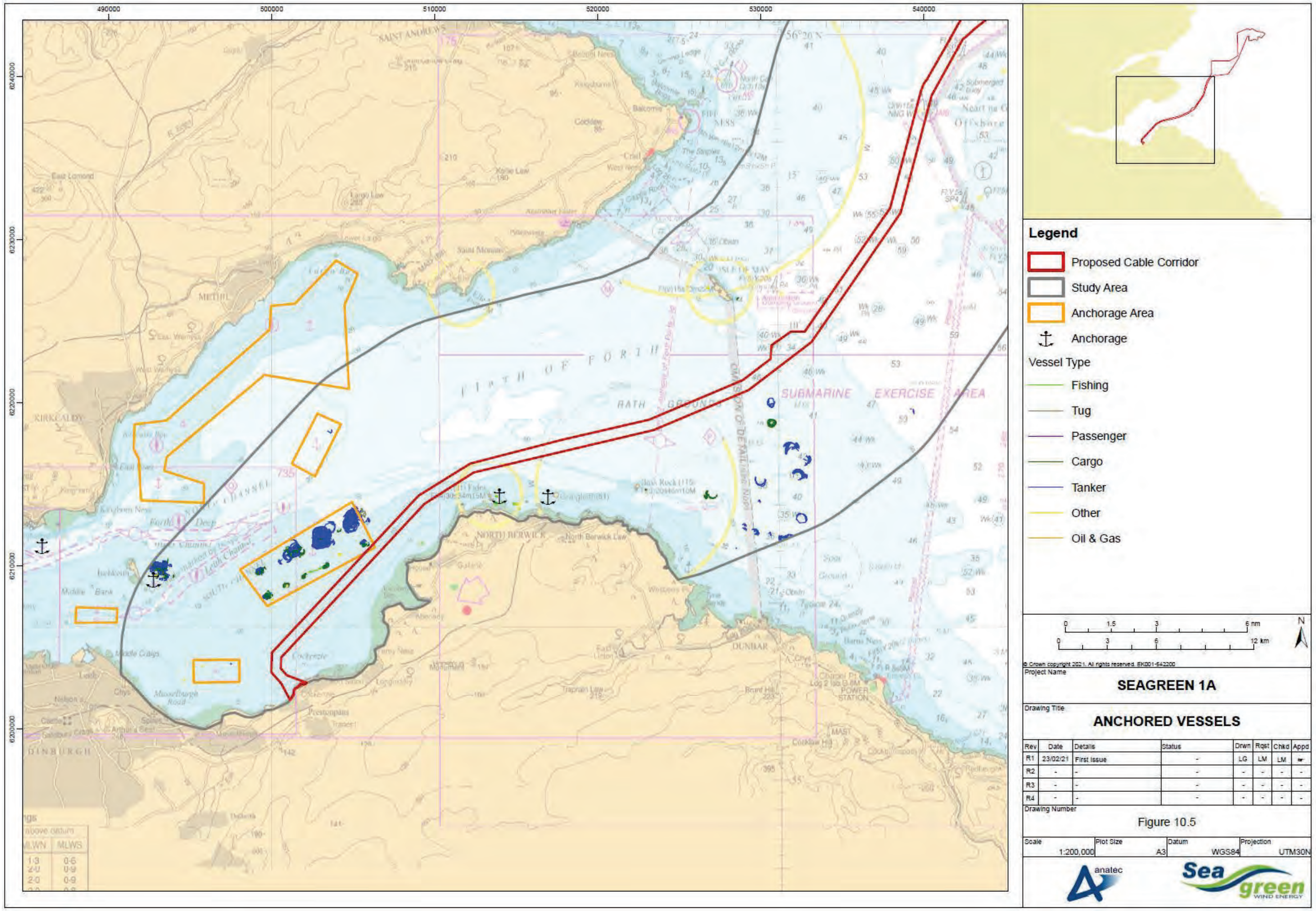

Figure 10-5 Anchored vessels

10.5.5 Fishing Activity

High levels of fishing activity were recorded throughout the entire study area, as shown in

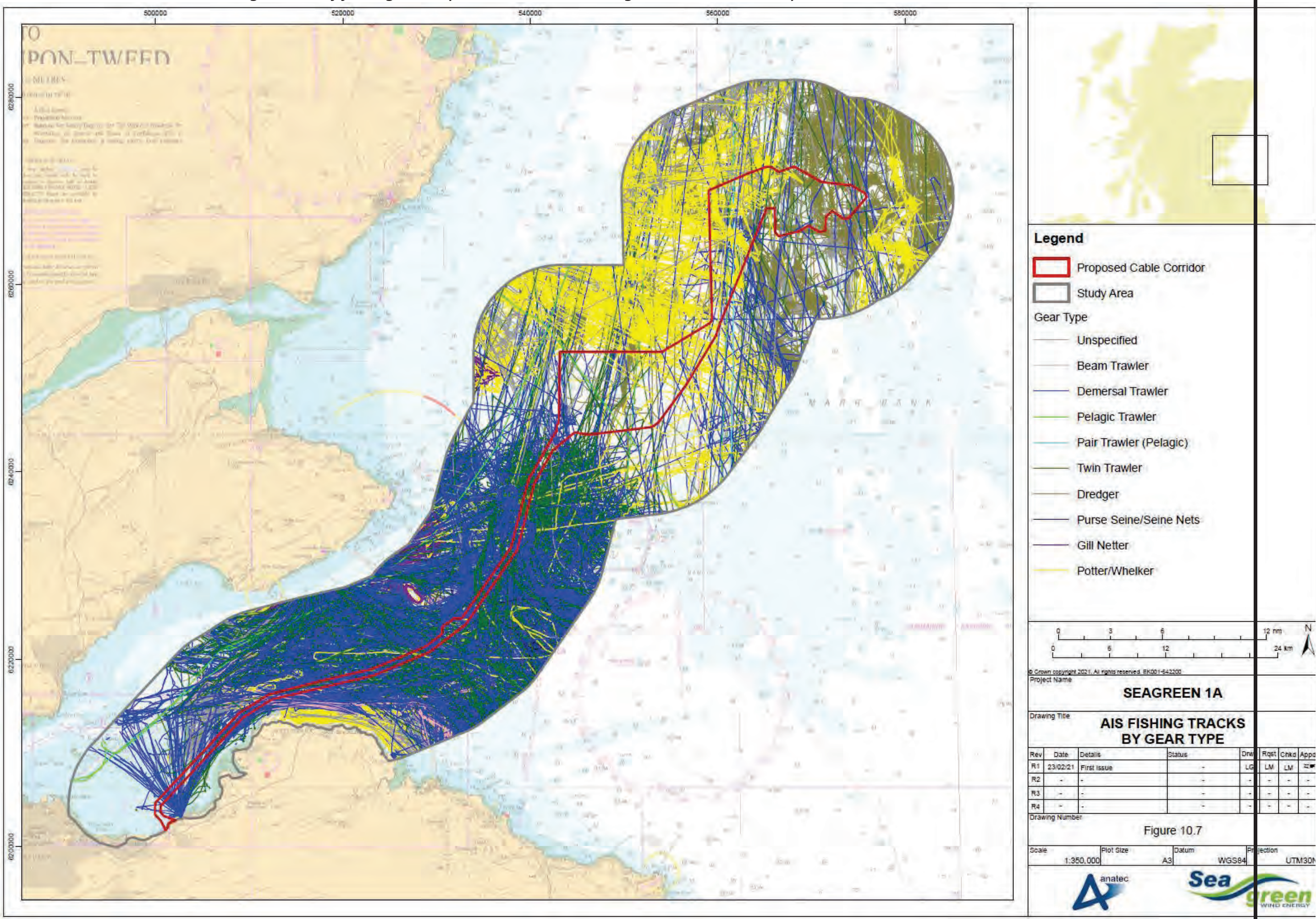

Figure 10-7, which presents the AIS fishing tracks colour-coded by gear type.

The busiest month for fishing vessels was July with an average of 20 unique vessels per day. The quietest month was January with an average of six unique vessels per day.

As presented in Figure 10-6, the most frequently recorded gear type in the study are demersal trawlers, followed by potters / whelkers and twin trawlers. Gear types included in the 'other' are purse seines / seine nets, pelagic trawlers and pelagic pair trawlers.

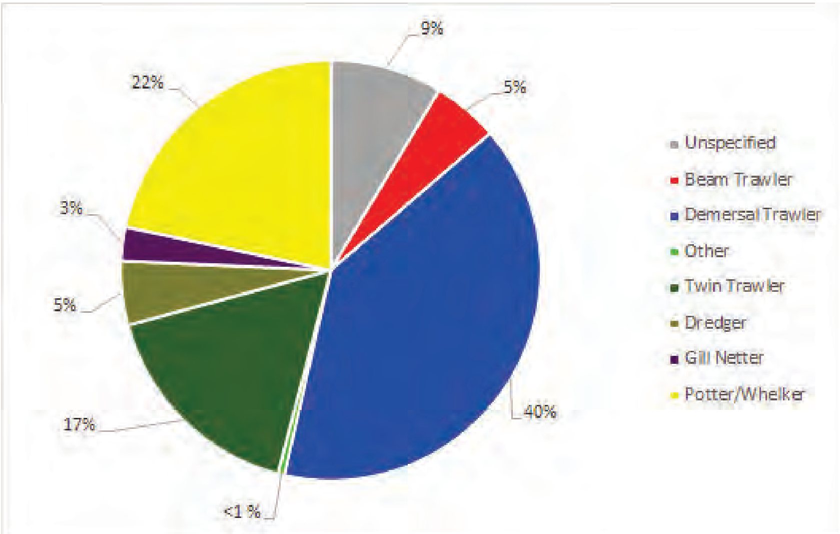

Figure 10-6 Fishing Gear Type Distribution

Overall, approximately 67% of gear types in the area were demersal, i.e. towed along the seabed. This includes demersal trawlers, beam trawlers, twin trawlers and dredgers.

The majority of fishing vessels recorded within the study area were UK-registered. Other nationalities identified include Dutch and Danish.

The average fishing vessel length recorded was 15 m. Approximately 60% of vessels were less than 15m in length and hence carrying AIS voluntarily. It is again noted that vessels less than 15 m are likely under-represented, particularly within inshore waters.

The average fishing vessel speed recorded in the area was 4 knots. Overall, 84% of vessel speeds were below six knots. Vessels with average speeds less than six knots generally are much more likely to be engaged in fishing activities whilst those with higher speeds (i.e. greater than six knots) are likely transiting through the area. Vessels engaged in fishing activities will be more greatly impacted by the cable installation works than those transiting through the area.

The Vessel Monitoring System (VMS) satellite tracking data was obtained from Marine Scotland. Vessel positions within VMS data are received approximately once every 1 to 2 hours for vessels of 12 m in length and above. The data is comprehensive for UK vessels globally, and fishing vessels from EC countries within British Fishery limits and certain other countries, e.g., Norway.

Gear type and length information is not provided within the VMS data and, as vessel names and identities are redacted, it is not possible to research these vessels. The anonymity of VMS data also meant it was not possible to filter out guard vessels from the VMS analysis.

The VMS data analysed from 2018 and 2019 correlated well with the AIS data in terms of overall fishing activity over the 12 month period.

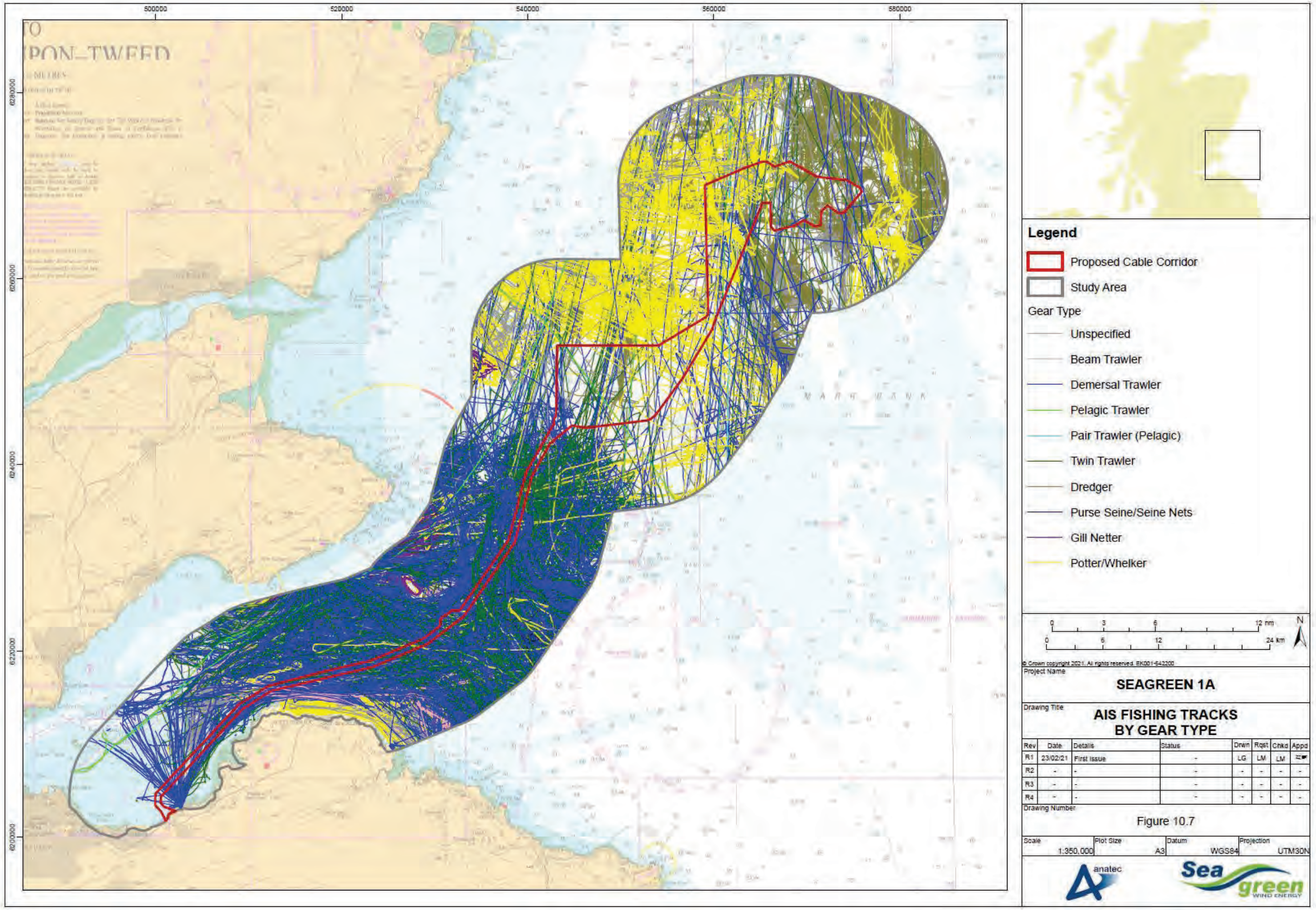

Figure 10-7 AIS fishing tracks by gear type

10.5.6 Recreational Vessels

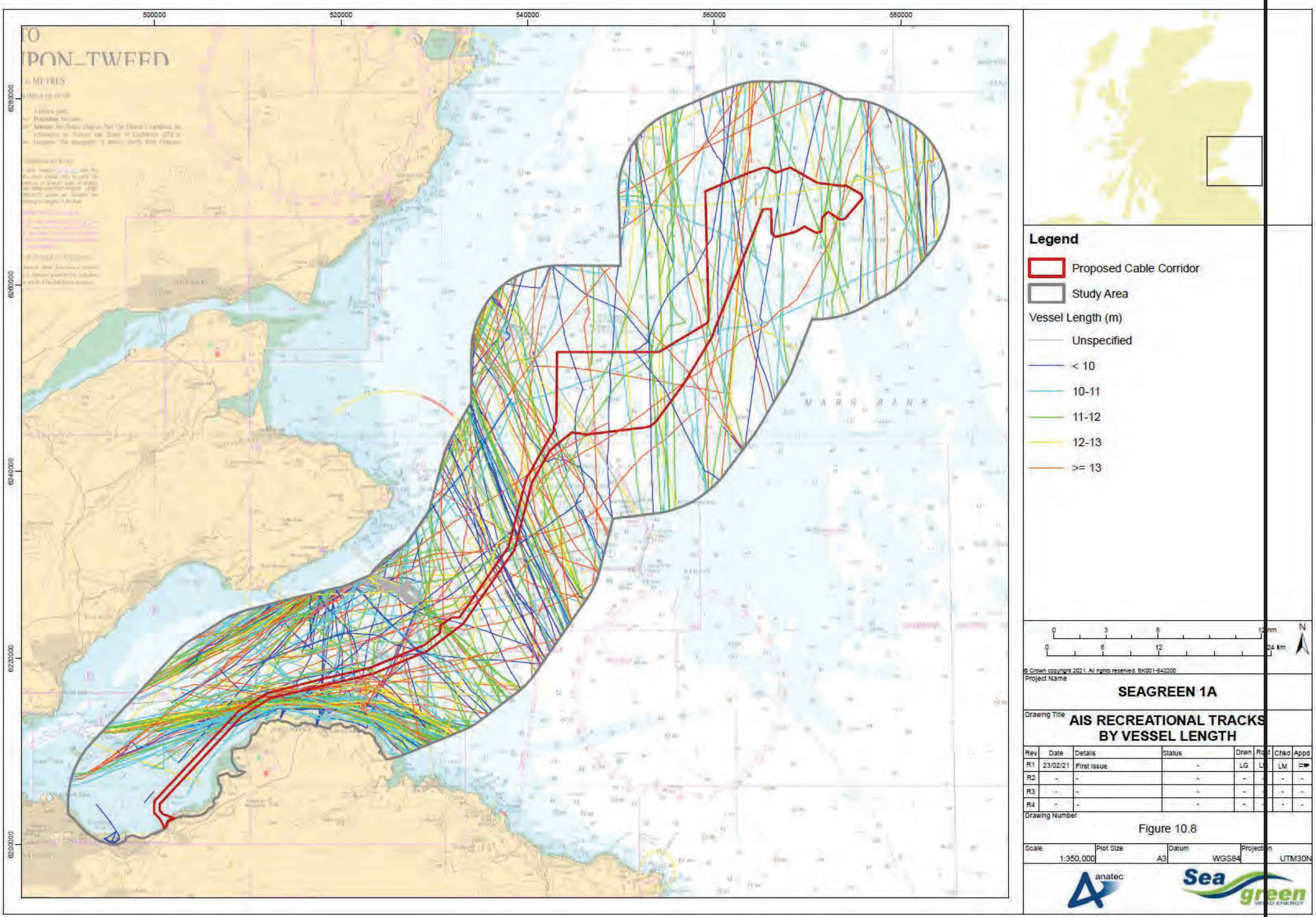

Figure 10-8 presents the AIS recreational tracks within the study area, colour-coded by vessel length. It is noted that recreational activity may be under-represented in the above figure as recreational craft are not required to carry AIS.

There was an average of one unique recreational vessel per day recorded on AIS over the 12 month period. The busiest month was July with an average of five unique vessels. There were no recreational vessels recorded in January.

Excluding vessels with unspecified lengths, the average length of recreational vessels within the study area was 12 m.

There are a number of recreational facilities located in proximity to the offshore SG1A Project export cable corridor such as Queensferry Boat Club, Forth Cruising Club, and Royal Forth Yacht Club. Port Edgar accommodates a yacht marina administrated by City of Edinburgh Council.

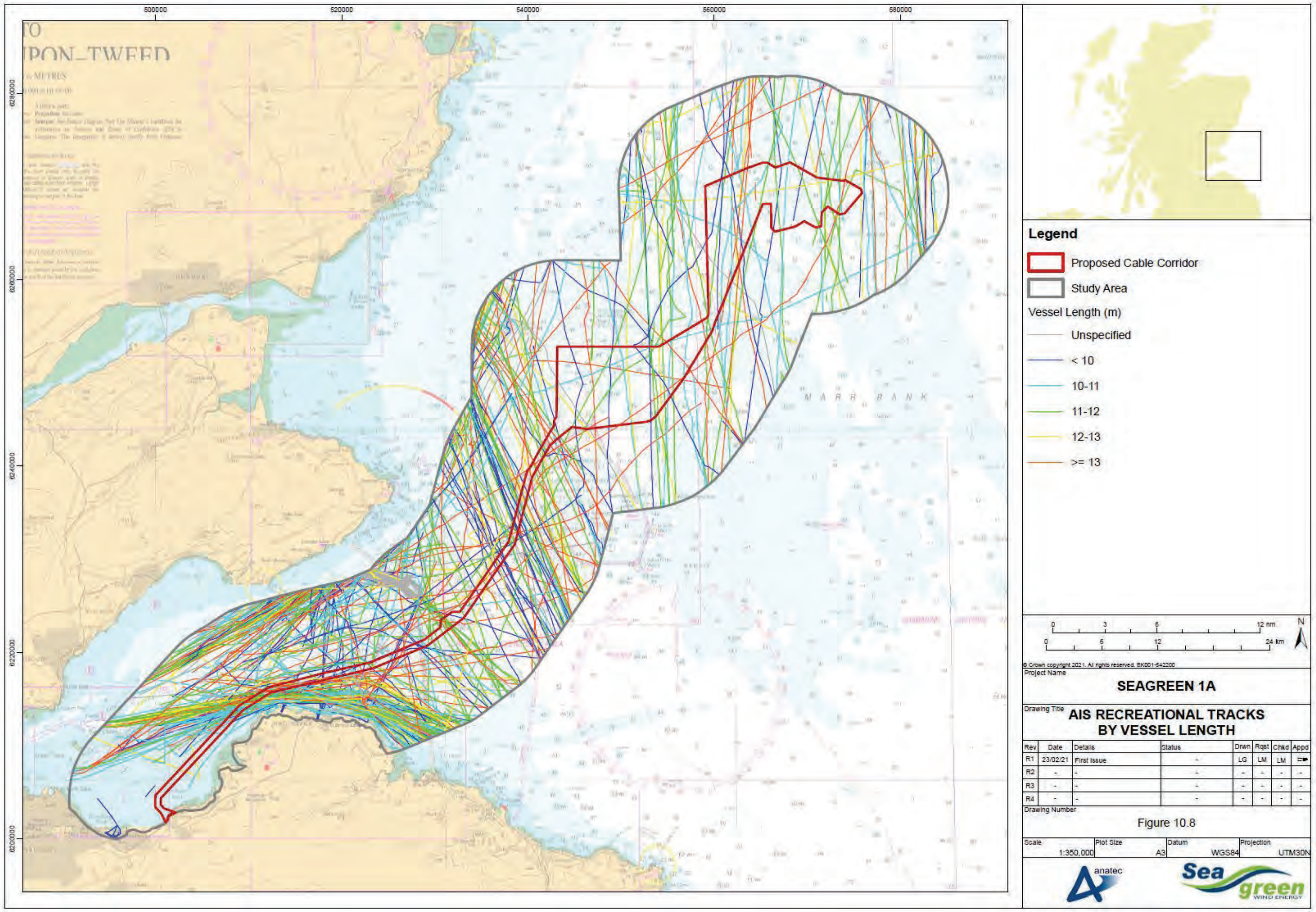

Figure 10-8 AIS recreational tracks by vessel length

10.5.7 Future Baseline

In order to inform any likely future changes in shipping, a brief review of vessel traffic calling at major ports relevant to the area was carried out to determine the trends in shipping in the past years. Typical destinations broadcast by commercial vessels within the study area include Grangemouth, Leith, Aberdeen and Rotterdam. Although declining trends were identified in the total traffic visiting some of the Scottish ports, others European ports such as Rotterdam showed fairly consistent growth despite declines in certain commodities e.g. dry bulk. Despite any declines, forecasts for 2030 predict growth in international trade (Oxera, 2015).

In previous studies, a predicted increase of 10% has conservatively been assumed for the future change in shipping. It is noted that the growth in UK shipping in particular is uncertain due to the many unknowns surrounding the decision to leave the EU and therefore, this may affect commercial shipping activity.

Fishing activity was significant with the baseline assessment; however, trends are difficult to predict and can depend on various influencing factors such as fish stocks, quotas, etc. Fishing activity could change significantly due to the changes in legislation post-Brexit.

Recreational activity may remain similar or increase slightly in future years, due to population growth and longer life expectancies, which means people have more leisure time. However, this can also be impacted by factors such as weather and economy.

10.6 Assessment Criteria

The impact assessment process has been evaluated using the IMO FSA methodology (IMO, 2002), which is recognised as industry best practice for a navigational risk assessment. The FSA assigns each impact a "severity of consequence" and "frequency of occurrence" to evaluate the significance during the construction, operation and maintenance and decommissioning phases of the Proposed Development. The definitions used in the FSA to evaluate the consequence and frequency of impacts are presented in Table 10.3 and Table 10.4 respectively.

Table 10.3 Severity of Consequence

Severity	Definition
Catastrophic	• Total loss of a vessel or crew; and • Extensive environmental damage.
Serious	• Loss of a crew member, or multiple serious injuries; • Major damage to infrastructure or vessel; • Major environmental damage; and • Major national business, operation or reputation impacts.

Severity	Definition
Moderate	• Serious injury to person; • Notable damage to infrastructure or vessel; • Significant environmental damage; and • Considerable business, operation, or reputation impact.
Minor	• Slight injury(s) to person; • Minor damage to infrastructure or vessel; • Minor environmental damage; and • Minor business, operation, or reputation impact.
Negligible	• No injury to persons; • No significant damage to infrastructure or vessel; • No environmental damage; and • No significant operational impacts.

Table 10.4 Frequency of Occurrence

Frequency	Definition
Frequent	Will occur on a regular basis during the project.
Reasonably Probable	Extremely likely to happen during the project span.
Remote	Likely to happen during the project span.
Extremely Unlikely	Unlikely to happen but not exceptional.
Negligible	Only likely to happen in exceptional circumstances.

The severity of consequence and frequency of occurrence rankings are then used to determine the level of significance for each impact during each of the three phases of the offshore SG1A Project. The overall significance of impacts has been assessed as "Unacceptable", "Tolerable" or "Broadly Acceptable" with the definitions of these given in Table 10.6. The risk matrix used to assign significance is presented below.

Table 10.5 Risk Matrix

Frequency						
Frequency	Frequent	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
Frequency	Reasonably Probable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
Frequency	Remote	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
Frequency	Extremely Unlikely	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
Frequency	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Minor	Moderate	Serious	Catastrophic
		Severity				

Table 10.6 Significance Definitions

Significance	Definition
Unacceptable (High Risk)	Generally regarded as unacceptable whatever the level of benefit associated with the activity. Significant risk mitigation or design modification required to reduce to tolerable (ALARP).
Tolerable (Moderate Risk)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are as low as reasonably practicable (ALARP) and that risks are periodically reviewed to monitor if further controls are appropriate.
Broadly Acceptable (Low Risk)	Generally regarded as acceptable and adequately controlled. At these risk levels the opportunity for further reduction is limited.

10.7 Identification of Potential Impacts

The impacts identified based on the shipping and navigation baseline assessment are summarised and listed below in Table 10.7. The impacts are grouped by phase, i.e. construction / decommissioning, and operation and maintenance.

Table 10.7 Assessed Impacts

Phase	Impact
Construction / Decommissioning	Collision of a passing (third party) vessel with a vessel associated with the cable installation.
	Cable installation causing disruption to passing vessel routeing/timetables.
	Cable installation causing disruption to fishing and recreational activities.
	Cable installation causing disruption to military exercises.
	Cable installation causing disruption to aggregate dredging activities.
	Cable installation vessel allides with wind turbine.
	A vessel drags anchor over the exposed cable.
	A vessel drops anchor in an emergency over the exposed cable.
	A vessel engaged in fishing snags its gear on the exposed cable.
Operation and Maintenance	A vessel drags anchor over the cable.
	A vessel drops anchor in an emergency over the cable.
	A vessel engaged in fishing snags its gear on the cable.
	A vessel grounds due to reduced under keel clearance.
	Collision of a passing vessel with a vessel associated with maintenance works / monitoring of the cable.
	Interference with magnetic compass onboard passing vessels

The following impacts have been excluded from the assessment, as they may cause damage to the cable but do not impact on other users of the sea.

- A vessel founders (sinks) onto the cable – the cable may be damaged by a foundering vessel, but there is no impact to the vessel due to the existence of the cable.

- A vessel drops an object, e.g. container, onto the cable – the cable may be damaged by an object being dropped from a vessel (e.g. containers from a container ship), however the existence of the cable does not affect the risk to the vessel.

Decommissioning is assumed to have similar (or lesser) impacts than installation. The decommissioning of the cables may be subject to a separate assessment nearer the time, determined by the relevant legislation and guidance available, and therefore, has not been assessed in detail.

10.8 Embedded Mitigation Measures

This section details the embedded mitigation measures of the offshore SG1A Project, included as part of the FSA process.

Construction / Decommissioning Phase

The mitigation measures assumed to be in place during the construction / decommissioning phases are detailed below:

- Circulation of information via Notices to Mariners, Radio Navigational Warnings, Navigational Telex (NAVTEX), and/or broadcast warnings in advance of and during the offshore works. Information will also be circulated to local marinas in the area and notices will include a description of the work being carried out.
- Additional communication with Forth Ports will be undertaken when full details of construction works are known.
- Cable lay vessels (CLV) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability.
- Temporary aids to navigation will be deployed (if required) to guide vessels around any areas of installation activity.
- Guard vessel(s) will be employed to work alongside the installation vessel(s) during the construction period. The guard vessel(s) will alert third party vessels to the presence of the installation activity and provide assistance in the event of an emergency.
- Compliance with COLREGS (IMO, 1972) and SOLAS (IMO, 1974).
- Passing vessels will be requested to maintain a "safe" distance from installation vessels restricted in manoeuvrability, e.g. for a CLV with dynamic positioning a typical safe distance is 500m. This will be monitored by guard vessels.
- Where cable exposures exist that would result in significant risk, guard vessels will be used until the risk has been mitigated by burial and/or other protection methods.
- Liaison with Forth ports and local harbours.
- Liaison with operators of nearby offshore wind farms.
- A Fisheries Liaison Officer (FLO) will be in place.

Operation & Maintenance Phase

The mitigation measures assumed to be in place during the operation & maintenance phase are detailed below:

- The export cable will be clearly marked on nautical charts with associated note/warning.
- The export cable will be suitably protected, e.g., buried where feasible, to help protect against snaggings from fishing gear and risk from vessel anchors. Protection will be informed by a Cable Burial Risk Assessment (CBRA) which takes into account fishing and anchoring practices. It is anticipated that at least 80% of the cable will be buried. Alternative protection measures (rock placement, concrete mattresses or grout bags) will be used where burial is not feasible.
- In water depths of greater than 20m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20m, the water depth will not be affected by more than 1m. Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out.
- Compass deviation effects will be minimised through cable design and separation distance.

10.9 Assessment of Impacts

This section identifies aspects of the offshore SG1A Project export cable corridor which have the potential to impact the shipping and navigation receptors identified from the baseline assessment.

10.9.1 Identified Impacts

This section outlines the impacts (summarised in Table 10.7) that have been considered as part of the FSA process.

10.9.1.1 Construction Impacts

Increased Collision Risk

There is an increased collision risk created during the construction phase for all passing traffic due to the presence of vessels associated with the construction of the offshore SG1A Project export cable corridor, including vessels involved in seabed preparations, cable installation and cable burial. The nature of cable installation, and other construction activities, requires large, slow moving vessels which will be restricted in their ability to manoeuvre. Therefore, these vessels may have limited capability in taking avoidance action from a passing vessel on a collision course, should such a situation arise. Due to their size and mobility in comparison, smaller vessels associated with the construction phase, e.g. tugs, guard vessels, are considered to pose a lesser risk of collision than that of the cable installation vessels.

The collision risk is likely to be greater in higher density shipping areas. The highest density areas for the offshore SG1A Project export cable corridor are associated with cargo vessels and tankers transiting to ports within the Firth of Forth.

It is expected that the majority of vessels in the area will be aware of the installation work before encountering the installation vessels through embedded mitigation such as circulation of information through Notices to Mariners, etc. AIS broadcast, marking and lighting of construction vessels, and the presence of guard vessels will also raise awareness of the construction work to passing vessels. Communication with Forth Ports when a detailed construction plan is available should help to minimise collision risk associated with the navigational approach channels.

It is anticipated that the offshore SG1A Project export cable corridor installation and associated works will take place between Q2 and Q3 of 2023. The seabed preparation and cable installation operations are expected to take four weeks per operation, while the landfall works including trenchless installation could take up to two months. Cable pull in, placement of external protection and post-lay survey are expected to take one week each.

The frequency of this impact is considered to be **Extremely Unlikely**, taking into account all embedded mitigation. Since vessel collision could lead to significant damage to one of the vessels involved, and potential injury to crew members, the severity is ranked as **Serious**, resulting in an overall ranking of **Tolerable**.

Disruption to Vessel Routeing/Timetables

Installation of the cables may also cause disruption to vessel routeing/timetables. The risk of a collision between two third-party vessels may also be increased as a result of route deviation.

This will most likely affect busier areas of shipping where vessels are transiting on regular routes with a time schedule. The proposed offshore SG1A Project export cable corridor is routed through the Forth Ports limits and cable installation works could cause disruption to vessels approaching ports within the Forth Ports Limits (such as Grangemouth, Leith and Rosyth), and pilot vessels associated with Forth Ports.

Through circulation of information, the vast majority of vessels should be aware of the cable work in advance, allowing routes to be planned with minimal impact on schedules. Liaison with the Forth Ports will help minimise impacts associated with areas where sea room is limited.

The frequency of this impact is considered to be **Reasonably Probable**, however due to the temporary nature of the works, the severity is considered to be **Minor**, resulting in an overall ranking of **Tolerable**, taking into account all planned embedded mitigation.

Disruption to Fishing & Recreational Activities

From the baseline assessment, it can be seen that regular fishing and recreational activity is observed within the vicinity of the cable route. Installation vessels, and vessels associated with the trenchless installation works, therefore may cause a disruption to both local fishermen and recreational boaters along the entire cable route. It is noted that recreational craft and small fishing vessels close to shore are likely under-represented by the AIS data.

This impact is likely to be along the length of the cable for fishermen and mainly in nearshore waters for recreational users. It is expected that embedded mitigation such as presence of guard vessels and promulgation of information will notify sea users of construction works. It is noted that recreational vessels may be less aware of construction works than commercial vessels. The appointment of a Fisheries Liaison Officer (FLO) will aid in ensuring local fishermen are made aware of construction works.

The frequency of this impact is considered to be **Reasonably Probable** and the severity **Minor**, resulting in an overall ranking of **Tolerable**, taking into account all embedded mitigation.

Disruption to Military Exercises

The offshore SG1A Project export cable corridor intersects a number of Ministry of Defence (MOD) practice and exercise areas (PEXA). These areas are operated under a clear range procedure, that is, no firing will take place unless the area is considered to be clear of all shipping. Therefore, no firing is expected to be undertaken while there is construction work ongoing within the area.

Assuming embedded mitigation measures (e.g. circulation of information) are in place preceding any installation works, it is likely the installation work timetable will be taken into consideration by the MoD if any exercises were scheduled to take place within the area.

The frequency of this impact is considered to be **Extremely Unlikely** and the severity **Minor**, resulting in an overall ranking of **Broadly Acceptable**, taking into account all embedded mitigation.

Disruption to Aggregate / Maintenance Dredging

There are currently no licensed aggregate extraction areas for Scotland. A review of the AIS data also confirmed that there was no dredging activity within the study area, although dredgers were noted to transit through the area.

Leith approach channel is maintained at a dredged depth of 6.71 m below Admiralty chart datum. Maintenance dredging of this approach channel could therefore be disrupted by construction activity. However, the channel is 3 nm from the cable route and there should therefore be sufficient room to navigate around the construction works.

It is assumed that embedded measures (i.e. promulgation of information) are in place preceding any construction works.

The frequency of this impact is considered to be **Extremely Unlikely** and the severity **Minor**, resulting in an overall ranking of **Broadly Acceptable**, taking into account all embedded mitigation.

Cable Installation vessel Allides with Wind Turbine

Given the proximity of the cable route to nearby wind farms, there is the potential for a cable installation vessel to allide with a wind turbine. Neart na Gaoithe is the closest consented wind farm site in proximity to the proposed offshore SG1A Project export cable corridor, located 200 m to the south. Neart na Gaoithe is currently under construction and is expected to be fully operational in 2023. It is noted that the wind turbines may not be located at the edge of the site boundary, and the distance between the cable route and the turbines may be slightly larger.

The Inch Cape development area is located 600 m north of the proposed cable corridor. The Inch Cape Offshore Wind Farm is consented with no further timescales available.

Due to the distance of the proposed cable from the wind farm site boundaries, there may be a risk that an installation vessel allides with an existing wind turbine depending on project timescales. This could be a powered collision, e.g. due to navigational error or equipment failure, or a drifting collision, due to the vessel losing power.

The risk will be mitigated by good communication between the Seagreen project team and the wind farm developers, installation vessels following best practise guidelines, guard vessels, etc.

The frequency of this impact is considered to be **Remote**, taking into account all embedded mitigation. Since vessel collision could lead to significant damage to the vessel and potential injury to crew members, the severity is ranked as **Serious**, resulting in an overall ranking of **Tolerable**.

Anchor Dragging onto Exposed Cable

There is a risk that an anchored vessel will lose its holding ground and subsequently drag anchor over the cable. Significant anchoring activity was found in designated anchorage areas, one of which intersects the cable route. The closest vessel at anchor was located approximately 240 m north of the proposed cable corridor.

A decision has not yet been made on whether the cable installation will be simultaneous lay and burial or post-lay burial. Should the latter option be chosen, there may be a period of time (estimated to be up to 100 days) after laying when the cables are exposed and not protected through burial or other means such as rock placement. This period represents a potentially higher risk of interaction from vessel anchors with the exposed cable.

While exposed any vessel anchor could interact with the cables. If an anchor becomes snagged on the cables, there could be a risk of injury in trying to free it. If the anchor cannot be freed the safest action is to slip it, and not attempt to raise or cut the cable. Smaller vessels may be at risk of losing stability and capsizing in the worst case.

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of this impact is considered to be **Remote** due to the potential for the cables to be exposed, but taking into account all embedded mitigation measures. The severity is considered to be **Serious**. This results in an overall ranking of **Tolerable**, taking into account all embedded mitigation.

Emergency Anchoring onto Exposed Cable

If a passing vessel suffers engine failure, there is a possibility that it may drop anchor to avoid drifting into an emergency situation such as a collision or grounding. This is more likely to occur in areas closer to the coast or to other hazards (e.g. offshore developments) where there is a higher risk of grounding or collision. In open waters where depths are deeper and anchoring may not be feasible, the vessel is more likely to attempt to either fix the problem or await assistance.

The maritime incident data showed that the most frequent incident type to be recorded was machinery failure, which could lead to emergency anchoring.

During the period where the cables may be exposed, any anchor could interact with the cable. If the anchor fouls the cable, there could be a risk of trying to free it. Smaller vessels may be at risk of losing stability and capsizing in the worst case. If the anchor cannot be freed it should be slipped, and no attempt made to raise or cut the cable.

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of this impact is considered to be **Remote** due to the potential for the cable to be exposed, but taking into account all embedded mitigation measures (in particular, guard vessels). The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

Fishing Gear Snagging onto Exposed Cable

Fishing vessels carrying demersal gear that interacts with the seabed when deployed are at risk of snagging on subsea cables. Demersal gear types identified in the baseline assessment include demersal otter trawlers, beam trawlers and boat dredges, which together contributed 67% of gear types recorded on AIS in the area. The highest risk area of snagging is waters outside the Forth Ports limits where vessels were recorded actively engaged in fishing operations (e.g. significant demersal trawling activity across cable route). It is also noted that there is likely to be significant activity from small fishing vessels in coastal waters, which may be under-represented in the AIS data.

There is higher risk of snagging from demersal gear if the cable is exposed. Consequences of snagging could range from damage to gear and the cable, loss of stability due to lines being put under strain and in the worst case, capsize of the vessel, men overboard and risk of injury or fatality. For example, a risk of capsize could occur if the vessel attempted to free its gear by raising the cable rather than releasing the gear.

It is expected that mitigation including having a FLO in place and circulation of information (e.g. via Kingfisher and local communications) will help ensure fishermen are aware of the exposed cable and avoid fishing directly over it. In addition, guard vessels will be used in any areas where cable exposures are considered to present significant risk to fishing gear snagging.

The frequency of this impact is considered to be **Remote** during the period that the cable is left exposed, but taking into account all embedded mitigation, and the severity **Serious**, resulting in an overall ranking of **Tolerable**.

10.9.1.2 Operations & Maintenance

Anchor Dragging

Anchoring activity in proximity to the marine cable route has been described previously under the description of this impact during the construction phase. Once the cable is protected, either through burial and/or other protection measures, larger vessels (e.g. cargo vessels and tankers) are more likely to threaten the cable as their anchors are able to penetrate deeper into the seabed. The anchors of smaller vessels (e.g. fishing and recreational craft) are unlikely to penetrate as deep.

Embedded mitigation includes marking cables on nautical charts which will alert mariners to the presence of the cable. Following the installation and charting of the cable, it is expected that vessels will not plan to anchor in its immediate proximity. Cable protection has been confirmed with target burial depths between 1m and 3m. This has been informed by a Cable Burial Risk Assessment (CBRA) and it is assumed that the target burial is higher where the risk from larger vessels dragging anchor is considered to be significant. The aim is to achieve a minimum of 80% burial of the offshore SG1A Project export cable corridor with 20% of external protection. Protection methods such as rock placement will be added where sufficient burial is not possible.

The frequency of this impact is considered to be **Extremely Unlikely**, assuming the cable is marked on navigational charts and suitably protected through burial and/or other protection measures. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

Emergency Anchoring

This impact has already been described under the construction phase.

As with anchor dragging, larger anchors (e.g. cargo vessels, tankers) pose the biggest threat to the buried cable, as they are capable of penetrating deeper into the seabed, and can cause greater damage than smaller anchors (fishing and recreational vessels) if contact is made. The identified target burial depths of 1m to 3m mitigates the risk from vessel anchors.

The frequency of this impact is considered to be **Extremely Unlikely** as, even in an emergency, Masters should consult charts before dropping anchor, and therefore avoid anchoring directly over the cables. Additionally, this takes into account the planned protection informed by the CBRA. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

Fishing Gear Snagging

Once the cable is installed, the depiction of the cable on nautical and Kingfisher charts (embedded mitigation measures) may discourage fishing in the cable's vicinity; however evidence shows this is not always the case with installed cables as often it is assumed they are adequately protected against over-trawling. The planned cable protection is assumed to provide effective mitigation.

The frequency of this impact is considered to be **Extremely Unlikely** assuming the cables are marked on navigational charts and suitably protected via burial (target depths between 1 m and 3 m) or other protection measures, and the severity **Serious**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

Vessel Grounding due to Reduced Under Keel Clearance

This impact refers to a vessel grounding due to reduced under keel clearance associated with alternative protection methods in areas where cable burial is not feasible (e.g. due to pipeline crossings or hard seabeds). This could lead to subsequent capsize, injury, loss of life, oil spill, etc. In general, the higher risk areas are coastal waters where water depths are shallower.

Six areas of the proposed cable have been identified that may require alternative protection measures such as rock placement, concrete mattresses or grout bags. These include one pipeline crossing, the exit point for the trenchless installation section of cable, and areas where seabed conditions are unfavourable for cable burial. The maximum height of cable protection will be 1 m. The average draught of vessels crossing the cable route was 5.6 m, with a maximum draught of 20.8 m. Within shallower waters (less than 20 m depth), the maximum draught was 9.6m. The charted water depth at the location where the existing pipeline crosses the proposed cable route is approximately 19 m. The largest vessel in this area was a 180 m tanker with a draught of 9.6 m, giving a clearance of between 9 m and 10 m based on chart datum (i.e. relative to lowest astronomical tide).

Within the Forth port limits, where water depths are shallower, larger vessels will be under pilotage (or carry a Pilotage Exemption Certificate) and should therefore be familiar with the area. Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a review of impacts at those areas and consultation with the MCA will be carried out.

The frequency of this impact is considered to be **Extremely Unlikely**, and the severity **Serious** resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

Increased Collision Risk (Passing Vessel with Repair/Maintenance/Survey Vessel)

There may be a requirement to undertake inspection surveys or unplanned repair works on the proposed cable, which could result in an increased collision risk of survey / maintenance vessels with passing traffic.

Assuming circulation of any intended works is undertaken in advance, the risk is not considered to be significant. It is noted that maintenance/monitoring work is expected to be less disruptive and span a shorter period than cable installation (during the construction period).

The frequency of this temporary impact is considered to be **Extremely Unlikely** given the short duration of maintenance works. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

Magnetic Compass Interference

The static magnetic fields created by HVAC cables can interact with the earth's natural magnetic field, which can result in interference with magnetic navigational equipment, particularly in shallow waters. MCA guidance states that a deviation of three degrees will be accepted for 95% of the cable route and a five degree deviation accepted for the remaining 5%. The vast majority of commercial traffic uses Global Positioning System (GPS) and non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by Electromagnetic Interference (EMI). Therefore, it is considered unlikely that any created interference will have a significant impact on vessel navigation. However, magnetic compasses still serve as an essential means of navigation in the event of power loss or as a secondary source, and some smaller craft (fishing or leisure) may rely on it as their sole means of navigation, especially in bad visibility or at night. The important factors that affect the resultant deviation are:

- Water depth;

- Burial depth;
- Spacing or separation of the two cables in a pair; and/or
- Cable route alignment relative to the earth's magnetic field.

The offshore SG1A Project export cable corridor will be buried wherever possible, to a depth between 1 m and 3 m. Where cables are buried to a depth of up to 1 m, the predicted magnetic field strength at the seabed is expected to be below the earth's magnetic field (assumed to be 50 µT) (Moray Firth Offshore Renewables Limited, 2012)

The frequency of this impact is considered to be **Reasonably Probable**, with severity **Minor**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

10.9.1.3 Decommissioning

The requirement to decommission is a condition of The Crown Estate lease and is also incorporated in the statutory consenting process through the provisions of the Energy Act 2004. Under the statutory and licensing processes, the appointed Offshore Transmission Owner (OFTO) will be required to prepare a detailed decommissioning programme and set aside funds for the purposes of decommissioning. The decommissioning programme will consider the latest technological developments, legislation and environmental requirements at the time that the work is due to be carried out.

10.9.2 Additional Mitigation

Additional mitigation measures that could be implemented during the construction and operational phases include:

- Minimising the period of time the cable is left exposed, if post-lay burial is chosen.
- Targeted circulation of information about the project to regular commercial operators prior to offshore work commencing.
- Circulation of information to local sailing clubs located to increase the likelihood of local sailors being made aware of temporary installation work.
- Circulation of information to wind farm developers likely to be impacted by cable installation works.
- A Post-lay compass deviation survey to determine the magnitude of compass deviation.

It is noted that additional mitigation identified for the construction phase may also be implemented in the decommissioning phase.

10.9.3 Residual Effects

No impacts identified during construction, operation or decommissioning were assessed to be **Unacceptable**. The additional mitigation measures presented above will reduce impacts assessed as **Tolerable** to ALARP, however the rankings remain the same. A summary of the shipping and navigation impact assessment is provided in Table 10.8.

Table 10.8 Impact summary for Shipping and Navigation

Phase	Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Impact	Conclusion
Construction	Increased collision risk to passing vessels from a vessel associated with the cable installation.	Circulation of information; Suitable marking and lighting of construction vessels; Temporary AtoNs (if required); Guard vessels (if required); Liaison with Forth ports and local harbours; Compliance with COLREGS and SOLAS; Safe passing distances	Extremely Unlikely	Serious	Tolerable	Targeted circulation of information to regular commercial operators and local sailing clubs.	Tolerable	Not Significant
Construction	Cable installation causes disruption to passing vessel routeing/ timetables, as well as increased collision risk between third parties due to route deviations.	Circulation of information; Liaison with Forth ports and local harbours	Reasonably Probable	Minor	Tolerable	Targeted circulation of information to regular commercial operators and wind farm developers.	Tolerable	Not Significant

Phase	Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Impact	Conclusion
Construction	Cable installation causes disruption to fishing and recreational activity.	Circulation of information; Guard vessels (if required); Appointment of FLO.	Reasonably Probable	Minor	Tolerable	Circulation of information to local sailing clubs.	Tolerable	Not Significant
Construction	Cable installation causes disruption to military exercises	Circulation of information.	Extremely Unlikely	Minor	Broadly Acceptable	Not Applicable	Broadly Acceptable	Not Significant
Construction	Cable installation causes disruption to marine aggregate dredging activities.	Circulation of information.	Extremely Unlikely	Minor	Broadly Acceptable	Not Applicable	Broadly Acceptable	Not Significant
Construction	A vessel allides with a wind turbine	Guard vessels (if required); Temporary AtoNs (if required); Liaison with wind farm developers.	Remote	Serious	Tolerable	Not Applicable	Tolerable	Not Significant
Construction	A vessel drags anchor onto exposed cable.	Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable	Not Significant

Phase	Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Impact	Conclusion
Construction	A vessel drops anchor in an emergency onto exposed cable.	Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable	Not Significant
Construction	Fishing gear snags on exposed cable.	Appointment of FLO; Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable	Not Significant
Operation and maintenance	A vessel drags anchor over the cable.	Cable protection measures; Cable marked on charts.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable	Not Significant
Operation and maintenance	A vessel drops anchor in an emergency over the cable.	Cable protection measures; Cable marked on charts.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable	Not Significant
Operation and maintenance	A vessel engaged in fishing snags its gear on the cable.	Cable marked on charts; Cable protection measures; Appointment of FLO.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable	Not Significant

Phase	Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Impact	Conclusion
Operation and maintenance	A vessel grounds due to reduced under keel clearance.	Cable marked on charts; Less than 5% reduction in water depth or further consultation with MCA.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable	Not Significant
Operation and maintenance	Collision of a passing vessel with a vessel associated with maintenance works/monitoring of the cable.	Circulation of information; Suitable marking and lighting of construction vessels; Temporary AtoNs (if required); Guard vessels (if required); Liaison with Forth ports and local harbours; Compliance with COLREGS and SOLAS; Safe passing distances	Extremely Unlikely	Serious	Tolerable	Targeted circulation of information to regular commercial ferry operators and local clubs.	Tolerable	Not Significant
Operation and maintenance	Interference with magnetic compass onboard passing vessels.	Cable burial;	Reasonably Probable	Minor	Tolerable	Post-lay compass deviation survey	Tolerable	Not Significant

10.10 Cumulative Impacts

This section describes cumulative developments potentially relevant to the offshore SG1A Project export cable corridor, including the expected cumulative impacts.

Neart na Gaoithe

Neart na Gaoithe is the closest wind farm site in proximity to the proposed offshore SG1A Project export cable corridor, located 200 m to the south. Construction of Neart na Gaoithe began in August 2020 and is expected to be fully operational in 2023. The Neart na Gaoithe proposed cable corridor is located approximately 1.6 nm south of the offshore SG1A Project export cable corridor.

An operations and maintenance base for the Neart na Gaoithe wind farm will be located at Eyemouth Harbour, 30 nm to the south-east of Cockenzie.

Due to the location of Neart na Gaoithe, any vessel carrying out operations on the wind farm may be impacted by construction works for the offshore SG1A Project export cable corridor. The presence of the wind farm also prevents third party vessels from deviating to the south of the cable route to avoid construction works. This could cause an increase in collision risk and/or disruption to vessel routeing, as well as disruption to fishing and recreational activity, due to the close proximity of the two developments. It is noted that construction vessels associated with the offshore SG1A Project export cable corridor may require to pass fairly close to the wind farm site. However, good coordination with the wind farm developer will mitigate any risks.

If both operators follow best practise guidelines then the cumulative impacts are expected to remain **Tolerable**.

Inch Cape

The Inch Cape development area is located 600 m north of the proposed cable corridor. The proposed offshore SG1A Project export cable corridor is adjacent to the consented (but not yet constructed) Inch Cape Offshore Wind Farm cable corridor route.

Inch Cape Offshore Limited (ICOL) is currently finalising its assessment for the location of its operations and maintenance base at a local port on the East Coast.

Timescales for the construction of the Inch Cape offshore wind farm are not currently available. If the construction period for the wind farm overlaps with construction on the offshore SG1A Project export cable corridor, this could lead to increased collision risk, as well as disruption to commercial shipping, fishing and recreational activities, particularly if construction on the two export cable routes overlaps.

If the Inch Cape offshore wind farm is constructed prior to construction works for the offshore SG1A Project export cable corridor, due to the location of Inch Cape, any vessel carrying out operations on the wind farm may be impacted by construction works for the offshore SG1A Project export cable corridor. The presence of the wind farm prevents vessels from deviating to the north of the cable route to avoid construction works. This could cause an increase in collision risk and/or disruption to commercial shipping, fishing and recreational activities. It is noted that construction vessels associated with the offshore SG1A Project export cable corridor may require to pass fairly close to the wind farm site. However, good coordination with the wind farm developer will mitigate any risks.

If both operators follow best practise guidelines then the cumulative impacts are expected to remain **Tolerable**.

Berwick Bank & Marr Bank

Berwick Bank Offshore Wind Farm and Marr Bank Offshore Wind Farm are two distinct projects in the early stages of development, both being taken forward by SSE Renewables. The proposals are located next to one another and are over 40km off the coast of East Lothian.

There are no confirmed construction dates as yet as this will be required to go through the consenting process which is likely to be post the offshore SG1A Project export cable corridor application. Berwick Bank site boundary intersects the proposed offshore SG1A Project export cable corridor and the Marr Bank site boundary is located approximately 7 nm south.

As the construction works for the developments are not anticipated to overlap, there are not expected to be any cumulative impacts associated with these offshore wind farms.

10.11 Conclusion

The 12 month AIS analysis showed that the main vessel types within the study area of the offshore SG1A Project export cable corridor were fishing vessels, tankers and cargo vessels. July was the busiest month with an average of 49 unique vessels per day. The quietest month recorded was January with an average of 17 vessels per day.

The average vessel length recorded in the study area was 73 m. The largest vessel recorded was a 336 m crude oil tanker transiting to Hound Point oil terminal within the Firth of Forth. The average vessel draught recorded in the study area was 6 m.

High density within the study area can be associated with vessel cargo and tankers entering / exiting ports within the Firth of Forth such as Grangemouth, Rosyth and Leith and the terminals at Braefoot and Hound Point

There was an average of two unique vessels per day recorded at anchor within the study area. The majority of anchored vessels were tankers and cargo vessels.

The busiest month for fishing vessels was July with an average of 20 unique vessels. The quietest month was January with an average of six unique vessels.

There was an average of one unique recreational vessel per day recorded over the twelve month period. The busiest month was July with an average of five unique vessels. There were no recreational vessels recorded in January.

Aspects of the proposed offshore SG1A Project export cable corridor which have the potential to affect the shipping and navigation receptors identified from the baseline assessment were assessed using the IMO FSA process. Assuming all embedded mitigation is in place, no impacts identified during construction, operation or decommissioning were assessed to be Unacceptable. The additional mitigation measures presented will reduce impacts assessed as **Tolerable** to ALARP, however the rankings remain the same.

11. Marine Archaeology

11.1 Introduction

This section assesses the potential impacts of the offshore SG1A Project export cable corridor on the marine historic environment, identified known historic assets and the potential for unknown marine historic environment assets to be present. A summary of relevant historic environment legislation is provided and a description of the criteria used to determine the importance or sensitivity of the identified historic environment assets. An initial assessment has been undertaken including consideration of embedded mitigation (see Section 3.8.2.5 and Section 11.8), Where potentially significant direct or indirect impacts are predicted, appropriate additional mitigation and management strategies have been identified and a residual impact assessment presented.

Marine historic assets are defined in the Marine (Scotland) Act 2010, Section 73, paragraph 5) as vessels, vehicles, aircraft, parts of such, contents of such, buildings and other structures, caves, deposits, artefacts or any other thing or groups of things that evidence previous human activity.

The study area for marine archaeology (see

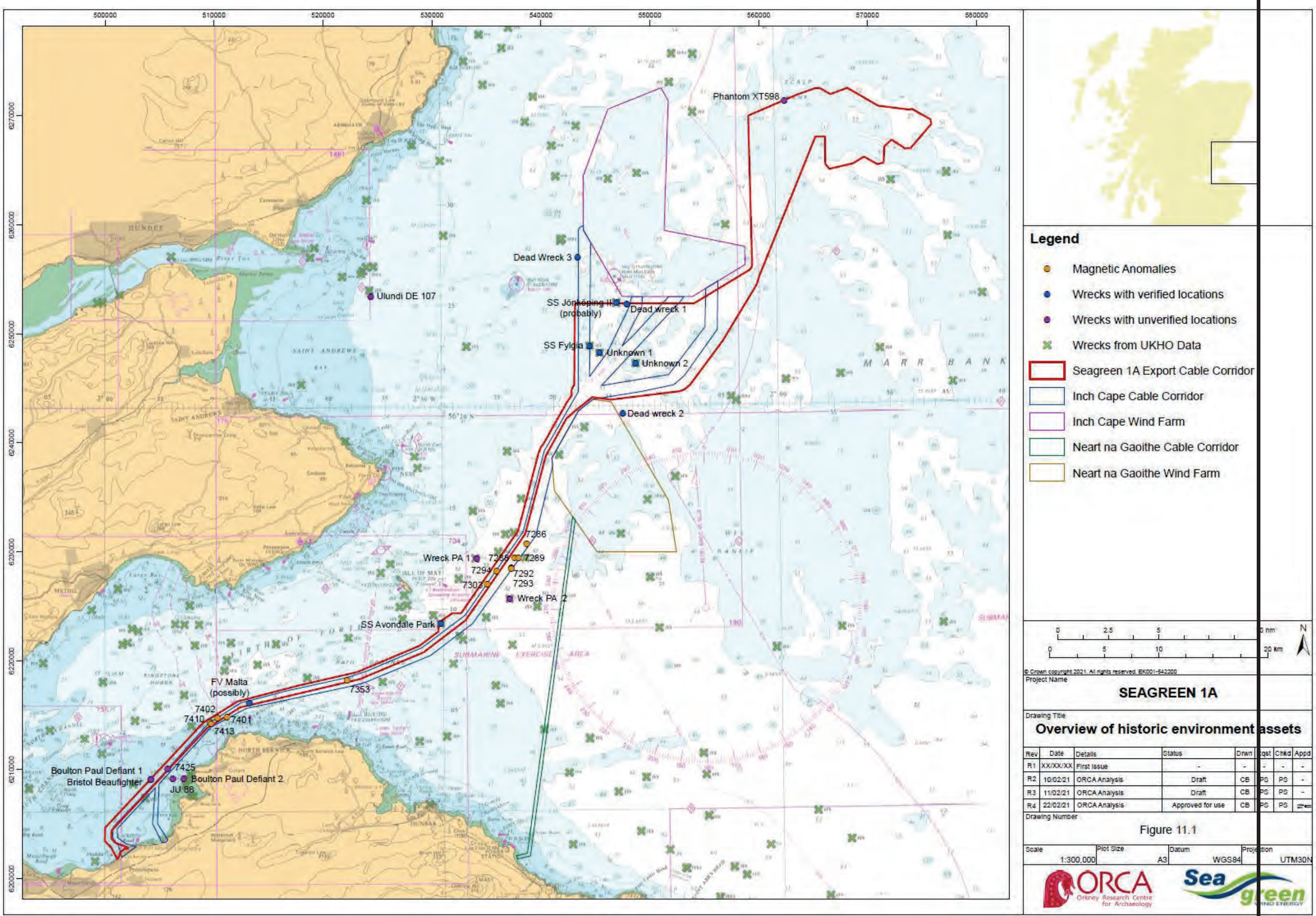

Figure 11-1) comprised the offshore SG1A Project export cable corridor excluding the area at the northeast end of the route that is within the site boundary and has been subject to EIA as part of the consenting of the Seagreen Project. The study area also included data from the consented Inch Cape export cable corridor because of the spatial overlap with the offshore SG1A Project export cable corridor.

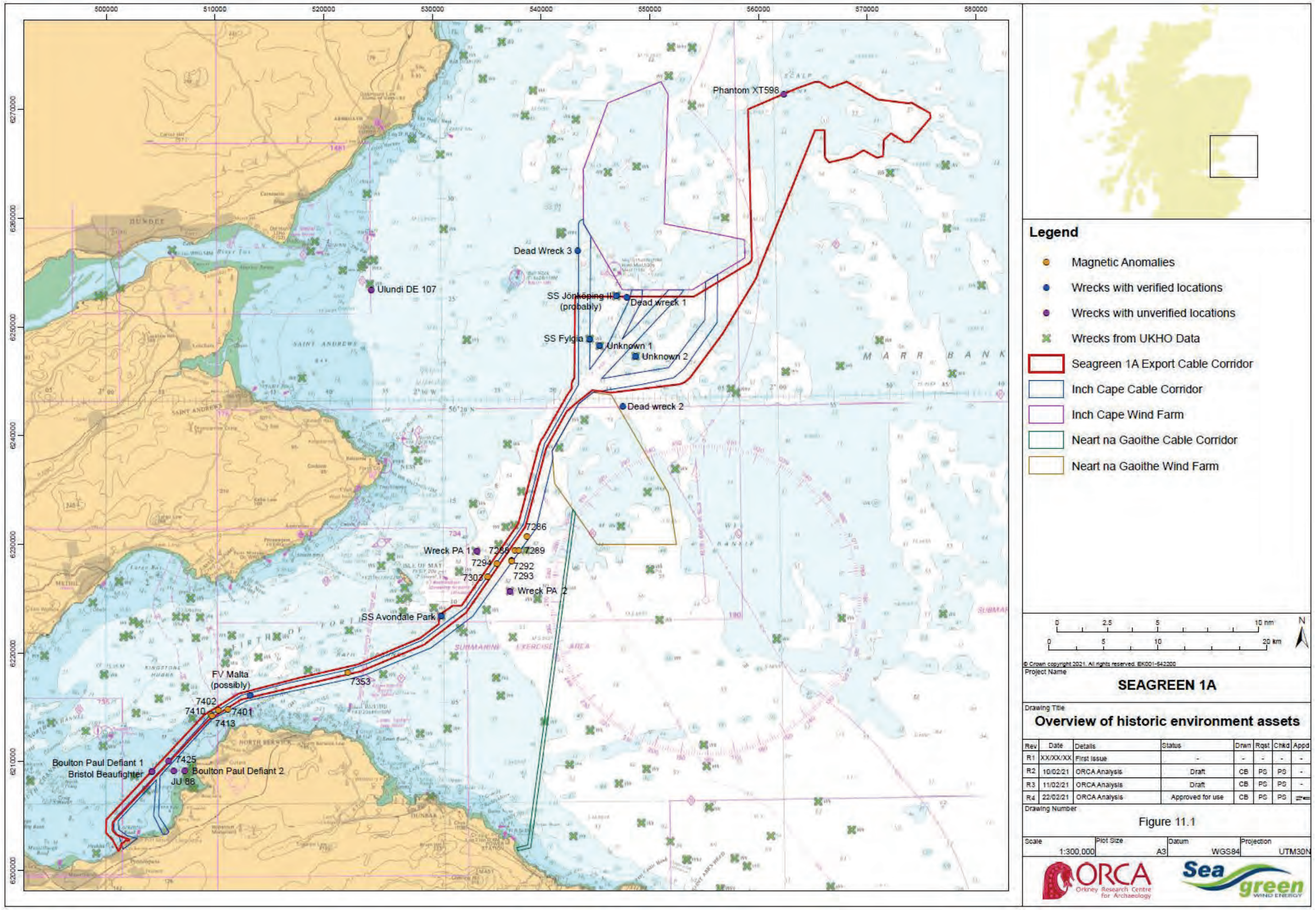

Figure 11-1 Marine Archaeology Study Area

11.2 Legislation and Policy Context

The cable route is located within Scottish and UK Territorial Waters. Key legislation and guidance relating to the marine historic environment is outlined below:

- The United Nations Convention of the Law of the Sea (UNCLOS);
- Annex to the UNESCO Convention on the Protection of the Underwater Cultural Heritage 2001;
- The European Convention on the Protection of the Archaeological Heritage (revised), known as the Valletta Convention;
- The Protection of Military Remains Act 1986 (PoMRA) has the principal concern to protect the sanctity of vessels and aircraft that are military maritime graves. Any aircraft lost while in military service is automatically protected under this Act;
- The Marine (Scotland) Act 2010. This requires licensing activities in the marine environment to consider potential impacts on the marine environment including features of archaeological or historic interest and defines marine historic assets (Section 73). The Act creates Historic Marine Protected Areas (HMPAs) to replace wrecks designated under The Protection of Wrecks Act 1973;
- Scotland's National Marine Plan: It contains policies and advice concerning the marine historic environment, including that development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance and that as well as designated marine heritage assets there are likely to be a number of undesignated sites of demonstrably equivalent significance, which are yet to be fully recorded or await discovery;
- Scotland's National Marine Plan also recommends that Historic Marine Planning Partnerships and licensing authorities should seek to identify significant historic environment resources at the earliest stages of planning or development process and preserve them in situ wherever feasible. Adverse impacts should be avoided, or, if not possible, minimised and mitigated. Where this is not possible licensing authorities should require developers to record and advance understanding of the significance of the heritage asset before it is lost, in a manner proportionate to that significance;
- The Historic Environment Policy Statement for Scotland (HEPS) 2019 includes policies that decisions affecting any part of the historic environment require understanding of its significance and consideration of avoiding or minimising detrimental impacts; and
- Historic Environment Scotland Designation Policy and Selection Guidance 2019 stands alongside HEPS 2019 and outlines the principles and criteria that underpin the designation of HMPAs.

11.3 Consultation

Historic Environment Scotland (HES) provided a response to the offshore SG1A Screening Report. Full details are provided in Section 5 of this EIAR and the offshore SG1A Project PAC Report, submitted in support of the Marine Licence application.

In summary, HES stated that:

- They were content that any potentially significant effects on their interests are likely to be capable of mitigation;
- They welcomed that an Environmental Appraisal would be produced in support of the Marine Licence application that would consider in further detail the impact on the seabed resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies; and
- They welcomed that the offshore SG1A Project will prepare a marine heritage Written Scheme of Investigation and Protocol for Accidental Discoveries to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest.

11.4 Data Sources

The key reference sources used in the marine archaeology assessment presented in this EIAR are:

- The Historic Environment and Cultural Heritage section on the Marine Scotland Information website, http://marine.gov.scot/themes/historic-environment-and-cultural-heritage [accessed 16-17/11/2020].
- Statutory lists, registers and designated areas, including List of Designated Wrecks and Historic Marine Protected Areas;
- UK Hydrographic Office (UKHO) wreck register and relevant nautical charts;
- The National Record of the Historic Environment (NRHE) via the online Canmore database;
- The wrecksite.eu database https://www.wrecksite.eu/;
- Larn, R., & Larn, B., (1998). The Ship Wreck Index of Great Britain & Ireland Vol.4 Scotland. London: Lloyds Register of Shipping;
- Whittaker, I.G., (1998). Off Scotland: a comprehensive record of maritime and aviation losses in Scottish waters. Edinburgh: C-Anne Publishing;
- The Environmental Statements and technical appendices for the Seagreen, Neart na Gaoithe and Inch Cape Offshore Wind Farm projects (Seagreen 2012, Mainstream 2011, Inch Cape 2013, Inch Cape 2018);
- Other readily available website databases and publications were consulted for information and, where used, are cited in the text.

11.5 Existing Baseline Description

11.5.1 Statutory Designations

No marine cultural heritage statutory designations are present within the marine archaeology study area. However, if the Phantom jet or any other military aircraft are discovered (see Section 11.5.4), they would automatically fall under the Protection of Military Remains Act 1986 (PoMRA).

11.5.2 Submerged Prehistoric Archaeology and Landscapes

Hominids and humans have occupied the UK continental shelf (UKCS) at various times for more than 700,000 years, but finds showing this are incredibly rare. Submerged landscapes are where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited fish and shellfish on the coast which is now submerged.

Current research indicates that there is potential for submerged Holocene sediments and prehistoric remains to survive in this part of the North Sea, but the chances of survival are low for remains of moderate or higher importance (Bicket and Tizzard 2015; Dawson et al 2017; Flemming 2004; Sturt 2013).

The archaeological analysis of the geotechnical (borehole, Cone Penetrometer Tests and vibrocore logs) and geophysical surveys (bathymetry and sub-bottom profiling) conducted for the Seagreen Alpha area (Seagreen 2012), the Neart na Gaoithe Offshore Wind Farm (Mainstream 2011), and the Inch Cape export cable area immediately south of the OWF boundary (Inch Cape 2018), identified no organic sediments of any palaeoenvironmental interest, no relict land surfaces and no prehistoric remains.

However, there were three cores from the Inch Cape route close to the Lothian coastline that were of high interest, containing definite organic material of potential prehistoric deposits (Wessex 2015; Inch Cape 2018 Appendix 13A). Regionally, there is nearshore potential in eastern and south-eastern Scotland for inundated coastal paleo-landscapes that could be of archaeological and paleoenvironmental interest (Bicket and Tizzard 2015).

11.5.3 Shipwrecks

Shipwreck inventories and documentary sources are usually biased towards the 18th century and later when more systematic reporting began. Therefore, there are few known historical records of wrecks from medieval or earlier periods. As a maritime nation with a reliance on marine based trade and exchange, and with the exploitation of marine resources from prehistoric times, there have been countless shipwrecks around UK waters from all periods – many of which remain unreported.

Coastal archaeological evidence suggests exploitation of the marine environment in the North Sea for fishing and transport purposes from prehistoric times. There are many trading and fishing ports up the east coast of Scotland, and shipping along this coast and across the North Sea is well documented from the medieval period onwards (Wessex 2012). Therefore, there is a high probability for unknown, unrecorded vessels to have sunk in the general area over the centuries, although the likelihood of encountering wrecks dating before the 18th century is low (op. cit.). There is a significant number of known maritime losses from the 19th and 20th centuries, aircraft as well as vessels, with unknown or arbitrary locations in the wider Forth and North Sea basin. Therefore, there is a moderate potential for the discovery of unrecorded assets.

Table 11.1 is an overview of known marine cultural heritage losses that may be or are known to be in the study area from the data sources listed in Section 11.4. Those with verified locations are plotted on

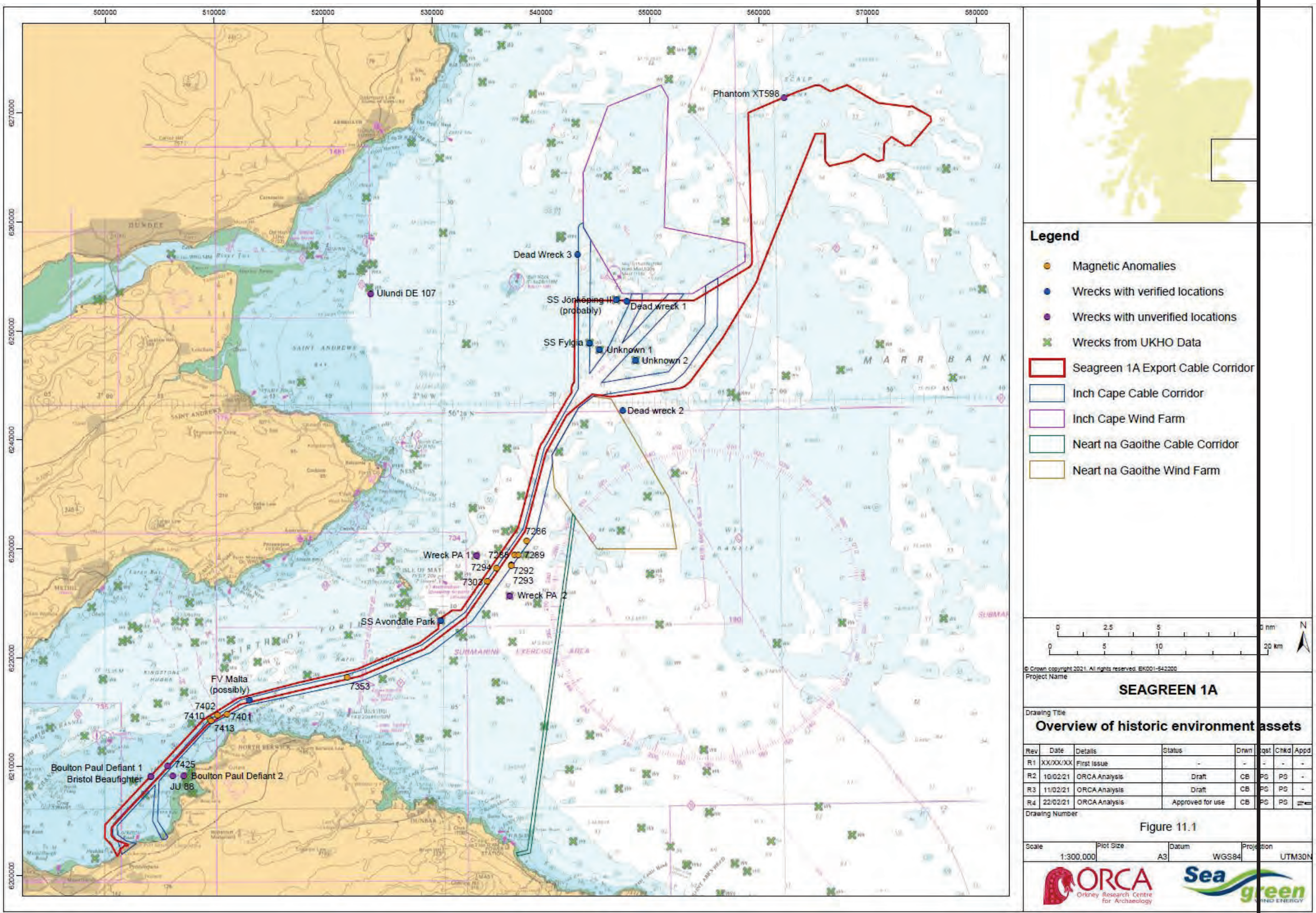

Figure 11-1, as are losses that have been assigned locations that are unverified and may (or may not) be in the study area. Without further investigation, wrecks of unknown identity must be considered of unknown importance. Dead wrecks (a UKHO term for located wrecks that have not been found on later surveys) should be considered as still potentially present. The Ulundi is included despite its apparent position, because it is simply recorded as having sunk off Bell Rock, and may be in the area. Similarly Wrecks PA1 and PA2 have approximate positions only and may be within the offshore SG1A Project export cable corridor.

The surveys conducted for the Inch Cape project identified targets of high or moderate potential, some of which could be related to known sites, others not, including sites of high importance, but most outwith the offshore SG1A Project export cable corridor boundary (Wessex 2013; Seagreen 2013). Therefore, there is known potential for the survival of heritage assets on the seabed of the offshore SG1A Project export cable corridor. The side scan sonar (SSS) and multi-beam bathymetry (MBES) images used as stills in Wessex 2013 are of good quality, indicating that these surveys and the archaeological review of the datasets would have identified any wrecks or debris within the Inch Cape cable corridor.

The Inch Cape Export Cable surveys recorded five wrecks that are within the offshore SG1A Project export cable corridor (See

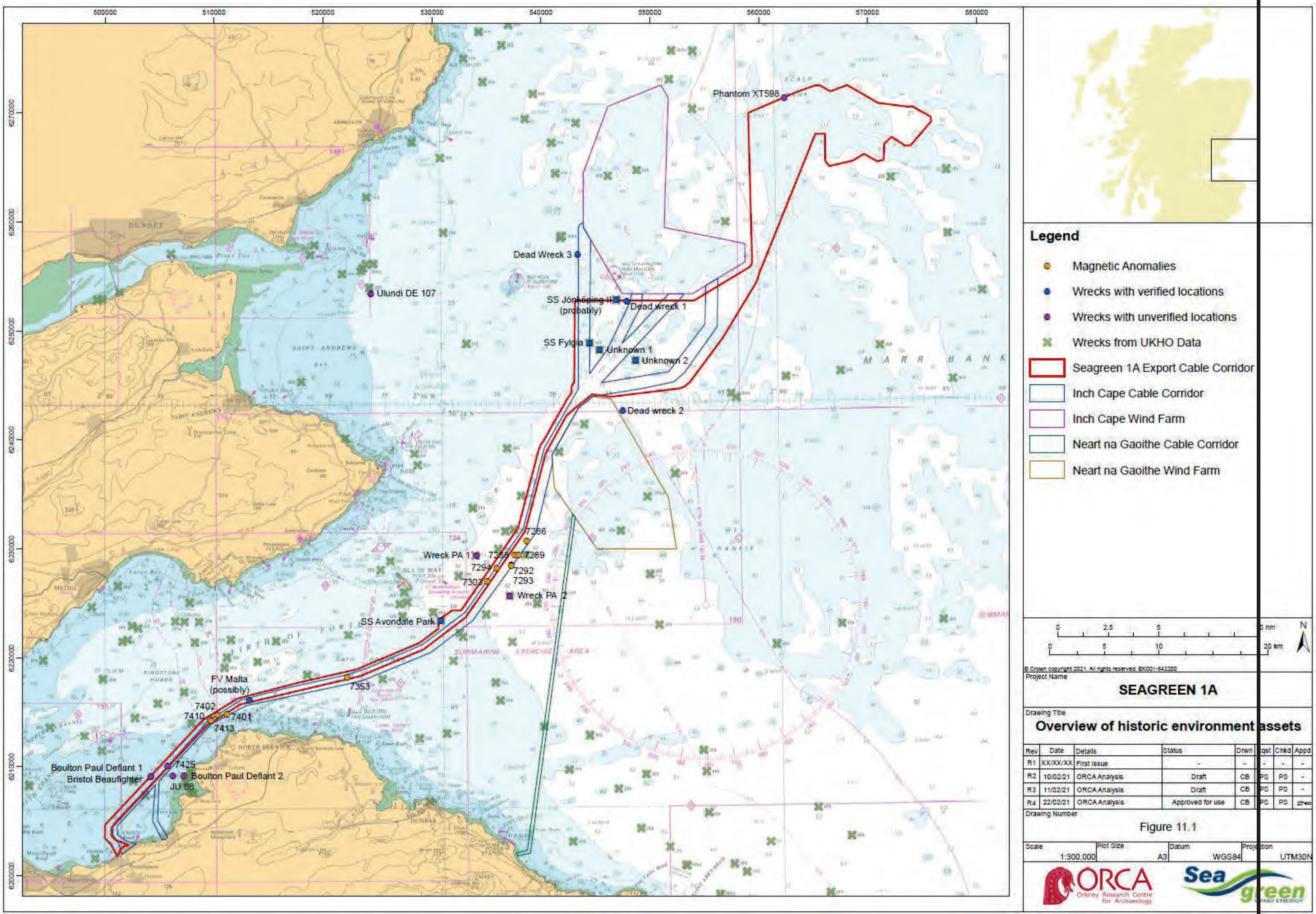

Figure 11-1; Table 11.1). Three of these are charted wrecks, the SS Jönköping II (probably), SS Fylgia, and SS Avondale Park. Both the SS Jönköping II (probably) and the SS Fylgia were sunk by torpedo during wartime, but fortunately their crews were all saved. Neither of the vessel types or cargoes are of significant heritage value, and so the assets are considered of low importance. The SS Avondale Park was also a vessel type and cargo of no significant heritage value, however two of the crew were lost when it was torpedoed by U-2336 during the last U-boat action in World War II (WW2). It is considered of moderate importance. Although a 19th-century vessel, the FV Malta was of a vessel type and with a cargo of no significant heritage value, so considered to be of low importance. Dead Wreck 3 is described in Section 11.5.4 below.

11.5.4 Aircraft

There are six aircraft potentially lost in the study area (see

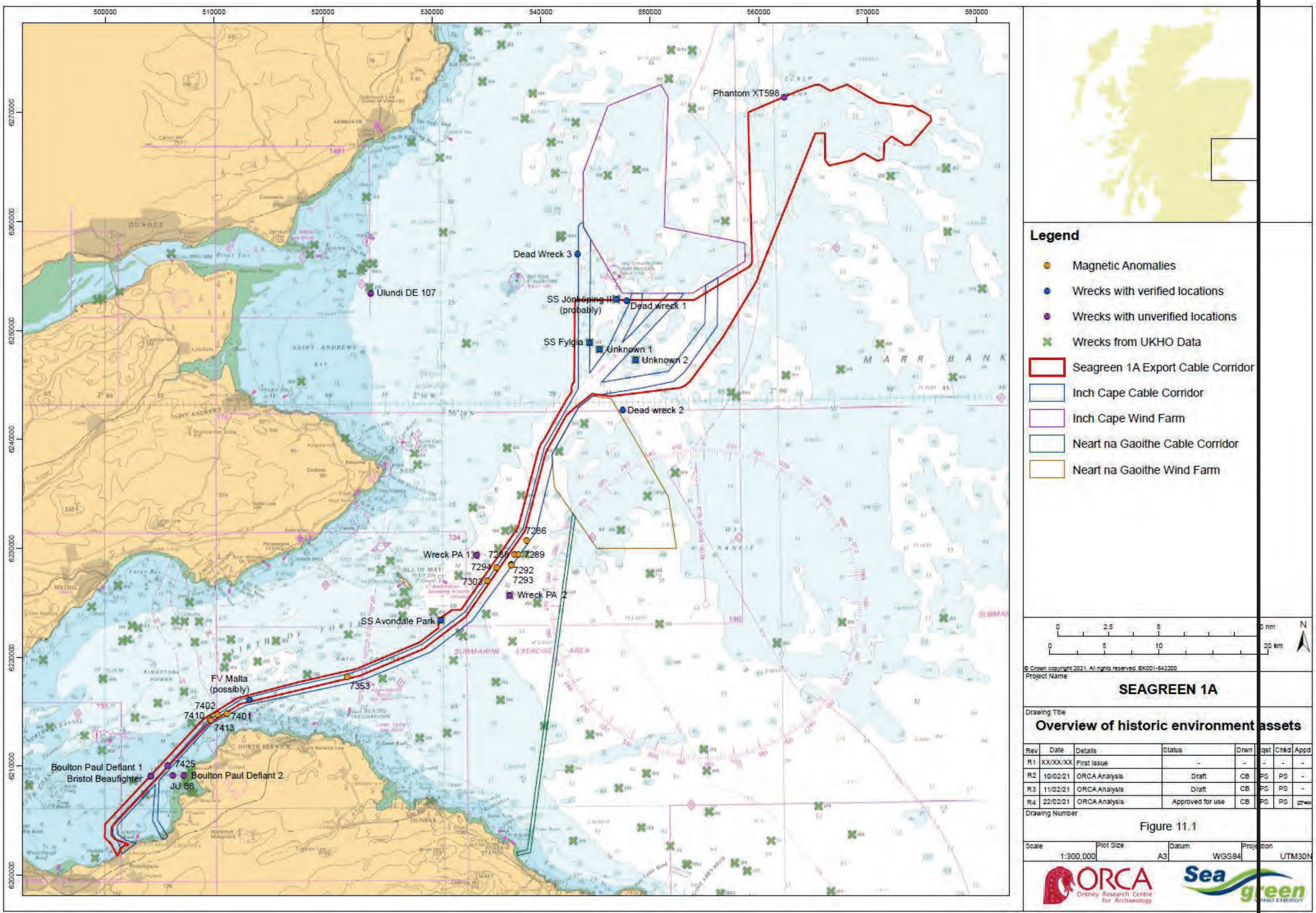

Figure 11-1; Table 11.1). A Phantom FG1 from RAF Leuchars went missing in the north of the area and was never located. It is of high importance, under the terms of PoMRA. Dead Wreck 3 was observed by HMS Berkeley and thought possibly to be an aircraft. A later survey in 2008 failed to find the contact and considered it to possibly have been buried. The wreck was amended to ''DEAD'' but the location should be regarded as having potential heritage interest (Wessex 2013).

Four aircraft are recorded as being lost somewhere near Aberlady during WW2, but have not been located. They are of high importance. A number of aircraft did go missing without trace off eastern Scotland while on military service throughout the 20th century, though mostly during WW2. Although the likelihood of finding one within offshore SG1A Project export cable corridor is low, any such aircraft would automatically fall under the Protection of Military Remains Act 1986 (PoMRA).

11.5.5 Geophysical Anomalies

The reviews of geophysical survey datasets (sidescan sonar, magnetometry, multibeam echo sounding and swath bathymetry) collected for the Seagreen Alpha, Neart na Gaoithe and Inch Cape developments (Seagreen 2012, Mainstream 2011, Inch Cape 2013, Inch Cape 2018) identified anomalies or targets on the seabed in all development areas. Therefore, there is known potential for the survival of heritage assets on the seabed of the offshore SG1A Project export cable corridor.

The archaeological review of the surveys conducted for the Inch Cape export cable shows that the datasets were of good quality and would have identified any wrecks or debris within the Inch Cape cable corridor. That cable route, which overlaps with the offshore SG1A Project export cable corridor, has a large number of small magnetic anomalies and were considered to be most likely geological in nature. There were several larger magnetic anomalies (see

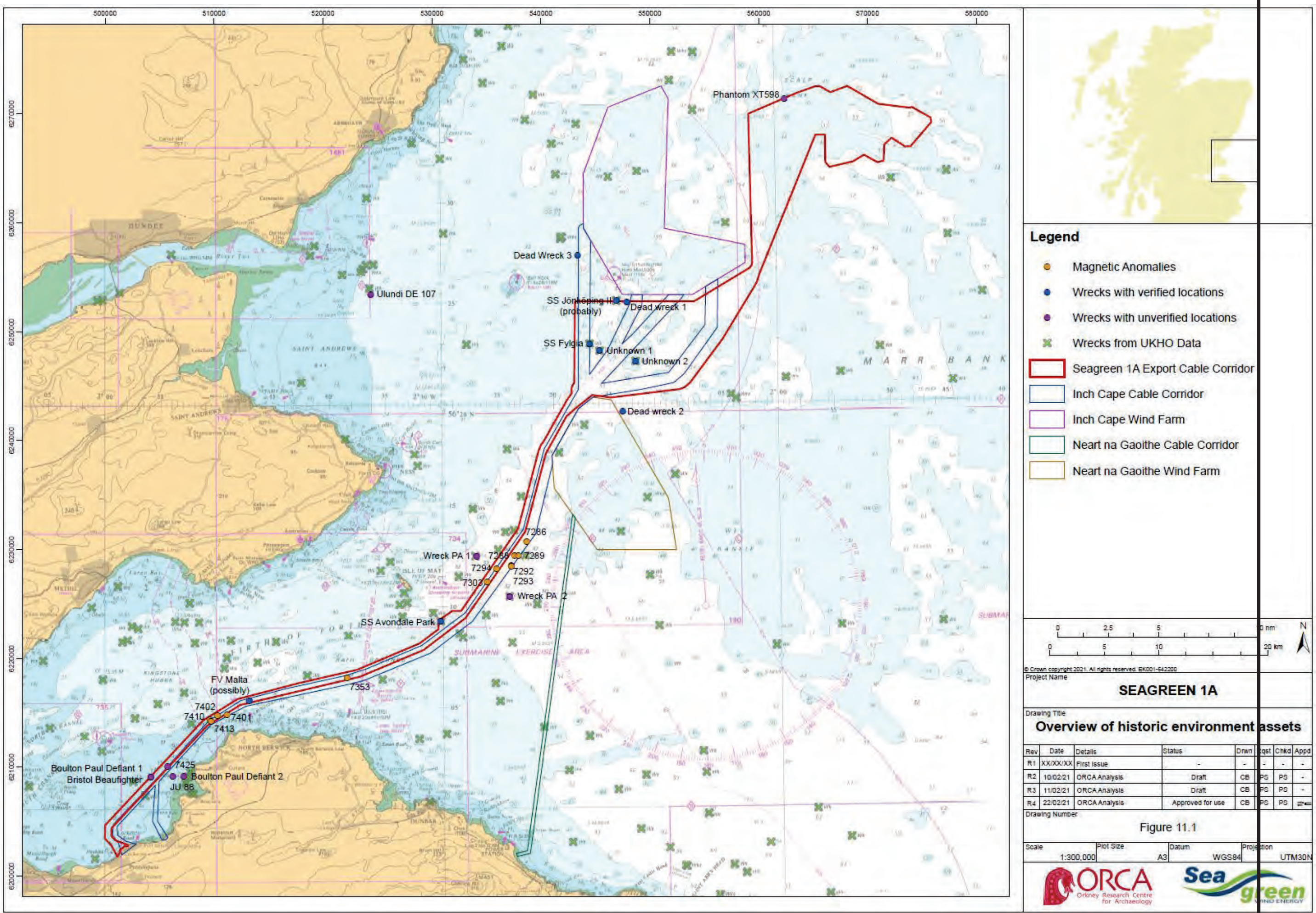

Figure 11-1 and Table 11.1), that could be anthropogenic. They could also be geological, but should be avoided without further investigation to confirm their nature.

Additional surveys will be carried out by the offshore SG1A Project, to validate existing survey data and to provide up-to-date data to inform detailed design and installation methods. These surveys include geophysical and geotechnical (January-March 2021) surveys.

Pre-construction geophysical surveys will take place at predefined locations within the offshore SG1A Project export cable corridor using low to high frequency survey devices such as multibeam echosounders (MBES), side scan sonar (SSS) sub-bottom profilers (SBP). Geophysical studies will also allow for the avoidance of known assets and identified geophysical anomalies, along the offshore SG1A export cable corridor, that are likely to be anthropogenic as the primary embedded mitigation strategy.

11.5.6 Historic UXO

Even though wartime losses have been identified, the study area is outside the main north-south shipping lanes up the east side of Scotland and east-west into the major ports, and so was not particularly prone to offensive mine activity in wartime.

During World War I (WW1), there was extensive mine laying off the Isle of May, the entrance to the Tay and Firth of Forth and in 1918 four large minefields with over 320 mines were laid offshore west of the study area (Bi Monthly mine sweeping report 1st Aug- 18th Aug 1918 (National Archives Kew: ADM 116-1518)). Between March 1917 and February 1918, the Granton minesweeping flotilla reported sinking several British mines off Bell Rock lighthouse.

In WW2 there were several defensive minefields in the waters east of the Firth of Forth up to Rattray Head and in the Moray Firth, with the nearest being the British field SN 17 laid on 2 February 1942 (National Archives OCB M.6500A: British Islands and Adjacent Waters Minefield Index Chart 1945). The SS Einar Jarl, a charted wreck just south of the Study Area, struck what is thought to be a floating mine and not part of a German offensive mine field.

Table 11.1 Overview of identified marine historic environment assets

Name	UKHO Wreck Number	Canmore ID	Wessex ID	Description	Circumstance of loss	Date Lost	Lat (WGS84) or Easting UTM z30N	Long (WGS84) or Northing UTM z30N	Source	Importance	Reason
SS Jönköping II (probably)	3003	121116, 201634, 325983	7132	Swedish Steamship. Built 1888. Gourlay Brothers & Co. (Dundee) Ltd., Dundee. 1274 tons. Steel. 74.8m x 10.4m x 4.9m. Cargo: Göteborg to Hull with general cargo. Ex-SS Ardle. Wreck is sitting on the seabed upright, one larger piece of debris visible nearby (Wessex 2013)	Sunk by torpedo from UC49 (Hans Kükenthal) Crew survived.	24/01/1918	56 25.073N	02 14.348W	1,2,3,5,6,9,10	Low	Common vessel type; cargo of low interest; crew survived
DEAD wreck 1	3002			Located in 1955 by HMS Welcome. Not located by Guardline survey in 2008. Amended to DEAD			56 24.994N	02 13.395W	4	Unknown	
SS Fylgia	2997	201631, 322309	7195	Swedish Steamship, Built 1889. William Dobson & Co., Newcastle-Upon-Tyne. 1741 tons. 81.1m x 11.3m x 4.9m. Göteborg to Rouen with a general cargo including wood pulp & steel ingots. Sidescan sonar shows complex area of debris.	Sunk by torpedo from UC49 (Hans Kükenthal) Crew survived.	24/01/1918	56 22.966N	02 16.763W	1,2,3,9,10	Low	Common vessel type; cargo of low interest; crew survived
Unknown 1	2995			Unknown wreck 19m long lying 048/228			56 22.61N	02 15.894W	3	Unknown	
Unknown 2	2994			Unknown wreck 26m x 8m x 4.1m lying 140/220			56 22.077N	02 12 .676W	3	Unknown	
DEAD wreck 2	2990			Located in 1975 but not located by Guardline survey in 2008. Amended to DEAD . Location from 1975 may not have been accurate and so missed by the 2008 survey.			56 19.594N	02 13.894W	3	Unknown	
DEAD wreck 3	3141	322362	7141	Found in 1995 (HMS Berkeley and viewed with remote camera. Considered to be either lost trawl gear or aircraft. Not located by Guardline in 2008 and considered to be buried. Not identified in geophysical survey for Inch Cape.			543387	6257055	3,9,10	Unknown	
Phantom XT598	3179	315446		Aircraft. McDonnell Douglas] Phantom FG1. 111 Sgn RAF Leuchars	Crashed 056 deg, 16.1 miles Bell Rock. Two crew lost. Not located.	23/11/1978	56 34.99N	01 59.097W	1,3,4,7,10	High	PoMRA
SS Avondale Park	2934	102069		British Steamship. Built 1944. Foundation Maritime Ltd., Pictou, Pictou Canada. 2878 tons. Hull for Belfast	Torpedoed by U-2336. Part of Convoy EN-91. Last U boat action on WW2. Two crew lost	07/05/1945	56 09.279N	02 30.215W	1,2,3,5,6,8,10	Medium	WW2 crew lost

Name	UKHO Wreck Number	Canmore ID	Wessex ID	Description	Circumstance of loss	Date Lost	Lat (WGS84) or Easting UTM z30N	Long (WGS84) or Northing UTM z30N	Source	Importance	Reason
Ulundi DE 107		315245		Dundee Steam Trawler, iron. Built 1894 by Cook, Welton & Gemmell Ltd., Beverley (Hull) 131 tons.28.5 x 6.2 x 3.4.	Sunk following a collision off Bell Rock. Crew survived	02/10/1911	-	-	1,4,7,10	Low	Vessel of common type. Cargo of low interest
Wreck PA 1	2960			Unknown wreck located by sonar in 1960.		-	56 12,500N	02 27.000W	3	Unknown	
Wreck PA 2	2948			Wreck located in 1919. Listed as a bad obstruction in the Kingfisher Book of Tows Vol 1 (1979)		-	56 10,495N	02 24,092W	3	Unknown	
FV Malta GN22 possibly.		199427, 289393	7376	Wooden steam trawler. 118 ton. Built by Allan David & Co., Granton. Large but discrete area containing spread of small pieces of debris, at least 14 seen in the sidescan sonar but there could potentially be a lot more buried and dispersed (Wessex 2013).	Foundered following a collision with the loss of 2 crew.	08/10/1881	513250	6216134	4,7,9,10	Low-Moderate	Vessel of common type. Cargo of low interest. 2 crew lost
7425			7425	Nothing located in this location in UKHO database. Nothing identified in geophysical survey conducted for Inch Cape.		-	505739	6210061	2	Unknown	
JU 88		325342		Junkers JU88	Shot down 4 miles NE of Port Seaton	16/10/1939	-	-	1,10	High	PoMRA
Bristol Beaufighter		329845		Bristol Beaufighter JM220 of 132 OTU	Crashed into the sea off Dirleton.	15/05/1945	-	-	1,10	High	PoMRA
Boulton Paul Defiant		329749		Boulton Paul Defiant N1570 of 60 OTU	Crashed into the sea 5 miles WNW of Drem.	08/12/1941	-	-	1,10	High	PoMRA
Boulton Paul Defiant		329760		Boulton Paul Defiant N3503 of 410 Sqn	Crashed into the sea at Aberlady Bay.	11/04/1942	-	-	1,10	High	PoMRA
Magnetic anomaly			7135	103.8 (nT) Large distinct monopole, though located in an area of numerous natural anomalies. Possibly anthropogenic, possibly geological			543753	6259498	9	Unknown	
Magnetic anomaly			7163	109.1 (nT) Large, distinct dipole, identified on more than one line. Possibly anthropogenic, possibly geological			548728	6251873	9	Unknown	
Magnetic anomaly			7244	61.6 (nT) Large distinct monopole. Possibly anthropogenic, possibly geological			545731	6244830	9	Unknown	
Magnetic anomaly			7255	112.7 (nT) Distinct but complex anomaly, only identified on one line., Poss. Natural/noise?			542428	6242080	9	Unknown	

Name	UKHO Wreck Number	Canmore ID	Wessex ID	Description	Circumstance of loss	Date Lost	Lat (WGS84) or Easting UTM z30N	Long (WGS84) or Northing UTM z30N	Source	Importance	Reason
Magnetic anomaly			7286	56.4 (nT) Distinct dipole. Possibly anthropogenic, possibly geological			538713	6230755	9	Unknown	
Magnetic anomaly			7288	45.0 (nT) Distinct anomaly on edge of a natural feature. Possibly anthropogenic, possibly geological			537603	6229478	9	Unknown	
Magnetic anomaly			7289	48.6 (nT) Distinct dipole. Possibly anthropogenic, possibly geological			537966	6229470	9	Unknown	
Magnetic anomaly			7292	51.6 (nT) Distinct anomaly identified on more than one line. Possibly anthropogenic, possibly geological			537316	6228510	9	Unknown	
Magnetic anomaly			7293	87 .6 (nT) Distinct anomaly identified on more than one line. Possibly anthropogenic, possibly geological			537318	6228465	9	Unknown	
Magnetic anomaly			7294	71.5 (nT) Distinct dipole. Possibly anthropogenic, possibly geological			535941	6228235	9	Unknown	
Magnetic anomaly			7303	46.2 (T) Distinct dipole. Possibly anthropogenic, possibly geological			535088	6227003	9	Unknown	
Magnetic anomaly			7353	186.1 (nT) Large, broad anomaly identified on more than one line. Possibly anthropogenic, possibly geological			522236	6218178	9	Unknown	
Magnetic anomaly			7401	394.5 (nT) Distinct but irregular anomaly, identified on more than one line. Possibly anthropogenic, possibly geological			511191	6214805	9	Unknown	
Magnetic anomaly			7402	51.4 (nT) Distinct monopole. Possibly anthropogenic, possibly geological			510318	6214755	9	Unknown	
Magnetic anomaly			7410	80.9 (nT)Distinct dipole in area of larger, broad anomalies. Possibly anthropogenic, possibly geological			509648	6214363	9	Unknown	
Magnetic anomaly			7413	146.6 (nT) Large distinct monopole, poss. On more than one line. Possibly anthropogenic, possibly geological			509746	6214260	9	Unknown	

1 = Whittaker (1998); 2 = Larn & Larn (1998); 3 = UKHO; 4 = Wrecksite.eu; 5 = Baird B (1993); 6 = Baird B (2016); 7 = Britishnewspaperarchive.com; 8 = Ridley, G. (1992); 9 = Wessex 2013; 10 = Canmore

11.6 Assessment Criteria

The importance of marine historic environment receptors has been evaluated to inform the impact assessment. The level of importance assigned depends on a number of factors, including intrinsic, contextual and associative characteristics (HES Designation Policy and Selection Guidance 2019, Annex 5, paragraphs 15-17) and general guidelines used by statutory authorities and agencies such as the Scottish Government and HES. These are:

- HES and SNH's Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. 2018, v5;
- Historic Environment Scotland Designation Policy and Selection Guidance 2019;
- English Heritage. (2012). Ships and Boats: Prehistory to Present. Designation Selection Guide. Swindon: English Heritage;
- Wessex Archaeology. (2011). Assessing Boats and Ships, 1914-1938, 1914-1938. Archaeological Desk-Based Assessment in 3 volumes. Salisbury: Wessex Archaeology; and
- The Chartered Institute for Archaeologists (CIfA) Codes, Standards and Guidelines (http://www.archaeologists.net/codes/ifa).

In line with good practice, a precautionary level of importance has been assigned until proven otherwise (e.g. it may prove that a wreck considered to be of high importance has completely disintegrated). It should be noted that a site that has not been statutorily designated can still be of high importance. Features for which further information is unavailable are recorded as of uncertain importance. Table 11.2 summarises the criteria used to grade the importance of the cultural heritage receptors identified in Section 11.5.

Table 11.2 Definitions of importance of archaeological and historical sites

Level of importance (sensitivity)	Criteria
Very High	Archaeological and historical sites, submerged prehistoric landscapes and deposits, wrecks, wreck cargos, or areas of relative international importance, including world heritage sites. Shipwrecks dating to the prehistoric, Norse and Medieval periods, which are very rare; wreck cargos that contain very rare artefacts or artefacts representative of a particular area or time period; vessels and aircraft, lost in international conflicts, which involved losses of life. Shipwrecks involved in international trade, which were lost before 1913, a period during which the shipping industry was a major element in Britain's world influence, but only if the cargo is likely to survive and is of very high historical value, or if the remains provide evidence of ground-breaking changes in construction technology or vessel design and if the vessel type is extremely rare.
High	Archaeological and historical sites, submerged prehistoric landscapes and deposits, wrecks, wreck cargos, or areas of relative national importance, including designated wrecks (designated under UK or Scottish legislation) or HMPAs. Shipwrecks dating to the prehistoric, Norse and Medieval periods, which are rare; wreck cargos that contain rare artefacts or artefacts representative of a particular

Level of importance (sensitivity)	Criteria
	area or time period; non-designated vessels and aircraft, lost in conflicts, with no unrecovered losses of life; aircraft lost while on military service (but not in conflict), 20th–century vessels lost during peacetime with known losses of life likely to remain onboard. Shipwrecks involved in national trade, which were lost before 1913, a period during which the shipping industry was a major element in Britain's world influence, but only if the cargo is likely to survive and is of high historical value, or if the remains provide evidence of changes in construction technology or vessel design and if the vessel type is rare.
Medium	Archaeological and historical sites, wrecks, wreck cargos and areas of relative regional importance, or high local significance due to local associations. Shipwrecks, shipwreck cargos, anchorages and fishing areas from before 1913 that would have been involved in regional industry and trade if they are representative of the changes in naval engineering or support the identification and preservation of the diversity of vessels from this period, but only if the cargo is likely to survive and is of moderate historical value, or if the vessel type is not common.
Low	Archaeological and historical sites, wrecks, wreck cargos and areas of relative local importance. Shipwrecks dating from after 1913 relating to fishing, ferrying or other coastwise trade. Vessel types and cargos of limited intrinsic, contextual or associative characteristics, or that are still common.
Negligible	Features that have been recorded but assessed as having little or no archaeological or historical interest, such as recent wrecks with no local cultural significance, or those wrecks whose structure or cargos have been so damaged that they no longer have any historical merit.
Uncertain	Features that cannot be identified without detailed work, but potentially of some interest. Also, for example, if the date of construction or rarity of a vessel is not known but is potentially of some interest. Find-spots, which may represent an isolated find, or could represent the location of a hitherto unknown site.

The magnitude of any potential adverse impact on marine cultural heritage receptors caused by the offshore SG1A Project are determined using the criteria outlined in Table 11.3. It should be noted that these categories are guideline criteria, since assessments of magnitude are also matters of professional judgement.

Table 11.3 Definitions of importance of archaeological and historical sites

Magnitude of Impact	Description of Direct Impact	Description of Indirect Impact
Major	Works would result in the complete loss of the site or the loss of an area, features or evidence fundamental to the historic character and integrity of the site, severance of which would result in the complete loss of physical integrity.	The removal of, or a fundamental and irreversible change to, the relationship between a marine heritage asset or environment and a historically relevant seabed context. Major change that removes or prevents appreciation of characteristics key to a heritage asset, or permanent change to or removal of surroundings of a less sensitive asset or seabed context. A

Magnitude of Impact	Description of Direct Impact	Description of Indirect Impact
		noticeable change to a key relationship between a marine heritage asset or environment and a highly sensitive, valued or historically relevant seabed context over a wide area or an intensive change to a less sensitive or valued asset or seabed context over a limited area.
Moderate	Works would result in the loss of an important part of the site or some important features and evidence, but not areas or features fundamental to its historic character and integrity. Severance would affect the integrity of the site, but key physical relationships would not be lost.	Noticeable change to a non-key relationship between a marine heritage asset or environment and a historically relevant seabed context. Relationship, asset, or context tolerant of moderate levels of change. Small changes to the relationship between a heritage asset and a historically relevant seabed context over a wide area or noticeable change over a limited area.
Minor	Works or the severance of the site would not affect the main features of the site. The historic integrity of the site would not be significantly affected.	Minor changes to the relationship between a heritage asset or environment and a historically relevant seabed context over a wide area or minor changes over a limited area. Relationship, asset, or context considered tolerant of change.
Negligible	A very slight change, which is barely distinguishable, and approximates to the 'no change' situation	A very slight change, which is barely distinguishable, and approximates to the 'no change' situation.

Magnitude of impact is combined with the historic importance or sensitivity of the receptor to produce an overall impact significance. As per the assessment of magnitude of impact, Table 11.4 is a guide and the final assessment of significance will also require professional judgement. In this methodology, moderate and major effects are considered significant impacts that may require control, management and mitigation. However, it should be noted that impacts that lead to non-significant effects may still benefit from management or mitigation

Table 11.4 Marine archaeology impact significance matrix

Magnitude	Historic Importance/Sensitivity				
	Negligible	Low	Medium	High	Very high
Negligible	Negligible	Negligible	Negligible	Minor	Minor
Minor	Negligible	Negligible	Minor	Minor or moderate	Moderate
Moderate	Negligible	Minor	Moderate	Moderate	Major

Major	Minor	Minor or moderate	Moderate	Major	Major

11.7 Identification of Potential Impacts

The potential impact to marine historic environment assets that is assessed in this EIAR is from seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies. offshore SG1A Project activities (during construction, operation and decommissioning) which could result in such an impact are identified below in Section 11.7.1 and Section 11.7.2.

On the basis of the surveys conducted for the Inch Cape, Neart na Gaoithe and Seagreen Offshore Wind Farms (Seagreen 2012, Mainstream 2011, Inch Cape 2013, Inch Cape 2018), it is concluded that seabed disturbance will not result in loss or damage to paleoenvironmental deposits or prehistoric remains and will therefore not be considered in any further assessment of the offshore SG1A Project export cable corridor in this EIAR.

However, it should be noted that if nearshore geotechnical cores are to be taken, during any future geotechnical survey campaign for the offshore SG1A Project, close to the coast of East Lothian, where potential for paleoenvironmental or prehistoric remains were identified (Wessex 2013), they should be collected according to guidance in Gribble and Leather 2011. Consultation with HES will be undertaken to discuss the requirement for cores to be reviewed for submerged paleoenvironmental potential and material kept for potential analysis if organic sediments of paleoenvironmental interest (e.g. submerged peats, organic clays and silts) are identified.

11.7.1 Direct damage to or destruction of known and unknown marine historic environment assets

During seabed preparation, direct impacts to known and unknown cultural material on the seabed could be caused by vessel activities, seabed preparation, boulder clearance and grapnel hooking of debris, resulting in the removal of marine cultural heritage or removal of material that forms the context of the site. See Section 11.8 for embedded mitigation measures that will prevent such impacts.

During construction and installation, direct impacts to known and unknown cultural material on the seabed could be caused by activities resulting in the removal of marine cultural heritage or removal of material that forms the context of the site. Cable trenching and drilling activities at landfalls and trenching along the export cable corridor could cause greater potential impacts as they penetrate the seabed surface resulting in the potential destruction of any cultural heritage beneath and in the immediate vicinity of the cable route. Cable installation and burial, vessel activity, trench backfilling and stabilisation methods such as rock placement have the potential to cause direct damage to sites of marine cultural heritage through compression. See Section 11.8 for embedded mitigation measures that will prevent such impacts.

During operation and maintenance, it is possible that direct impacts to cultural material on the seabed could be caused by maintenance vessels dropping anchors on the seabed during routine inspections or preventative maintenance for general maintenance. The use of vessels with DP positioning systems rather than anchors, and informing any vessels with anchors of locations to avoid, will prevent such an impact. See Section 11.8 for embedded mitigation measures that will prevent such impacts.

During decommissioning of the cable, it is assumed that any impacts will be contained within the width of disturbance created by the installation of the cable. It is anticipated that there will not be any further impacts than those predicted during construction or operation.

11.7.2 Indirect damage to or destruction of known and unknown marine historic environment assets

There is potential that movement of the cable could expose areas of seabed that could affect nearby sites of cultural heritage interest (if present). However, such movement is considered to be very unlikely if the cables are buried or provided with protection where surface laid (e.g. rock placement).

11.8 Embedded Mitigation Measures

Potential impacts for marine historic environment receptors have been identified in Section 11.7. This has been used to ensure that all relevant development activities have been considered.

As detailed in Section 3.8.2.5, avoidance of known assets and identified geophysical anomalies that are likely to be anthropogenic will be the primary mitigation, embedded in the design of offshore SG1A Project export cable corridor .

The offshore SG1A Project will undertake marine geophysical surveys (sidescan sonar, magnetometry, multi-beam echosounding) to recognised standards sufficient for archaeological review (reconnaissance level in Plets et al 2013). Therefore, the archaeological review of data will be able to identify objects on the seabed (or just buried at the surface) that are 1-2 m in size, in order to capture the presence/absence of anchors, cannon and aircraft engines that could indicate assets of moderate or high importance.

Due to the potential for moderate or high value marine historic assets to be present but with an unknown location, the marine geophysical datasets collected for the offshore SG1A Project will be reviewed and analysed with a view to identifying anthropogenic geophysical anomalies so that marine historic assets can be identified and avoided. The geophysical survey data collected by the offshore SG1A Project will inform the refinement and micrositing of the offshore SG1A Project export cable corridor post consent to avoid known assets and identified geophysical anomalies.

A project-specific marine archaeological Written Scheme of Investigation (WSI) and a Protocol for the Accidental Discovery (PAD) of items of archaeological interest will be produced in consultation with the statutory authorities to manage potential impacts, once the final offshore SG1A Project cable route is established. This will be post-consent, and will take into account all known features as far as possible. The WSI and the PAD will be based on The Crown Estate's 2010 *Model Clauses for Written Schemes of Investigation: Offshore Renewables Projects*. This document is in the process of revision, and the latest version will be used if issued in time.

The WSI will:

- Set out the roles and respective responsibilities of the Project Team, including Contractors, and Archaeological Contractors and formal lines of communication between the parties and with Archaeological Curator(s);
- Outline the agreed mitigation and archaeological actions that are to take place in various circumstances to avoid impact on the known and potential marine historic environment assets;
- Provides detailed methodologies for these archaeological actions.
- Establish the position and extent of Archaeological Exclusion Zones, and methodologies for their monitoring, modification and/or removal;
- Ensure that any further geophysical, geotechnical, ROV, diver, or obstruction investigations associated with the project are subject to archaeological input and review of data, recording and sampling; and
- Establish the reporting, publication, conservation and archiving requirements for the archaeological works undertaken in the course of the scheme.

The marine PAD will set out a system for reporting unexpected finds of archaeological interest during route clearance, installation and as-built survey activities, thus reducing any adverse effects of the offshore SG1A Project on the marine historic environment by enabling people working on the Project to report archaeological discoveries as part of their work. The PAD will include an archaeological finds management plan for proper recording and analysis of any unexpected finds. The PAD will also cover site inductions and toolbox talks, so that personnel are made aware of the potential for unknown remains, and the procedures for reporting them.

The embedded mitigation presented above has been taken into consideration in the assessment of impact significance presented below. The embedded mitigation presented will reduce or eliminate any potential impacts on the marine historic environment from the offshore SG1A Project.

11.9 Assessment of Impacts

An assessment of the potential impacts of the offshore SG1A Project export cable corridor on the marine historic environment is shown in Table 11.5 below. Sensitivity/importance are high, because of the potential for the presence of military aircraft, and of unknown wrecks of moderate-high importance. However, the embedded mitigation measures outlined in Section 11.8 will reduce impact magnitude to negligible meaning all impacts on the marine historic environment will be of **minor adverse** significance (not significant in EIA terms).

Table 11.5 Potential environmental impacts and mitigations for marine historic environment receptors

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Construction								
Surveys: Geotechnical coring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Dredging / seabed clearance	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Trenching / Jetting	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Installation of cable protection / crossings	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Installation vessel anchoring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Operation & Maintenance								
Use of cable protection, such as rock armour	Seabed compression / scouring resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Surface-laid cable dragging / scouring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Anchoring of maintenance and inspection vessels	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Decommissioning								
Dragging / scouring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Exposing trench	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Anchoring of decommissioning vessels	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

11.10 Cumulative Impacts

The relative position of the offshore SG1A Project export cable corridor may give rise to the potential for cumulative interactions with other developments, including their export cables. The following offshore wind farm developments have been considered:

- Seagreen Phase 1;
- Marr Bank;
- Inch Cape; and
- Neart na Gaoithe.

It is highly unlikely that the installation, operation or decommissioning of the offshore SG1A Project presents any potential for significant cumulative impacts on historic marine assets on the seabed, since the named other projects have been, are, or will be designed to avoid any significant impacts on marine archaeology assets using embedded mitigation of cable route micrositing to avoid known features or geophysical anomalies and production of project specific WSIs. Therefore, cumulative impacts for the offshore SG1A Project in relation to the marine historic environment will be the same as those assessed for the offshore SG1A Project alone, i.e. **minor adverse** significance.

11.11 Conclusion

The embedded mitigation measures outlined in Section 11.8 reduce all potential impacts so that there will be no significant impacts on the marine historic environment, despite the potential for the presence of military aircraft, and of unknown wrecks of moderate-high importance.

Avoidance of historic assets is embedded in the project design, and marine geophysical surveys (side scan sonar, multi-beam echosounder, magnetometry) will be conducted to appropriate professional standards (reconnaissance level geophysical survey as outlined in Plets *et al* 2013). These datasets will be archaeologically reviewed post consent to identify historic environment assets and potentially anthropogenic geophysical anomalies that can then be avoided through cable route micrositing.

The offshore SG1A Project will prepare a project-specific marine heritage Written Scheme of Investigation and Protocol for Accidental Discoveries to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest. This would be based on standard professional guidelines, including The Crown Estate's *2010 Model Clauses for Written Schemes of Investigation: Offshore Renewables Projects*.

12. Schedule of Mitigation

This section of the EIAR presents a summary of the mitigation measures identified within each of the environmental topic assessments, to remove or reduce potential significant impacts of the offshore SG1A Project.

As set out in Section 6, two types of mitigation measures are considered; embedded mitigation measures and additional mitigation measures:

- Embedded mitigation: Mitigation measures that are embedded into the design of the project are referred and are intended to prevent, reduce and where possible offset any significant adverse impacts on the environment (summarised Table 12.1); and
- Additional mitigation: In some instances the EIA process may identify impacts that are considered significant and for which additional mitigation is required, to remove or reduce impacts identified. These are referred to as 'additional mitigation measures'.

Table 12.1 Embedded Mitigation (as detailed in Section 4)

Measure	Details
General	
Pre-construction surveys will be conducted to inform detailed route engineering.	Appropriate pre-construction validation surveys including geophysical, geotechnical, terrestrial and benthic scopes will be conducted to confirm the locations of potentially sensitive features. Detailed route design will be informed by the survey results, and sensitive features avoided where possible.
Environmental planning.	Development and implementation of a Marine Pollution Contingency Plan (MPCP) Development and implementation of a Construction Environmental Management Plan (CEMP). The CEMP will set out those responsible for overseeing work and the implementation of mitigation and good practice working methods during construction to minimise environmental effects.
Offshore	

Measure	Details
Marine mammal mitigation.	• All vessels will be compliant with the Scottish Marine Wildlife Watching Code (NatureScot, 2017) • A marine mammal observer (MMO) will be on the geophysical survey vessel to carry out the proposed mitigation. • The MMO will conduct a pre-shooting search of a 500 m radius mitigation zone. If a marine mammal is observed survey commencement will be delayed until 20 minutes after the marine mammal has left the mitigation zone or was last observed. • Soft start procedures will be implemented by seismic survey equipment, where practical, through the uniform ramping up of power. It is acknowledged that this is not possible for some SBP equipment (i.e. it is either on or off) and such instances will be ascertained by the appointed survey contractor; and • For SBP, in relation to line change procedures, it is interpreted here that equipment should be turned off if line changes (or other pauses) are expected to be longer than 40 minutes, and also where practical if line changes/pauses are less than 40 minutes, with the above pre-shooting search and soft start procedures applying in both cases.
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Marine Non-Native Species (MNNS) introduction during construction, operation and decommissioning is minimised.
Vessels will adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).	The Biofouling Guidelines provide a consistent approach to minimising the risk of MNNS introduction via biofouling on ship's hulls.
The use of external cable protection including rock berms and/or mattresses will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial.	Cable burial is the first choice for protection, as this minimises impacts on the environment and other sea users. However, when this is not possible due to existing subsea assets, or seabed conditions, other cable protection measures may be utilised to ensure the cable is adequately protected. The preferred option for this will be rock placement.

Measure	Details
All rock berms and external cable protection will be designed with slopes less than 1:2.5, and of suitable construction to minimise snagging risk.	Minimising disruption to commercial fisheries resulting from the installation and operation of the cables.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Liaison and Mitigation Action Plan (FLMAP).	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.
Additional communication for Forth Ports and local harbours	To communicate full details of construction works and programme.
Cable lay vessels (CLV) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability	Ensure navigational safety
Temporary aids to navigation will be deployed (if required) to guide vessels around any areas of installation activity.	Ensure navigational safety
Guard vessel(s) will be employed to work alongside the installation vessel(s) during the construction period. The guard vessel(s) will alert third party vessels to the presence of the installation activity and provide assistance in the event of an emergency.	Ensure navigational safety
Passing vessels will be requested to maintain a "safe" distance from installation vessels restricted in manoeuvrability, e.g. for a CLV with dynamic positioning a typical safe distance is 500m. This will be monitored by guard vessels	Ensure navigational safety
In water depths of greater than 20m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20m, the water depth will not be affected by more than 1m.	Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out.

Measure	Details
Compliance with International Regulations for the Prevention of Collision at Sea (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project, compliance will ensure navigational safety and minimise the risk of equipment snagging.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk of equipment snagging.
Crossing and Proximity agreements will be established with relevant cable and pipeline owners or operators of other assets.	These agreements will include the ability of a cable or pipeline operator to access their asset during construction if required. If such works are required to occur simultaneously, consultation with the cable or pipeline operator will be undertaken.
Protocol for Accidental Discoveries of Marine Historical Assets.	The Protocol will define procedures to be taken in the event of a discovery in order to avoid impact to any marine historic assets. Marine archaeology exclusion zones will be established where relevant, where access will be restricted.
Avoidance of any identified seabed heritage assets and geophysical anomalies. Conduct and review marine geophysical surveys to support avoidance.	Geophysical surveys and archaeological review of data, will allow for the avoidance of known assets and identified geophysical anomalies that are likely to be anthropogenic as the primary strategy. This will be supported by a marine Protocol for accidental archaeological discoveries (mPAD), and a marine archaeological written scheme of investigation (WSI).
Protocol for Dropped Objects at Sea	Seagreen 1A will implement prevention, notification and recovery processes for Dropped Objects
Navigational safety	Appropriate lighting and marking of vessels will be implemented to minimise risk to other marine users.

12.1 Natural Fish and Shellfish Resource

Embedded mitigation measures are outlined in Section 3.8.2.5 and Section 7.8. There are no additional mitigation measures which specifically in place for natural fish and shellfish resources.

12.2 Marine Mammals

Embedded mitigation measures were outlined in Section 3.8.2.5 and Section 8.8. Additional mitigation measures are:

- An EPS Licence to disturb cetaceans will be obtained.

12.3 Commercial Fisheries

Embedded mitigation measures were outlined in Section 3.8.2.5 and Section 9.8. SG1A has identified additional mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the following additional mitigation measures to reduce impacts on commercial fisheries to not significant:

- Appointment of a FLO to maintain proactive consultation with the fishing industry;
- Adherence to best practice guidance with regards to fisheries liaison (e.g. FLOWW, 2014; 2015);
- Timely and efficient distribution of Notice to Mariners (NtM), Kingfisher notifications and other navigational warnings of the location, expected duration and nature of works associated with the offshore SG1A Project;
- The appointment of Offshore Fisheries Liaison Officers (OFLOs) on board SG1A contracted vessels, as appropriate;
- Notification to the UK Hydrographic Office (UKHO) and Kingfisher of the proposed works /installed cable to facilitate the promulgation of maritime safety information and updating of nautical /admiralty charts and publications;
- Following review of the post-installation survey where areas of concern or where the target DoB is not achieved a geophysical survey will be carried out. (e.g. high-resolution multi-beam echo sounder, side scan sonar, video) in areas of the offshore SG1A export cable where target burial is not achieved. The resulting in 3D digital terrain maps and 2D cross sections of protection and the adjacent seabed and to make this available to fishermen.
- If required, and in consideration of the data which is collected during the geophysical survey, SG1A will carry out a single over trawl survey within 12 months of the installation and any protection works being completed. The locations and the extents of the over trawl surveys will be informed by the geophysical survey results, through currently available fishing activity data and through further postconstruction consultation with fisheries stakeholders and agreed with MSLOT.
- SG1A will conduct a detailed over trawl survey specification that will include a description of the appropriate vessel to undertake the survey, the type, specifications and rigging configuration of the trawl to be deployed and the towing pattern to be followed. The parameters to be assessed would also be defined along with acceptable limits relative to normal towing characteristics. SG1A will not undertake any further investigation in this respect where it is confirmed that the target depth of burial (DoB) has been achieved. The offshore SG1A Project proposes to discuss and confirm the full details of the over trawl survey approach with Marine Scotland, in consultation with fisheries stakeholders.
- SG1A will carry out a risk assessment for the need for guard vessels during works; or in the event of a cable exposure during operational phase of the cable's life. Where required, guard vessels will be confirmed through a standard.

- An evidence-based cooperation payment policy will be in place for static fishing gear operators which are requested to relocate fishing gear from the offshore SG1A Project, where relevant, in accordance with FLOWW guidance (2014, 2015).

12.4 Shipping and Navigation

Embedded mitigation measures were outlined in Section 3.8.2.5 and Section 10.8. Additional mitigation measures (see Section 10.9.2) are:

- Minimising the period of time the cable is left exposed, if post-lay burial is chosen.
- Targeted circulation of information about the project to regular commercial operators prior to offshore work commencing.
- Circulation of information to local sailing clubs located to increase the likelihood of local sailors being made aware of temporary installation work.
- Circulation of information to wind farm developers likely to be impacted by cable installation works.
- A Post-lay compass deviation survey to determine the magnitude of compass deviation.

12.5 Marine Archaeology

Embedded mitigation measures were outlined in Section 3.8.2.5 and Section 11.8. No additional mitigation measures were identified for marine archaeology.

12.6 Implementation

To ensure implementation of the embedded and additional mitigation in this EIAR, the schedule of mitigation (including Table 4.1 - Summary of offshore SG1A Project embedded mitigation) will be included in the offshore SG1A Project Construction Environmental Management Plan (CEMP) which will be produced prior to construction.

Any Contractor appointed to work on the offshore SG1A Project is expected to work to the offshore SG1A Project CEMP and will be required to produce a Contractor specific EMP in line with the project CEMP.

The CEMP will provide the policy and plans of how the construction and cable installation works are to be managed from an environmental perspective. The CEMP will clearly set out the lines of communication between SG1A Project Management Team and Environmental Lead, and the Contractor's Management Team and their Environmental Representative. It will set out the roles and responsibilities of the various parties to with regard to ensuring that all environmental mitigation is appropriately implemented.

In addition to the CEMP, the Fisheries Liaison and Mitigation Action Plan (FLMAP) will be implemented.

13. Summary of Impacts

This section of the EIAR (Table 13.1 and Table 13.2) summarises the impact assessment conclusions within each environmental topic assessment (Section 7-11).

For the purposes of this EIAR, potential impacts identified as major or moderate are generally considered to be significant in EIA terms, while impacts identified as minor or negligible are generally considered to be not significant in EIA terms. Therefore, **this EIAR concludes that the offshore SG1A Project will have no significant impacts**. Therefore, no additional environmental monitoring requirements have been identified beyond that identified as part of the SG1A Project's embedded mitigation (Section 3.8.2.5).

In addition to this EIAR, a Nature Conservation Appraisal Report (NCA Report) has been produced (Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report (LF000012-CST-OF-LIC-DEV-REP-0002)) to provide detailed assessment of the offshore SG1A Project's potential for effect on protected sites designated for their nature conservation interests. The offshore SG1A NCA Report concludes that the project is not Capable of Affect on any NCMPA site and will not have a Likely Significant Effect on any SPAs and SACs.

Table 13.1 Offshore SG1A Project – Summary of impacts

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Natural Fish and Shellfish Resource								
Construction (and Decommissioning)								
Habitat disturbance, loss	Sandeel	Medium	Low	Minor	No additional mitigation required beyond embedded mitigation.	Low	Minor	Not significant
	Nephrops	Low	Low	Negligible	No additional mitigation required beyond embedded mitigation.	Low	Negligible	Not significant
	Scallops	Medium	Low	Minor	No additional mitigation required beyond embedded mitigation.	Low	Minor	Not significant
	Herring	Negligible	Low	Negligible	No additional mitigation required beyond embedded mitigation.	Low	Negligible	Not significant
Operation and Maintenance								
Effects of EMF	Atlantic Salmon	Medium	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant
	Sea lamprey	Negligible	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
	European eel	Low	Negligible	Negligible	No additional mitigation required beyond embedded mitigation.	Negligible	Negligible	Not significant
Marine Mammals								
Construction (including pre-construction surveys)								
Geophysical surveys using UHRS	Injury - impair the ability of any animal to survive or reproduce.	International	Negligible	Minor	No additional mitigation beyond embedded mitigation	Negligible	Minor	Not significant
	Disturbance of up to 1.5% of any cetacean population. Disturbance of breeding seals associated with the Isle of May SAC	International	Low	Moderate	An EPS Licence to disturb cetaceans will be obtained. Surveys will be managed, where possible, such that activities in close proximity to the SAC are limited during the breeding season (September through December).	Negligible	Minor	Not significant
Geophysical surveys using SBP	Injury - impair the ability of any animal to survive or reproduce.	International	Negligible	Minor	No additional mitigation beyond embedded mitigation	Negligible	Minor	Not significant
	Disturbance of up to 1% of any cetacean population.	International	Low	Moderate	An EPS Licence to disturb cetaceans will be obtained.	Negligible	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Operation and Maintenance								
Geophysical surveys using SBP	Disturbance of up to 1% of any cetacean population.	International	Low	Moderate	An EPS Licence to disturb cetaceans will be obtained.	Negligible	Minor	Not significant
Decommissioning								
Geophysical surveys using SBP	Disturbance of up to 1% of any cetacean population.	International	Low	Moderate	An EPS Licence to disturb cetaceans will be obtained.	Negligible	Minor	Not significant
Commercial Fisheries								
Construction (and Decommissioning)								
Temporary loss or restricted access to fishing grounds	Impact to Static fishing gear vessels	Medium	Medium	Moderate	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Low	Minor	Not significant
	Impact to Scallop dredgers	Negligible	Negligible	Negligible		Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Low	Low	Minor		Negligible	Negligible	Not significant
	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included	Low	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Displacement of fishing activity into other areas	Impact to Scallop dredgers	Negligible	Low	Negligible	within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3(along with embedded mitigation in Section 3.8.2.5).	Low	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Low	Low	Negligible		Low	Negligible	Not significant
Safety issues for fishing vessels	Fishing vessels	Extremely Unlikely	Serious	Tolerable	No additional mitigation beyond embedded mitigation	Tolerable	Not significant	Fishing vessels
Operation and Maintenance								
Long term loss or restricted access to fishing grounds	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Negligible	Negligible	Not significant
	Impact to Scallop dredgers	Low	Low	Negligible		Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops)*	Medium	Low	Minor		Negligible	Negligible	Not significant
	Impact to Static fishing gear vessels	Medium	Low	Minor	SG1A has identified mitigation measures which will be included	Negligible	Negligible	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Displacement of fishing activity into other areas	Impact to Scallop dredgers	Low	Low	Negligible	within the Fisheries Liaison Mitigation Action Plan (FLMAP), which will be a live document. The FLMAP will include the mitigation listed in Section 9.9.3 (along with embedded mitigation in Section 3.8.2.5).	Negligible	Negligible	Not significant
	Impact to Demersal trawling (especially *Nephrops*)	Medium	Low	Minor		Negligible	Negligible	Not significant
Safety issues for fishing vessels	Fishing vessels	Extremely Unlikely	Serious	Tolerable	No additional mitigation beyond embedded mitigation	Tolerable	Not significant	Fishing vessels
Marine Archaeology								
Construction								
Surveys: Geotechnical coring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Dredging / seabed clearance	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Trenching / Jetting	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Installation of cable protection / crossings	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Installation vessel anchoring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Operation & Maintenance								
Use of cable protection, such as rock armour	Seabed compression / scouring resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Surface-laid cable dragging / scouring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Anchoring of maintenance and inspection vessels	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Decommissioning								
Dragging / scouring	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant
Exposing trench	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

Impact	Description of Impact	Receptor Sensitivity	Magnitude	Impact significance	Additional Mitigation Measures	Residual Magnitude	Residual Impact Significance	Conclusion
Anchoring of decommissioning vessels	Seabed disturbance resulting in loss or damage to wrecks, aircraft or anthropogenic geophysical anomalies	Low-High	Negligible	Minor	No additional mitigation required beyond embedded mitigation.	No change	Minor	Not significant

Table 13.2 Summary of Impacts – Shipping and Navigation

Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Effects
Shipping and Navigation						
Construction						
Increased collision risk to passing vessels from a vessel associated with the cable installation.	Circulation of information; Suitable marking and lighting of construction vessels; Temporary AtoNs (if required); Guard vessels (if required); Liaison with Forth ports and local harbours; Compliance with COLREGS and SOLAS; Safe passing distances	Extremely Unlikely	Serious	Tolerable	Targeted circulation of information to regular commercial operators and local sailing clubs.	Tolerable (not significant)
Cable installation causes disruption to passing vessel routeing/ timetables, as well as increased collision risk between third parties due to route deviations.	Circulation of information; Liaison with Forth ports and local harbours	Reasonably Probable	Minor	Tolerable	Targeted circulation of information to regular commercial operators and wind farm developers.	Tolerable (not significant)

Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Effects
Cable installation causes disruption to fishing and recreational activity.	Circulation of information; Guard vessels (if required); Appointment of FLO.	Reasonably Probable	Minor	Tolerable	Circulation of information to local sailing clubs.	Tolerable (not significant)
Cable installation causes disruption to military exercises	Circulation of information.	Extremely Unlikely	Minor	Broadly Acceptable	Not Applicable	Broadly Acceptable (not significant)
Cable installation causes disruption to marine aggregate dredging activities.	Circulation of information.	Extremely Unlikely	Minor	Broadly Acceptable	Not Applicable	Broadly Acceptable (not significant)
A vessel allides with a wind turbine	Guard vessels (if required); Temporary AtoNs (if required); Liaison with wind farm developers.	Remote	Serious	Tolerable	Not Applicable	Tolerable (not significant)
A vessel drags anchor onto exposed cable.	Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable (not significant)
A vessel drops anchor in an emergency onto exposed cable.	Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable (not significant)
Fishing gear snags on exposed cable.	Appointment of FLO; Circulation of information; Guard vessels for exposed cable.	Remote	Serious	Tolerable	Minimising duration cable is exposed.	Tolerable (not significant)
Operation and Maintenance						

Impact Description	Embedded Mitigation	Frequency of Occurrence	Severity of Consequence	Impact Significance	Additional Mitigation	Residual Effects
A vessel drags anchor over the cable.	Cable protection measures; Cable marked on charts.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable (not significant)
A vessel drops anchor in an emergency over the cable.	Cable protection measures; Cable marked on charts.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable (not significant)
A vessel engaged in fishing snags its gear on the cable.	Cable marked on charts; Cable protection measures; Appointment of FLO.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable (not significant)
A vessel grounds due to reduced under keel clearance.	Cable marked on charts; Less than 5% reduction in water depth or further consultation with MCA.	Extremely Unlikely	Serious	Tolerable	Not Applicable	Tolerable (not significant)
Collision of a passing vessel with a vessel associated with maintenance works/monitoring of the cable.	Circulation of information; Suitable marking and lighting of construction vessels; Temporary AtoNs (if required); Guard vessels (if required); Liaison with Forth ports and local harbours; Compliance with COLREGS and SOLAS; Safe passing distances	Extremely Unlikely	Serious	Tolerable	Targeted circulation of information to regular commercial ferry operators and local clubs.	Tolerable (not significant)
Interference with magnetic compass onboard passing vessels.	Cable burial;	Reasonably Probable	Minor	Tolerable	Post-lay compass deviation survey	Tolerable (not significant)

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Appendix A: Offshore SG1A Screening Report and Screening Opinion

Project Title	Seagreen 1A Limited
Document Reference Number	LF000012-CST-OF-LIC-DEV-REP-0001

Seagreen 1A Export Cable Corridor Screening Report

Rev	Date	Reason for Issue	Originator	Checker	Approver
01	02/12/2020	Approved for use	[redacted]		

Document Change Summary

Rev	Date	Detail of Change	Changed by

Table of Contents

Table of Figures

Table of Acronyms

AIS	Automatic Identification System
B	Magnetic Components
BGS	British Geological Survey
CaP	Cable Plan
CBRA	Cable Burial Risk Assessment
CDM	Construction Design and Management
CEH	Centre for Ecology & Hydrology
CEMP	Construction Environmental Management Plan
CITES	Convention on International Trade in Endangered Species
CMS	Convention of Migratory Species
COSHH	Control of Substances Hazardous to Health Regulation
cSAC	Candidate Special Area of Conservation
DP2	Dynamic Positioning
E	Electric
ECR	Offshore Export Cable Corridor
EIA	Environmental Impact Assessment
ELC	East Lothian Council
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPS	European Protected Species
EU	European Union
FLO	Fisheries Liaison Officer
FMMS	Fisheries Management and Mitigation Strategy
GT	Gross Tonnage
HDD	Horizontal Directional Drilling
HES	Historic Environment Scotland
HRA	Habitat Regulations Appraisal
HSE	Health, Safety and Environment

iE	Induced Electric
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
m	Meters
MBES	Multibeam Echosounders
MCA	Marine Coastguard Agency
MLWS	Mean Low Water Springs
MNNS	Marine Non-Native Species
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
µT	Micro Tesla
NCA	Nature Conservation Appraisal
NCMPA	Nature Conservation Marine Protected Area
nm	Nautical Miles
NMPi	National Marine Interactive Plan
NRA	Navigational Risk Assessment
O&M	Operation and Maintenance
OFTO	Offshore Transmission Owner
OTA	Offshore Transmission Asset
OWF	Offshore Wind Farm
PAC	Pre-Application Consultation
PAH	Poly-Aromatic Hydrocarbons
PCB	Poly-Chlorinated Biphenyls
PMF	Priority Marine Features
pNCMPA	Possible Nature Conservation Marine Protected Area
pSPA	Proposed Special Protection Area
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub-Bottom Profilers

SCANS	Small Cetaceans in the European Atlantic and North Sea
SEL	Sound Exposure Levels
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SG1A	Seagreen 1A Project
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SMU	Seal Management Units
SSC	Suspended Sediment Concentration
SSS	Side Scan Sonar
SWEL	Seagreen Wind Energy Limited
SG1A Ltd	Seagreen 1A Limited
TEC	Transmission Entry Capacity
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra-Short Baseline
UXO	Unexploded Ordinances
V m-1	Volts Per Metre
VMP	Vessel Management Plan
VTS	Vessel Traffic Service
WTG	Wind Turbine Generators

1. Introduction

Seagreen Wind Energy Ltd (SWEL, hereafter referred to as Seagreen) is a joint venture between SSE Renewables and Total. In 2014 Seagreen was awarded Section 36 Consents (S36 Consents) under the Electricity Act 1989 by Scottish Ministers for Seagreen Alpha and Seagreen Bravo Offshore Wind Farms (OWFs). Marine Licences for Seagreen Alpha and Bravo OWFs and the Offshore Transmission Asset (OTA) (together the 'Marine Licences') were also awarded by Scottish Ministers in October 2014, under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009. Together the wind farms Seagreen Alpha and Seagreen Bravo and the OTA collectively comprise 'the Seagreen Project'.

To maximise energy generation and facilitate full export capacity for the Seagreen Project, Seagreen 1A Limited, hereafter referred to as Seagreen 1A) is proposing to consent an additional export cable corridor (approximately 108km) from the consented Seagreen Project Area to an identified landfall location at Cockenzie. This single offshore export cable infrastructure comprises the Seagreen 1A project, hereafter referred to as the SG1A Project.

In accordance with Part 4 of the Marine (Scotland) Act 2010, Seagreen 1A proposes to submit an application for a Marine Licence to Marine Scotland's Licensing and Operations Team (MS-LOT) for the installation of the SG1A Project. The proposed 108 km offshore export cable corridor (ECR) is shown in Figure 1.1.

This report presents details of the characteristics and location of the proposed works along with the characteristics of any potential impacts to support a screening decision. This report will also outline any potential impacts that will be considered further in an Environmental Appraisal (EA) that will be produced to support the application for the Marine Licence. Based on the characteristics of the SG1A Project and with consideration of potential impacts that may arise from the project, it is Seagreen 1A's position that an Environmental Impact Assessment (EIA) under Marine Works (Environmental Assessment) (Scotland) Regulations 2017 (the 2017 EIA Regulations) is not required to support the Marine Licence application.

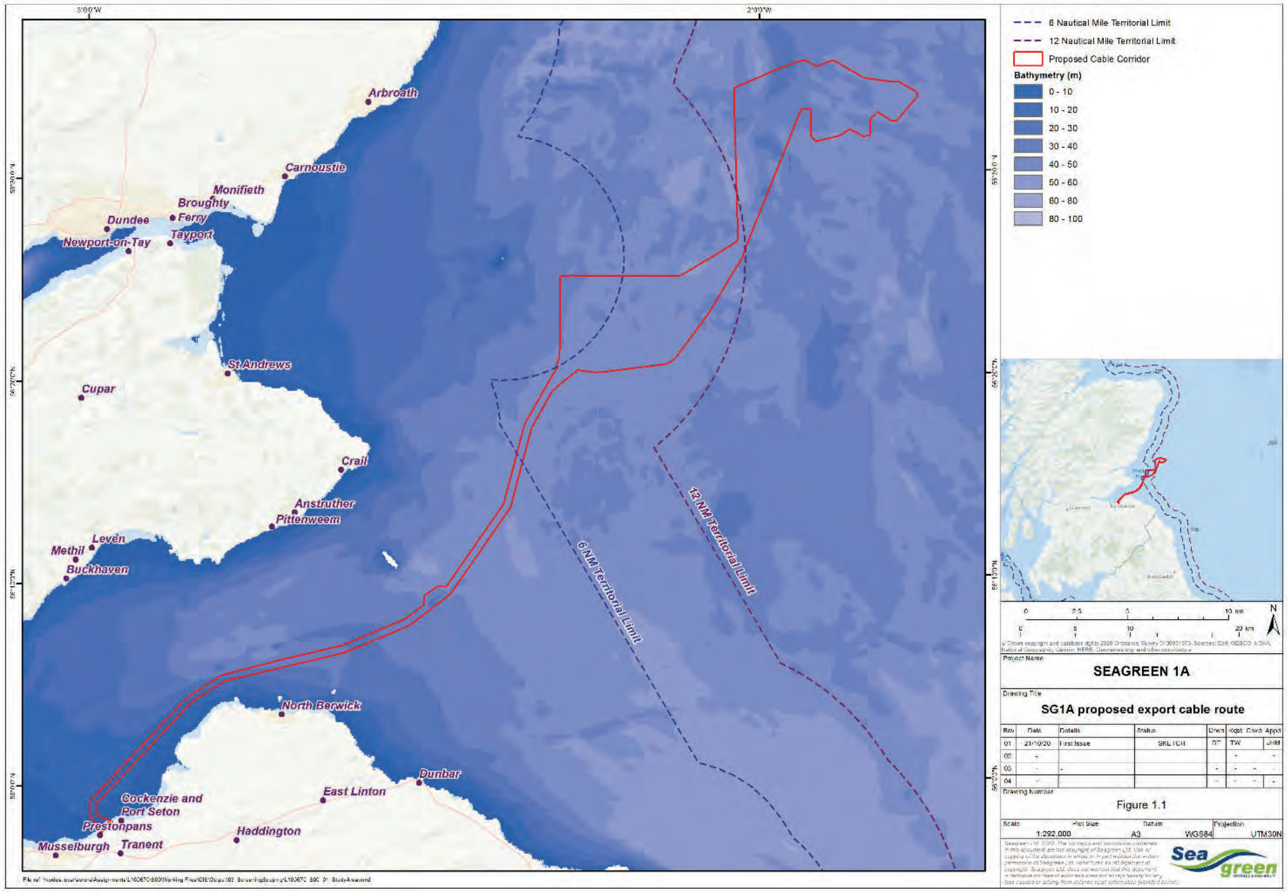

Figure 1.1 – Seagreen 1A preferred subsea cable route corridor

1.1 Background

Seagreen is a joint venture between SSE Renewables (49%) and Total (51%). 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. The Firth of Forth Zone lies beyond the 12 nautical mile (NM) Scottish territorial waters limit.

The Seagreen Project is located in the North Sea, in the outer Firth of Forth and Firth of Tay region and comprises the OWFs (the Wind Turbine Generators (WTGs), their foundations and associated array cabling), together with associated infrastructure of the OTA (Offshore Substation Platform (OSP), their foundations and the offshore export cable which will make landfall at Carnoustie and connect to the Tealing substation (Seagreen, 2018).

The SG1A Project, comprises one high voltage export cable to mean high water springs (MHWS), cable landfall and connection to the onshore infrastructure. Scour protection and cable protection may also be required.

In February 2020, Seagreen received a grid offer from National Grid for the Cockenzie substation in East Lothian with Transmission Entry Capacity (TEC) of 360MW. This was accepted by Seagreen in June 2020, with a connection date of October 2023. The proposed export cable infrastructure will transmit electricity from up to 36 WTGs in the consented Seagreen Project Area, via an OSP also consented under the Seagreen Project, to the new landfall location at Cockenzie.

The onshore cable infrastructure for SG1A will be consented under the Town and Country Planning Act (Scotland) 1997 and is not considered further within this report.

2. Consent Requirements

2.1 Consideration of the need for EIA

When considering the SG1A Project in isolation, the installation of a single offshore export cable does not fall under either Schedule 1 or Schedule 2 of the 2017 EIA Regulations. However, it is considered that the proposed works may represent a change or an extension to an authorised project and therefore may fall under the description of projects provided at Paragraph 13 of Schedule 2 of the 2017 EIA Regulations (i.e. a change to an installation for the harnessing of wind power for energy production (wind farms) where those works are already authorised). In this context an EIA is only required where the change may have significant adverse effects on the environment.

The 2017 EIA Regulations specify that in making a determination as to whether or not a Schedule 2 project is an EIA project, the relevant criteria set out in Schedule 3 must be considered together with the results of any relevant assessment. These criteria cover the characteristics of the works, the location of the works and the characteristics of the potential impacts. This Screening Report provides the required information to satisfy the Schedule 3 selection criteria as outlined below in Table 2.1.

It is noted that the SG1A Project overlaps considerably with the already assessed and consented Inch Cape OWF export cable corridor (further detail on the SG1A ECR layout is provided in section 3.2). This overlap has been designed to minimise any disturbance across the Forth and Tay area. An Environmental Impact Assessment was undertaken to support the successful consent application of Inch Cape OWF (Inch Cape, 2011; 2018). Given the overlap between the SG1A Project and the Inch Cape export cable corridor, information and assessment conclusions presented in the Inch Cape documents (Inch Cape, 2011; 2018) are used within this Screening Report, to support the characterisation of potential impacts of the SG1A Project (Section 6).

Taking into consideration the conclusions of the Inch Cape assessments, along with the assessments undertaken and presented within this Screening Report, and the scale of works for the SG1A Project (one single offshore export cable compared with up to six Inch Cape offshore export cables), this Screening Report has determined that the SG1A Project will not have any significant environmental impacts.

On the basis of the information presented in this report, Seagreen 1A is requesting that Scottish Ministers make a determination that an EIA under the 2017 EIA Regulation is not required to support the SG1A Project Marine Licence application.

Table 2.1 - Summary of the Schedule 3 Criteria and the relevant locations where each is addressed within this Screening Report

Schedule 3 Criteria	Subsections	Location in document
Characteristics of works 1. The characteristics of works must be considered having regard, in particular, to—	(a) the size and design of the works;	Section 3.3.2.2
	(b) cumulation with other existing works and/or approved works;	See cumulative impact sections within the key environmental consideration Sections 6.2.5.7, 6.3.5.5, 6.4.5.6, 6.5.5.4, 6.6.5.6, 6.7.5.7, 6.8.5.11, 6.9.5.4.
	(c) the use of natural resources, in particular land, soil, water and biodiversity;	Section 4.8
	(d) the production of waste;	Section 4.8
	(e) pollution and nuisances;	Section 4.8
	(f) the risk of major accidents and/or disasters which are relevant to the project concerned, including those caused by climate change, in accordance with scientific knowledge;	Section 4.8
	(g) the risks to human health (for example due to water contamination or air pollution).	Section 4.8

Location of works 2. The environmental sensitivity of geographical areas likely to be affected by works must be considered having regard, in particular, to—	(a) the existing and approved land use;	Section 4.4
	(b) the relative abundance, availability, quality and regenerative capacity of natural resources (including soil, land, water and biodiversity) in the area and its underground;	Section 4.8
	(c) the absorption capacity of the natural environment, paying particular attention to the following areas— (i) wetlands, riparian areas, river mouths; (ii) coastal zones and the marine environment; (iii) mountain and forest areas; (iv) nature reserves and parks; (v) European sites and other areas classified or protected under national legislation; (vi) areas in which there has already been a failure to meet the environmental quality standards, laid down in Union legislation and relevant to the project, or in which it is considered that there is such a failure; (vii) densely populated areas; (viii) landscapes and sites of historical, cultural or archaeological significance.	Section 6
Characteristics of the potential impact 3. The likely significant effects of the works on the environment must be considered in relation to criteria set out in paragraphs 1 and 2 above, with regard to the impact of the works on the factors specified in regulation 5(3), taking into account—	(a) the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);	Section 6 and Section 8
	(b) the nature of the impact;	Section 6 and Section 8
	(c) the transboundary nature of the impact;	Section 6 and Section 8
	(d) the intensity and complexity of the impact;	Section 6 and Section 8
	(e) the probability of the impact;	Section 6 and Section 8
	(f) the expected onset, duration, frequency and reversibility of the impact;	Section 6 and Section 8
	(g) the cumulation of the impact with the impact of other existing and/or approved works;	Section 6 and Section 8
	(h) the possibility of effectively reducing the impact.	Section 6 and Section 8

2.2 Marine Licence Requirement

In accordance with Part 4 of the Marine (Scotland) Act 2010, a Marine Licence is required for the installation and operation of submarine cables in Scottish waters.

Seagreen 1A does not consider a formal EIA to be required for the SG1A Project, however, it is noted that in its Guidance for Marine Licence Applicants (Marine Scotland, 2015a) Marine Scotland advises "applicants for marine licences for submarine cables should consider the scale and nature of their projects and give consideration to the need for a proportionate environmental assessment".

For larger projects, where there is potential for the subsea cable to impact key environmental receptors, it is recommended by Marine Scotland (Marine Scotland, 2015a) that an assessment of potential impacts on these receptors is carried out. Results from this assessment in addition to other relevant information about the Project should then be provided to support the Marine Licence application.

In line with Marine Scotland Guidance, this Screening Report sets out any potential impacts that will be considered further in an Environmental Appraisal that will be produced to support the SG1A Project application for a Marine Licence.

2.3 Consultation

Table 2.2 below highlights consultation undertaken to date in relation to the SG1A Project. Seagreen 1A intends to continue active consultation for the duration of planning, and all subsequent phases of the SG1A Project, particularly with the fisheries community. In light of the COVID-19 pandemic, it is expected all consultation will continue to be carried out virtually via video calls, email and telephone.

Table 2.2 - Consultation with stakeholders to date

Consultee	Description	Date
Marine Scotland	Call with key contacts to introduce the concept of the SG1A Project - first communication	27 May 2020
NatureScot	Call with key contacts to introduce the concept of the SG1A Project - first communication	3 June 2020
NatureScot, East Lothian Council (ELC)	Call to discuss SG1A Ornithology survey strategy and confirm survey and data requirements	10 September 2020
Marine Scotland	Call to discuss SG1A Ornithology survey strategy and confirm survey and data requirements	15 September 2020

Marine Scotland	SG1A Project update meeting. Confirmation of export cable corridor, discussion on consenting approach, project programme, key topics and next steps to screening	10 November 2020
Marine Scotland, NatureScot, Marine Scotland Science	SG1A Project update meeting and benthic survey scope. Update NatureScot on export cable corridor, discussion on consenting approach and programme and benthic survey scope and approach proposed	18 November 2020
Commercial Fisheries Stakeholders, including the Forth and Tay Commercial Fisheries Working Group members, Scottish Fishermen's Federation, Scottish White Fish Producer's Organisation, Regional Inshore Fisheries Groups and fishing vessel operators	SG1A Project Introduction email distributed including a map, and a summary of the background to the project plus expected upcoming activities and consultation information	20 November 2020
NatureScot	Email – agreement on benthic survey scope	26 November 2020
Marine Scotland Science	Letter – 'Seagreen 1A Consultation on Benthic Survey Scope of Works'	2 December 2020

2.3.1 Consideration of the need for Pre-Application Consultation (PAC)

Applicants for Marine Licences for certain prescribed classes of activities are required to carry out pre-application consultation (PAC) under The Marine Licensing (PAC) (Scotland) Regulations 2013 (the "PAC Regulations"). One of the prescribed classes of activities is the deposit of a submarine cable in the sea, or on or under the seabed from a vehicle, vessel, aircraft, marine structure or floating container, but only where that cable:

1. exceeds 1,853 metres in length; and
2. crosses the intertidal boundary.

Both criteria are met in relation to the SG1A Project and therefore PAC will be required. A virtual offshore PAC event for SG1A Project is planned to take place in January 2021, with the official public notification being issued in early December 2020, allowing a surplus of the statutory minimum period of time of 6 weeks of notice before the PAC event and 12 weeks prior to submission of the Marine Licence application. A PAC report will be developed and issued by Seagreen 1A alongside the Marine Licence application.

2.4 Scottish National Marine Plan

The Scottish Government adopted the National Marine Plan (NMP) in early 2015 (Marine Scotland, 2015b) to provide an overarching framework for marine activity in Scottish waters, with the aim to enable sustainable development and the use of the marine area in a way that protects and enhances the marine environment whilst promoting both existing and emerging industries. This is underpinned by a core set of general policies which apply across existing and future development and use of the marine environment. The relevant core policies and principles of the NMP have been considered in the context of the SG1A Project and development of this Screening Report.

2.5 Other legislative requirements

Where there is potential for a project to have an adverse effect on a Natura site (Special Area of Conservation (SAC) or Special Protection Area (SPA)), including proposed or candidate sites e.g. pSPAs or cSACs, an appropriate assessment is required in accordance with the Habitats Directive to ascertain whether a project will adversely affect the integrity of a site in view of the conservation objectives of the site.

The requirements of the Habitats Directive are transcribed in Scotland by the Conservation (Natural Habitats, &c.) Regulations 1994, as amended, and the Conservation of Offshore Marine Habitats and Species Regulations 2017. In accordance with these regulations, and as part of the Habitats Regulation Appraisal (HRA) process, where it is identified that there is potential for a Likely Significant Effect (LSE) on a Natura site, the applicant is required to provide information on the effects of the project on the integrity of a European site to the competent authority, to enable them to undertake an appropriate assessment of the project.

In addition to requirements for an HRA (see Section 7.1.2), where a project has the potential to impact either a designated or possible Nature Conservation Marine Protected Area (NCMPA or possible NCMPA (pNCMPA)) designated under the Marine (Scotland) Act 2010, applicants are also required to provide specific information on the potential impacts of the proposed project on the conservation objectives of these sites.

The potential for the SG1A Project to interact with features of these designated sites are considered in the relevant topic in Section 6. In support of the Marine Licence Application, a Nature Conservation Appraisal (NCA) will also be produced and submitted as an appendix to the Environmental Appraisal to satisfy the legislative requirements. Further details are provided in Section 7.1.2.

3. Location of Works: Route Selection

The proposed location for the SG1A Project is in the Firth of Forth and Firth of Tay between the consented Seagreen Project and the anticipated landfall location at Cockenzie as outlined in Figure 1.1. The SG1A project overlaps considerably with the consented Inch Cape export cable corridor, with the SG1A ECR running south and east of the Inch Cape OWF, north of the consented Neart Na Gaoithe OWF and northwest of Berwick Bank and Marr Bank proposed OWFs (Figure 3.1).

The options considered for the SG1A Project have been informed by work undertaken as part of a number of previous studies to establish a technically and environmentally feasible subsea cable route corridor which can be presented in the Marine Licence application.

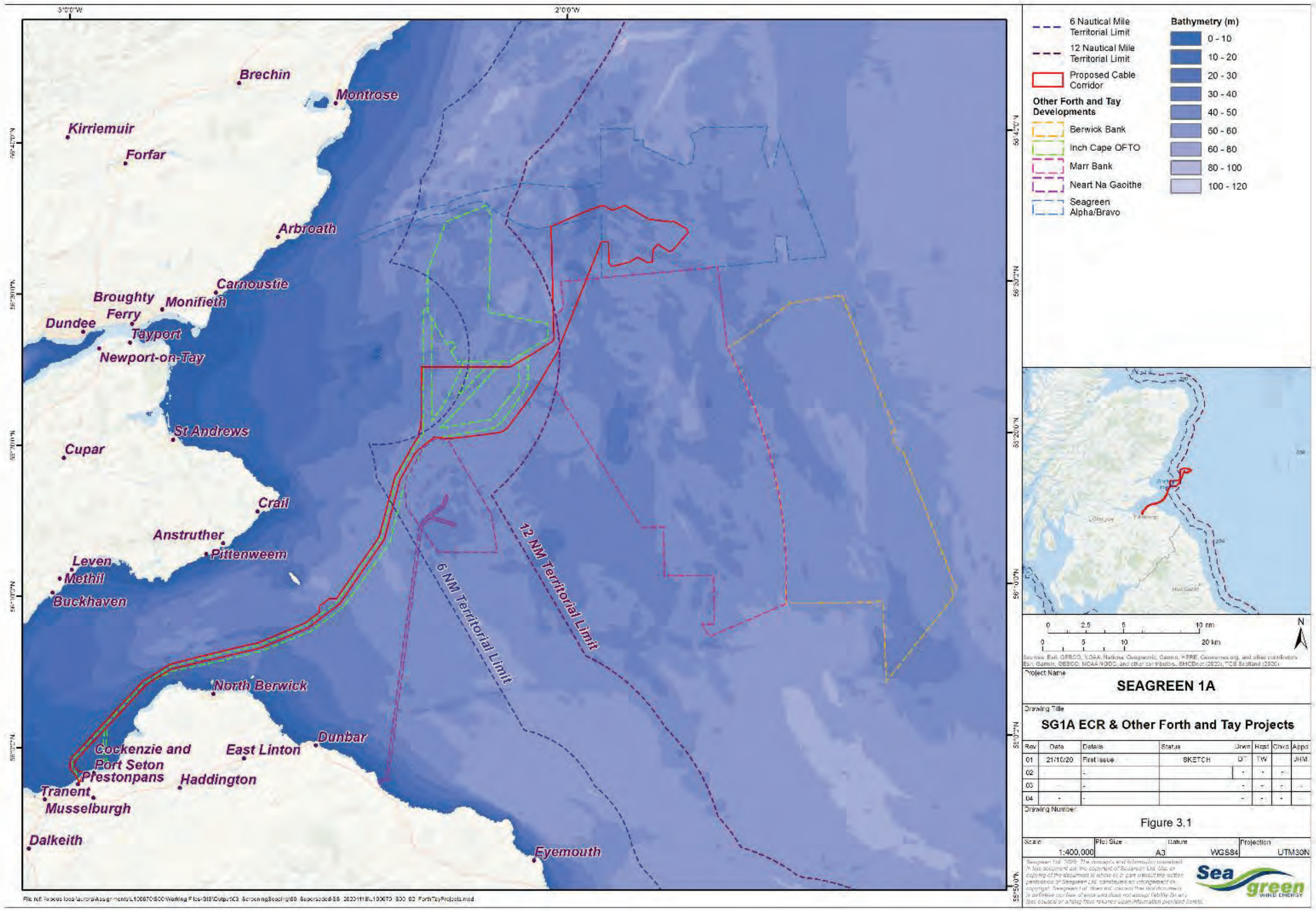

Figure 3.1 SG1A Project, the nearby Offshore Wind Farm developments and partially overlapping Inch Cape export cable route

3.1 Landfall Locations

The final landfall location and ECR for the Seagreen 1A Project are yet to be determined; however, two potential landfall locations have been identified and are currently under consideration at Cockenzie and Seton Sands. The chosen landfall location and onshore transmission infrastructure will be the subject of a separate onshore planning application under the Town and Country Planning Act (Scotland) 1997.

3.2 Subsea Cable Indicative Layout

The SG1A ECR follows a similar alignment to the consented Inch Cape OWF cable corridor to minimise disturbance across the Forth and Tay area.

The proposed SG1A ECR has been selected following a robust cable route selection process which considered environmental constraints, engineering feasibility and other marine users in the region, particularly fishing activities. Known environmental sensitivities including protected sites and their key features, important seabed habitats and wreck features are avoided where possible. Known areas of hard seabed substrate are also avoided and the cable route has been selected to reduce the overall cable lengths to maintain project feasibility. The route selected also seeks to avoid other offshore wind developments in the region, maintaining separation distance from both the Inch Cape and Neart na Gaoithe wind farm project boundaries. However, across much of its offshore route, the SG1A ECR overlaps across approximately 400m-500m of the consented Inch Cape ECR and extends approximately 200m-300m beyond this. This route was selected to minimise disturbance and reduce environmental impacts by closely following the trajectory of a consented cable corridor.

From early discussions with Inch Cape, Seagreen 1A understand that the Inch Cape project is unlikely to require and install the full six export cables consented in 2014. Discussions are ongoing with Inch Cape to understand export cable number and requirements, cable installation processes, any proximity issues and the potential for any cable crossings.

3.3 Marine Surveys

3.3.1 Regional existing benthic surveys

The SG1A Project area is well studied with considerable existing data available for the Forth and Tay region, including:

- Benthic surveys:
  - EUSeaMap;
  - The Seagreen Project (characterisation and pre-construction);
  - Inch Cape and Neart na Gaoithe survey data and EIA; and
  - Cooper and Barry (2017). A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed.
- Marine Ornithology surveys (see Section 6.5.1 for further details):

  - Seagreen, Inch Cape and Neart na Gaoithe OWF monthly boat-based surveys;
  - Seagreen, Inch Cape and Neart na Gaoithe OWF monthly aerial surveys;
  - Seagreen 1A Project (offshore cable): intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), July 2020 to present; and
  - Inch Cape offshore cable: intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), January 2012 to January 2013.

3.3.2 Additional surveys

Additional surveys are proposed by Seagreen 1A, to validate existing survey data (Section 3.3.1) and to provide up-to-date data to inform detailed design and installation methods. Further planned surveys also include a static fishing gear observation survey (November 2020), offshore ornithology surveys (ongoing), benthic and geophysical surveys (December 2020).

3.3.2.1 Benthic surveys

A benthic subtidal ecology baseline validation survey is proposed to validate the existing benthic ecology baseline characterisation by confirming habitats and biotopes along the export cable route. The benthic survey scope of works was presented to MS-LOT, Marine Scotland Science and NatureScot on 18 November 2020 (see Section 2.3).

The validation surveys will include:

- Repeat sampling of representative habitats/biotypes, with a division of the SG1A Project into three areas according to the existing understanding of the sediment characteristics, as follows:
  - Offshore course sediments;
  - Sand and muddy sediments; and
  - Inshore coarse sediments.
- Proposed sample methodology:
  - 20-30 combined grab and seabed imagery sampling locations;
  - Grab samples: PSA, benthic infauna (ID, abundance and biomass); and
  - Seabed imagery: Stills and video. Analysed for habitats of conservation importance (e.g. reefs; sea pens and burrowing megafauna).

The survey is proposed to be deployed in early December.

3.3.2.2 Ornithology Surveys

Nearshore and intertidal surveys in relation to the SG1A Project have been commissioned by Seagreen 1A and have been ongoing since July 2020 and are due to continue over the 2020/21 winter period.

The 'Seagreen 1A Transmission Cable: Onshore and offshore ornithology survey strategy' (Seagreen 1A, 2020) includes the following approaches for data collection:

- Continue the current digital aerial survey campaign commenced in 2019 on behalf of the Forth and Tay developers: Seagreen, Inch Cape and Neart na Gaoithe. Data will provide information on breeding, passage and wintering seabirds for approximately 47 km along the SG1A ECR at its seaward end, depending on its final location. Data will be compared to boat-based data collected between 2009 and 2013 for a comparable area;
- Monthly nearshore and inter-tidal bird surveys at set standardised locations, with an estimated minimum coverage of out to 1.5 km offshore from Mean High Water Springs, onshore; and
- For the remaining portion of the SG1A ECR information will be derived from the existing literature. This is in line with the strategy deployed by Inch Cape and agreed with NatureScot based on the low level of impacts predicted for the central region of the SG1A ECR.

This Screening Report, and the Marine Licence application for the SG1A Project, considers the marine bird species relevant to the offshore and inshore waters only (greater than 1 km from the coast). The ornithology interests for the intertidal, nearshore (up to 1 km from the coast) and onshore habitat zones will be considered in the SG1A Project's onshore consent application.

4. Characteristics of Works: Project Description

4.1 Project Specifications

Electricity generated by the Seagreen 1A Project will be transmitted using an HVAC cable (rated at up to 220 kV or 275 kV) submarine technology. The circuit will comprise of a 3-core aluminium or copper cored cable with steel and plastic armour wires (hybrid design) and a polypropylene outer layer. Key Parameters of the SG1A export cable are outlined in Table 4.1 below.

Table 4.1 – Key Project Parameters

Export Cable Parameters	Value
Max number of export cables	1
Max number of export cable trenches	1
Anticipated cable corridor width max (km)	1
Anticipated working width max (m)	100
Anticipated buried export cable length*	Approximately 80%
Maximum rock or mattress protected length*	Approximately 20%
If trenched, estimated width per trench (max) (m)	3 m
If trenched, cable burial depth (min – max) (m)	1-3 m

Export Cable Parameters	Value
If rock or mattress protected, maximum height (m)	1 m
If rock or mattress protected, maximum width (m)	6 m
Number of construction vessels for export cable installation	2

*The project will aim to maximise achievable protection by burial, but allowance is made for cable protection where burial is not possible

4.2 Installation

In order to protect cable infrastructure and minimise disruption to other marine users, Seagreen 1A intends to maximise achievable protection by burial along the majority of the SG1A ECR. Where this is not possible, for example at crossings with existing cables, or where the seabed characteristics are inappropriate for burial, additional cable protection measures will be applied.

The exact details of the cable installation technique to be employed will be confirmed when the contract for installation is awarded. It is however envisaged that a variety of installation and burial techniques will be required due to the variable nature of the seabed along the proposed cable corridor. Further information on proposed cable burial methods are provided in Section 4.2.3.

4.2.1 Seabed Preparations

Prior to offshore cable installation, linear seabed debris will be removed by grapnel tow (PLGR). Areas of boulders and confirmed Unexploded Ordinances (UXO) may also require clearance if not avoidable by a minor cable route deviation. Pre-sweeping may be required in order for the burial techniques to be employed effectively.

4.2.2 Cable Burial

Cable burial depth will be determined by a detailed hazard identification survey, which will assess the different locations and the various shipping and dredging activities. It is possible that the hazard identification survey will confirm areas where the cable burial depth may need to be varied due to local features, such as:

- sand waves;
- erosion of the seabed;
- shipping traffic anchor risk;
- intense dredge or trawl fishing activities; and
- existing infrastructure or observed seabed obstacles.

The anticipated export cable burial depth will be between 1 m and 3 m depending on ground conditions and the outcome of further cable burial risk assessments (CBRA). As previously stated, based on current understanding of ground conditions it is anticipated that up to 80% of the SG1A export cable will be buried.

If buried, the estimated maximum trench width will be 3 m and the maximum width of the temporary zone of influence, due to plough or Remotely Operated Vehicle (ROV) tracks, will be approximately 10m.

4.2.2.1 Cable Burial Risk Assessment

Following initial re-routing, based on results and data from the marine surveys, a CBRA will be carried out for the refined subsea cable route. The main objective of the CBRA will be to ensure that, based on the available survey data, cable burial can be achieved, using a variety of installation tools, along as much as possible of the preferred cable route.

The CBRA will consider a variety of tooling, i.e. pre- and post-lay plough, jetting, fluidisation and mechanical cutting (see Section 4.2.3), all of which will be considered as options for the cable installation contractor to utilise as required.

The CBRA will produce an indicative depth of burial listing for the cable route, which will afford suitable protection to the cable, based on external factors. The burial depth of the cable is anticipated to be between a minimum of 1 m and a maximum of 3 m. Where the CBRA identifies that due to seabed conditions, cable burial is not possible, alternative options for protecting the cable will be considered. The selection of any mechanical protection methods will be made to maximise the effectiveness of burial, and with careful consideration of other sea users, particularly commercial fisheries stakeholders. These additional protection measures may include, for example, rock placement and concrete mattressing (see Section 4.3). The CBRA will also provide indicative rock volumes and locations for any boulders and rocky seabed which exist in the SG1A ECR.

4.2.3 Cable Burial Tools

Different approaches and techniques are available for offshore cable installation. These are:

- cable lay with post lay burial using a jetting ROV, or a mechanical trencher; and
- simultaneous cable lay and burial, using a cable plough or a mechanical trencher

A combination of methods may be used for cable installations, depending on ground conditions. The preferred approach will be confirmed on completion of the pre-construction geotechnical site investigation surveys. Further detail regarding these options are provided below.

4.2.3.1 Cable Burial by Ploughing

Cable burial ploughs cut through the seabed, lifting the soil from a trench into which the cable is laid (Figure 4.1). The plough is designed to cut a narrow trench, with a slot of material temporarily supported which then falls back over the cable. The advantage of this method is that burial can be achieved as the cable is laid, thus minimising risk to the cable. However, the number of vessels which can carry out this method and that have the required cable carrying capacity for heavy power cable is limited.

The performance of a plough and the depth of burial which can be achieved are a function of plough geometry and seabed conditions, with dense or stiff soils providing the greatest challenge. One disadvantage of ploughing is the slow speed and very high tow forces required.

Figure 4.1- Cable Plough

4.2.3.2 Cable Burial by Jetting

Where the seabed predominantly comprises soft sediments the export cable may be buried using a post-lay jetting technique, generally controlled from a Dynamic Positioning (DP) vessel. The cable is laid on the seabed and a ROV fitted with high-pressure water jets is subsequently positioned above the cable (Figure 4.2). The jets fluidise a narrow trench into which the cable sinks under its own weight. The jetted sediments settle back into the trench and with typical tidal conditions the trench coverage is reinstated over several tidal cycles.

The advantage of this method is that the cable can be laid in a relatively rapid operation during suitable weather conditions. Cable burial can then be achieved separately with less concern over weather constraints disrupting operations. However, the performance of a jetting ROV is limited where sediments are more compacted.

Figure 4.2 - Jetting ROV

4.3 Cable Protection Methods

The SG1A project will seek to bury the export cable wherever possible, however, achieving satisfactory export cable burial depths may not be possible in some areas, due to for example hard substrate. A set target Depth of Lowering and Depth of Cover will be confirmed by the SG1A cable installation contractor, and set out within the Construction Environmental Management Plan (CEMP). Where burial is not achievable, mechanical protection will be installed to achieve the target Depth of Cover. The preferred method of protection, in consideration of industry-standards and design recommendations from fisheries stakeholders is rock placement. Other measures which may be utilised for the cable protection where burial is not achieved include:

- placement of concrete mattresses over the cable; or
- placement of grout bags over the cables.

4.3.1 Rock Placement

Rock placement has long been established as a method for protecting cables and is the preferable protection method of the three contingency options provided in this report. Placement of rock is a relatively quick operation and is possible to complete in more adverse weather than other forms of protection such as mattress installation. The graded rock used is normally imported from land quarries, although sea aggregates can also be used, with grain sizes being tailored to achieve the necessary protection. Where water depth is not a limiting factor, rock is usually deposited by a fall pipe vessel as this is the most efficient method of getting the material onto the seabed. In shallower waters (<10 m) a specialist vessel fitted out with basic equipment for depositing? the aggregate over the side may be used.

The maximum height of any rock placement export cable protection is expected to be 1 m above the seabed, with a maximum width of up to 6 m.

4.3.2 Concrete Mattresses

Mattresses are generally made of concrete elements formed on a mesh of polypropylene rope, which will conform to changes in seabed morphology (Figure 4.3). Bevelled elements are used on the edges to create a sloped profile against the seabed. Where appropriate, mattresses fitted with polypropylene 'fronds' can be used to enhance the protection provided. The fronds encourage sediment deposition, in the best case creating a protective sand bank over the mattress. Mattresses require placement either by divers or a ROV to ensure that they are positioned correctly, consequently this takes longer than other methods.

The maximum height of any mattressed export cable protection is expected to be 1m above the seabed, with a maximum width of 3-6 m.

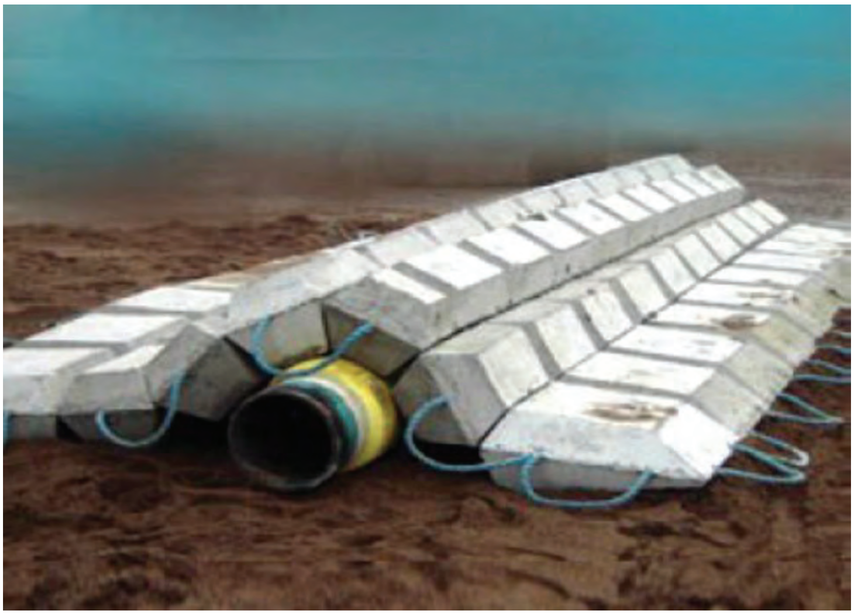

Figure 4.3 - Cable Protection using concrete mattresses

4.3.2.1 Grout bags

The placement of grout bags over the cables which are then inflated with structural grout. The grout cures to provide an effective over cover protection system for the cables.

4.4 Landfall

At the Cockenzie landfall location, a trenchless installation technique (Horizontal Directional Drilling (HDD) or Direct Pipe) will be used to install a cable duct from the transition pit location (located onshore above MHWS and subject to a separate planning application) and out to approximately Mean Low Water Springs (MLWS). The cable will be pulled to shore from an offshore vessel suspended by floats. The cable will be drawn through the ducts to the transition pit by a winch. Cables seaward of the pipe ends will be protected by jetting or trench excavation.

In the intertidal area and/or the shallow subtidal water, a backhoe excavator may be used to dig the trench at the duct entrance. Beach access may be required, particularly for trench excavation. This may be achieved via temporary local access at the landfall location, or by use of an existing point of access nearby.

For any trenchless installation operations, the maximum drill rig area is expected to be of the order of 50 m by 50 m. The equipment to be used includes the drilling rig and drill spoil processing equipment. For the cable pull in, a temporary winch will be required to draw the cable.

4.5 Operations, Maintenance and Repair

Operation and Maintenance (O&M) of the export cable after commissioning will comprise of both scheduled and unscheduled events. Scheduled works on the offshore electrical infrastructure will include regular monitoring or survey, statutory inspection and routine inspection visits. When necessary, retrofitting and upgrading works may also take place. The offshore survey works will normally be timetabled for the summer months, given the typically more settled weather and longer day light hours. Twenty-four hour working will also be evaluated, as this type of solution could be delivered from a mothership stationed offshore.

The project will have an O&M team in place for the day to day management and control of the project infrastructure. This is expected to be based in purpose built onshore O&M Control Centre facilities, ideally situated on the quayside at the chosen operations port location. If there is no local airport or heli-port available, this facility could also accommodate the helicopter hangar and heli-pad if required.

In order to manage the post consent and ongoing site monitoring requirements it is likely that a combination of dive support vessels and ROVs will be used to undertake inspection of cables, scour protection and rock protection.

4.6 Decommissioning

The requirement to decommission is a condition of The Crown Estate lease and is also incorporated in the statutory consenting process through the provisions of the Energy Act 2004. Under the statutory and licensing processes, the appointed Offshore Transmission Owner (OFTO) will be required to prepare a detailed decommissioning programme and set aside funds for the purposes of decommissioning.

The decommissioning programme will consider the latest technological developments, legislation and environmental requirements at the time that the work is due to be carried out. For the purpose of the characteristics of impacts which have been detailed for each relevant environmental receptor (Section 6), it is assumed that decommissioning worst case scenario parameters will be no more than those for the construction phase alone.

4.7 SG1A Project Mitigation and Management Measures

An overview of the SG1A Project mitigation measures that will be applied are summarised in Table 4.2. Any additional environmental topic specific mitigation is presented throughout Section 6.

Table 4.2 - Summary of SG1A Project mitigation and management measures

Measure	Details
General	
Pre-construction surveys will be conducted to inform detailed route engineering.	Appropriate pre-construction validation surveys including geophysical, geotechnical, terrestrial and benthic scopes will be conducted to confirm the locations of potentially sensitive features. Detailed route design will be informed by the survey results, and sensitive features avoided where possible.
Environmental planning.	Development and implementation of a Marine Pollution Contingency Plan (MPCP) Development and implementation of a CEMP. The CEMP will set out those responsible for overseeing work and the implementation of mitigation and good practice working methods during construction to minimise environmental effects.
Offshore	
Marine megafauna mitigation.	o All vessels will be compliant with the Scottish Marine Wildlife Watching Code (NatureScot, 2017) o All vessels will comply with the Basking Shark Code of Conduct (Marine Conservation Society, undated)
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.

Measure	Details
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Marine Non-Native Species (MNNS) introduction during construction, operation and decommissioning is minimised.
Vessels will adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).	The Biofouling Guidelines provide a consistent approach to minimising the risk of MNNS introduction via biofouling on ship's hulls.
The use of external cable protection including rock berms and/or mattresses will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial.	Cable burial is the first choice for protection, as this minimises impacts on the environment and other sea users. However, when this is not possible due to existing subsea assets, or seabed conditions, other cable protection measures may be utilised to ensure the cable is adequately protected. The preferred option for this will be rock placement.
All rock berms and external cable protection will be designed with slopes less than 1:2.5, and of suitable construction to minimise snagging risk.	Minimising disruption to commercial fisheries resulting from the installation and operation of the cables.
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Management and Mitigation Strategy (FMMS).	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.

Measure	Details
Compliance with International Regulations for the Prevention of Collision at Sea (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project, compliance will ensure navigational safety and minimise the risk of equipment snagging.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk of equipment snagging.
Crossing and Proximity agreements will be established with relevant cable and pipeline owners or operators of other assets.	These agreements will include the ability of a cable or pipeline operator to access their asset during construction if required. If such works are required to occur simultaneously, consultation with the cable or pipeline operator will be undertaken.
Protocol for Accidental Discoveries of Marine Historical Assets.	The Protocol will define procedures to be taken in the event of a discovery in order to avoid impact to any marine historic assets. Marine archaeology exclusion zones will be established where relevant, where access will be restricted.
Protocol for Dropped Objects at Sea	Seagreen 1A will implement prevention, notification and recovery processes for Dropped Objects
Navigational safety	Appropriate lighting and marking of vessels will be implemented to minimise risk to other marine users.

4.8 Other Schedule 3 Criteria

In addition to the characteristic of works detail provided in Section 4, the following section outlines how the SG1A Project has regard to:

- Use of natural resources (Schedule 3 1(c));
- Production of waste;
- Pollution and nuisances;
- Risk of major accidents and/or disasters;
- Risks to human health;
- Existing and approved land use;
- Relative abundance, availability, quality and regenerative capacity of natural resources; and
- Absorption capacity of the natural environment.

In terms of the **use of natural resources**, installation of the cable using trenching methods across the intertidal and subtidal areas offshore would necessitate the removal of material during excavation of the cable trench, however this would be temporary during the construction phase and the material would either be reinstated (intertidal) or allowed to backfill naturally (subtidal) and surveyed to ensure reinstatement to a similar profile. The installation methodology would not result in the long-term exploitation of significant volumes of natural resources. Therefore, no significant adverse effects on the environment through the use of natural resources are anticipated.

Regarding **production of waste and pollution and nuisances**, all wastes will be managed in line with an Environmental Management Plan (EMP) which will be prepared for the works. The EMP will include waste management measures to minimise, reuse, recycle and dispose of waste streams in compliance with relevant waste legislation. Marine pollution prevention and contingency planning measures will also be set out in a MPCP which will be prepared for the works. The EMP and MPCP will likely form a consent requirement of any awarded Marine Licence. Nuisance will be controlled by planning conditions through the submission and approval of an EMP which will contain proposed measures for the mitigation of construction noise and vibration. Due to the measures in place to control and/or manage waste, pollution and nuisance, which are expected to be secured by consent conditions, significant adverse effects on the environment are not predicted.

Regarding **risk of major accidents and/or disasters, including those caused by climate change**, Seagreen 1A will require all contractors and subcontractors to complete adequate risk assessments for all aspects of the installation activities and these requirements will be captured within a Construction Method Statement which will be prepared for the works. The project will be a notifiable project for the purposes of the Construction (Design and Management) Regulations 2015 (CDM Regulations), and Seagreen 1A will require compliance with the CDM Regulations in the design of the project and through the completion of the installation process through conditions of contract. Management standards in line with ISO 9001, 14001 and OHSAS 18001 will be applied for the overall Seagreen 1A project management system, and the management systems of all contractors will be required to concur with the same principles.

In relation to **risks to human health**, Seagreen 1A will require compliance with the Control of Substances Hazardous to Health Regulations 2002 (COSHH Regulations) through conditions of contract in ensuring that the risk to health from workplace exposure to hazardous substances is appropriately assessed and that exposure is prevented or, where this is not reasonably practicable, adequate controls are implemented and exposure monitored and managed to within acceptable levels, in line with relevant regulations. Health and Safety regulations will be adhered to at all times and relevant Health, Safety and Environment (HSE) Management tools implemented, to ensure the safety of the workforce and the general public.

Having regard to the **existing and approved use**, the **relative abundance, availability, quality and regenerative capacity of natural resources in the area**, and the **absorption capacity of the natural environment (with reference to coastal zones and European and nationally designated sites)**, due to the relatively small area of disturbance in comparison to the wider Cockenzie area, the localised nature of the effects arising from the works, and the short-term and temporary (all areas restored to their natural profile) nature of potential effects, there will be no significant adverse effects on the environment. This conclusion is further supported by the information provided in Section 6 (Characteristics of Impact – Key Environmental Considerations).

5. Indicative Project Programme

The key programme dates for construction of the SG1A Project are summarised in Table 5.1 below. The indicative programme is based on submitting a Marine Licence application in February 2021 and achieving consent for the project in June 2021.

The assessment allows for construction activities to take place 24/7 and at any time of the year, as vessel utilisation is important in maintaining schedule and reducing cost. The indicative construction programme for the SG1A Project commences in Q2 2023 and completes in Q2 2024. It is in Seagreen 1A's interest to plan and implement an efficient and effective construction programme. Construction activities will take place within the periods below, but are not expected to take the full duration shown against each activity.

Seagreen 1A will endeavour to minimise impact or disruption to other users of the sea in planning the construction activities in more detail. For example, the export cable will be buried or protected as soon as is practicable after being laid on the seabed.

It is proposed to maintain ongoing dialogue with the commercial fishing sector from project inception, throughout development and into construction through the designated communication channels, including the FLO when contracted. Further information on commercial fisheries and specifically on mitigation, including via notices and engagement are provided in Section 6.7.4.

Table 5.1 - Indicative Construction Programme

Programme Stage	Start	Completion
Installation of export cable	Q2 2023	Q3 2023
Commissioning of export cable and handover to operator(s)	Q3 2023	Q4 2023
Project completion	-	Q2 2024

Table 5.2 - Construction Activity Summary

Construction Aspect	Likely vessel requirements
Pre-construction geophysical survey	Dedicated geophysical survey vessel of ECR corridor using side scan sonar, multibeam echosounder and magnetometer.
Pre-construction geotechnical survey	Dedicated geotechnical survey vessel will take a number of boreholes, core penetration tests (CPTs) and vibrocores within ECR corridor.
Cable Pre-Lay Grapnel Run (PLGR)	Dedicated vessel with PLGR device and Remotely Operated Vehicle (ROV)
Cable lay and burial	Cable lay vessel
Cable Mattress / Rock Placement	Construction vessel or dedicated rock placement vessel
Scour protection	Construction vessel or dedicated rock placement vessel

The availability of construction vessels of the capacity required for the installation of the ECR is also a key consideration.

For the purpose of this assessment, it has been assumed that there will be up to two primary construction vessels (one cable lay vessel, approximately 150 m and one cable protection vessel approximately 100 m), servicing the construction stage at any given time. Smaller support vessels may be required for landfall works.

The objectives in developing the construction methods will be to:

- minimise construction related health and safety risks to personnel;
- minimise construction related environmental risks;
- minimise cost risk;
- minimise schedule risk; and
- maximise production.

6. Characteristic of Impacts: Key Environmental Considerations

6.1 Overview of Proposed SG1A Project

This section presents the key environmental topics with potential for interaction with the SG1A Project. For each topic, consideration is given to the existing baseline, study area, mitigation measures and the characteristics of potential impacts. Each topic will outline any potential impacts that may require further consideration in an Environmental Appraisal that will be produced to support the application for the SG1A Project Marine Licence.

In consideration of the characteristics, location and duration of works associated with the SG1A Project, the following offshore environmental topics have not been included in this Screening Report. They have not been considered further as no pathway for any potential impact has been identified between the receptor and the proposed works associated with the SG1A Project Further information is provided in Table 6.1.

Table 6.1 Offshore Environmental Topics not considered further within this report or the Environmental Appraisal

Environmental Topic	Justification for not including in Environmental Appraisal
Seascape, Landscape and Visual Amenity (SLV)	During operation, the SG1A Project will be an underwater cable therefore there is no pathway for impact. During construction and decommissioning the presence of 2 construction vessels in an active shipping area will not result in any impacts on SLV. Visual disturbance from landfall works will be included within the onshore Planning Application and supporting environmental information.

Military and Civil Aviation	During operation, the SG1A Project will be an underwater cable therefore there is no pathway for impact. During construction and decommissioning the presence of 2 construction vessels in an active shipping area will not result in any impacts on aviation. Potential impacts on military vessel operations is considered within the Shipping and Navigation assessment in this report (Section 6.8).
Socio-economics, Tourism and Recreation	No potential impact pathways are identified for the SG1A Project and these receptor groups in light of the nature, duration, extent and location of the works.
Population and Human Health	
Air quality and Climate Change	
Offshore Airborne Noise	
Other Human Activities	

The key project parameters that are being considered when characterising the potential impacts of the SG1A project are listed in Table 4.1 (Section 4).

The SG1A Project overlaps considerably with the already assessed and consented Inch Cape OWF export cable corridor (further detail on the SG1A ECR layout is provided in section 3.2). Given the overlap between the SG1A Project and the Inch Cape export cable corridor, information and assessment results presented in the Inch Cape EIA documents (Inch Cape, 2011; 2018) are referred to throughout Section 6 of this Screening Report to support the characterisation of potential impacts of the SG1A Project. However, it is highlighted that the Inch Cape project is consented for six offshore export cables, whereas the SG1A Project is for one single offshore export cable, which is a notable differential considered in the following sections when characterising potential impacts of the SG1A Project.

6.1.1 Approach to Cumulative Assessment

The relative position of the SG1A Project may give rise to the potential for cumulative interactions with other nearby offshore wind farm developments, including their export cables which will be assessed for relevant environmental receptors in the Cumulative Assessment within the Environmental Appraisal. Only those developments which do not form part of the existing environment (i.e. are not operational/installed) will be considered. The developments which are considered relevant to the cumulative assessment include:

- The Seagreen Project (consented, pre-construction);
- Berwick Bank OWF (scoping);
- Marr Bank OWF (concept/early planning);
- Inch Cape OWF (consented); and
- Neart Na Gaoithe OWF (under construction);

Each topic in Section 6 provides consideration of the potential for cumulative interactions of the SG1A Project with other nearby developments and whether they will be considered further in the Environmental Appraisal. Depending on the geographical extent of the study area to be considered for each receptor within the Environmental Appraisal, the exact list of developments may include additional projects to those listed above.

6.2 Physical Environment and Water and Sediment Quality

This section provides a description of the physical environment baseline and characterises any potential impacts which may affect physical environment receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

6.2.1 Key Data Sources

The key data sources used to inform the physical environment and water and sediment quality section include:

- Marine Scotland National Marine Interactive Plan (NMPi);
- Joint Nature Conservation Committee (JNCC) MPA Mapper;
- Scottish Environment Protection Agency (SEPA) River Basin Management Plan, water environment hub data viewer;
- Inch Cape Offshore Wind Farm Environmental Statement:
    - Chapter 10 Metocean and Coastal Processes;
    - Appendix 10A – 10F;
    - Appendix 10A.1 – 10A.7
    - Appendix 12B Contaminated Sediments Baseline Development Area
- Barne, *et al.,* (1997). Coasts and seas of the United Kingdom, Region 4, South-east Scotland: Montrose to Eyemouth;
- Firth of Forth Banks Complex site summary and data confidence assessments;
- Firth of Forth SSSI site management statement;
- Cefas Suspended Sediment Climatologies around the UK (Cefas, 2016);
- British Geological Survey (BGS) Offshore GeoIndex Map (BGS, 2020a);

6.2.2 Study Area

The study area applied to this topic covers the proposed extent of the updated SG1A Project and a wider region covering the outer area of the Firth of Forth, approximately between Arbroath in the north and Dunbar in the south. For this topic, the Firth of Forth entrance is taken to be the estuary mouth between Wormiston in the north to North Berwick in the south (Figure 1.1).

6.2.3 Baseline Description

6.2.3.1 Metocean Conditions

The mean spring tidal range across the Firth of Forth is in the order of 4m, increasing from outer areas towards the inner firth and Estuary, due to the funnelling effect of the coastline (Inch Cape, 2011; 2018). Information from the studies completed for the Inch Cape export cable corridor illustrates that along the proposed SG1A ECR the mean spring range increases from about 4.4 m in the vicinity of the Seagreen Project through to about 5.2 in proximity to the landfall (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; c; e; f; g). In terms of the period of flows, the duration of the flood is longer, corresponding to faster flow speeds on the ebb. The flow directions are mostly parallel to the coastline, resulting in variations in the flow direction along the SG1A Project. The mean spring current speeds along the SG1A Project range between 0.25 - 1.0 m/s, increasing across the entrance of the Firth of Forth, between Wormiston and Auldhame (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; c; e; f; h). Mean neap current speeds are slower at speeds of between 0 – 0.5 m/s along the SG1A Project (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; c; e; f).

Waves across the SG1A Project have an approach from the east to northeast associated with long-period swell waves and from the southwest associated with fetch limited locally generated wind waves. Modelling completed for the Inch Cape ECR indicated the dominant direction along much of the SG1A Project is from the northeast. The characteristic wave properties along the SG1A Project generally reduces towards the coast, due to depth limited influence of the seabed and the sheltering afforded by the coastline. Therefore, the most common significant wave heights associated with winter conditions can vary between less than 0.75 m on approach to the landfall to up to 2 m, in proximity to the Seagreen Project, with isolated events of up to 5 m (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; c; e). Significant wave heights associated with summer conditions are considerably lower, with maximum heights of 1 m at the offshore extent.

6.2.3.2 Geology and Bathymetry

There are several bedrock lithologies along the SG1A Project. The Firth of Forth is underlain by Carboniferous rocks which characterise the bedrock geology (Barne, *et al.*, 1997). The Carboniferous geology includes a zone of Coal Measures, which extends across the firth at Edinburgh. Elsewhere, the pre-Coal Measures (Namurian) sandstones and mudstones are largely of deltaic and fluvial origin, including oil-shales and thin limestones. Notably, some of these geological features are unconformably exposed at the coast, resulting in the designations associated with the Firth of Forth Site of Special Scientific Interest (SSSI) discussed further in Section 6.2.3.4 below.

In terms of bathymetry, the seabed slopes relatively smoothly from the coast to around 50 m on the Wee Bankie. Across the outer firth and towards the Inch Cape, Seagreen, Neart na Gaoithe and Berwick Bank offshore wind developments, there are a number of bedforms and deeps ranging in depth between 40 m and 80 m. Tidally dominated seabed bedforms from mega-ripples to sandbanks are present along the SG1A

Project, with evidence of movement associated with these features (Repsol Nuevas Energias UK Limited and EDP Renewables , 2013a; b; e).

6.2.3.3 Seabed Sediment and Transport Regime

The seabed sediment across much of the Firth of Forth predominantly comprises Holocene deposits of unconsolidated sand and gravel, particularly in the outer firth, with increasing silt and mud content towards the inner firth (BGS, 2020). In the outer firth, fine sediment supplied to the estuary by rivers is deposited by strong tidal currents. These currents also scour some parts of the estuary floor, particularly close to the coastline, resulting in large areas of exposed rock on the seabed along the margins of the outer firth. Along the SG1A Project, the seabed sediment follows the general pattern described for the Firth of Forth, with coarser sands and gravels at the offshore extent, transforming to mud-rich sands and mud/silt towards the landfall (BGS, 2020).

Average suspended particulate matter (SPM) across the Firth of Forthis relatively low compared with elsewhere in Scotland and the UK (Cefas 2016). Average measurements of 1 – 2 mg/l were assessed for the period between 1998 and 2015, increasing to about 3 – 5 mg/l closer to the coast. Sediment concentrations along the SG1A Project over the winter months are around 2 – 3 mg/l increasing to 5 mg/l at the coast, while during the summer months, the SPM are generally around 0 – 1 mg/l everywhere (Cefas, 2016). Site observations at Neart na Gaoithe, in proximity to the SG1A Project in the summer of 2010, identified concentrations ranging between 3 – 8 mg/l (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; e; f; I; j; k). These lower concentrations were estimated to be associated with calm weather conditions at an offshore location, whereas concentration of around 20 mg/l were more characteristic of the outer firth area, increasing to much higher concentrations at the coast. In terms of the sediment transport regime, there is net drift direction towards and into the Firth of Forth at the entrance into the Firth. Further offshore in proximity to the Seagreen Project, the dominant transport direction is to the north (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; f; g).

6.2.3.4 Conservation Sites with Geodiversity Features

The SG1A Project intersects two conservation sites which are designated for geodiversity features, the sites as well as the qualifying interest features are summarised in Table 6.2-.

Table 6.2- Geodiversity conservation sites in the vicinity of the SG1A Project

Designation	Site name	Geodiversity qualifying interest features and summary
NCMPA	Firth of Forth Banks Complex NCMPA	The NCMPA is separated out into three distinct regions, where the SG1A Project overlaps the Scalp Banks and Wee Bankie region. The relevant geodiversity interest features within the site include: • Offshore subtidal sand and gravels; • Quaternary of Scotland; • Moraines (geodiversity feature); and • Shelf banks and mounds.
SSSI	Firth of Forth SSSI	The geodiversity interest features include: • Coastal geomorphology of Scotland; • Carboniferous – Permian Igneous; • Maritime cliff; • Mineralogy of Scotland; • Mudflats; • Lower Carboniferous (Dinantian - Namurian (part)) • Quaternary of Scotland; • Saltmarsh; • Sand dunes; and • Upper Carboniferous (Namurian (part) – Westphalian)

Based on the mapped location of the qualifying interest features within the Scalp Bank and Wee Bankie region of the Firth of Forth Banks Complex NCMPA (Figure 6.1, JNCC, 2020a), the SG1A Project will most likely interact with one or more qualifying interest features in the site.

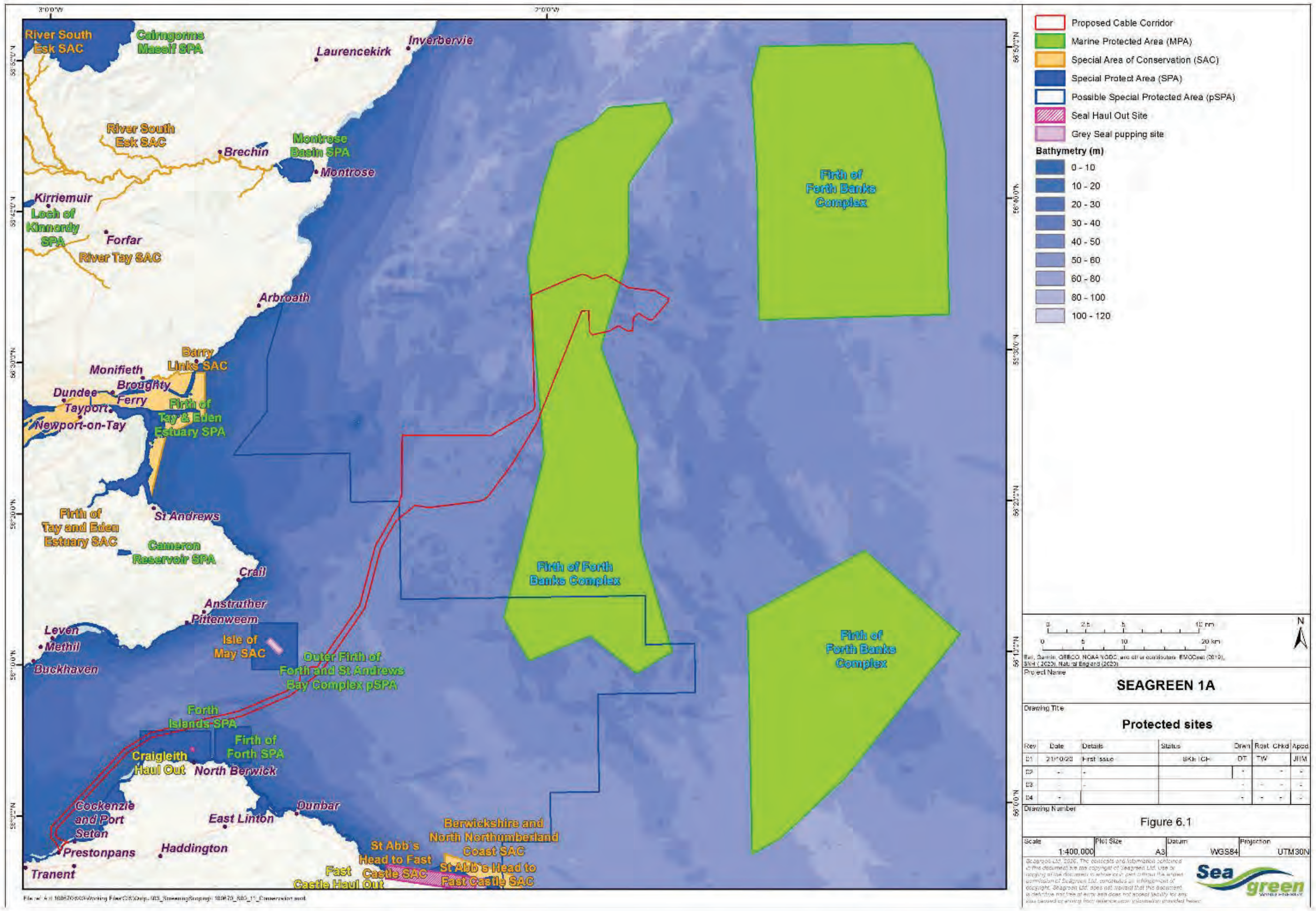

Figure 6.1 – Protected sites in the vicinity of the SG1A Project

6.2.3.5 Water Quality

The temperature of surface waters in the outer Firth of Forth is relatively uniform, averaging 5.5-6.0°C in winter and 13°C in summer, suggesting efficient mixing of fluvial outputs into the marine environment. The salinity of the sea water in the region is generally only very slightly below that of oceanic water (35 g/kg) and is fairly homogenous across the Firth of Forth (Dyke, 1987).

The SG1A Project crosses a number of designated coastal water bodies within Scotland river basin district (Figure 6.2), which are:

- Firth of Forth Outer – Offshore;
- Eyebroughty to North Berwick;
- Port Seton to Eyebroughty; and
- Leith Docks to Port Seton.

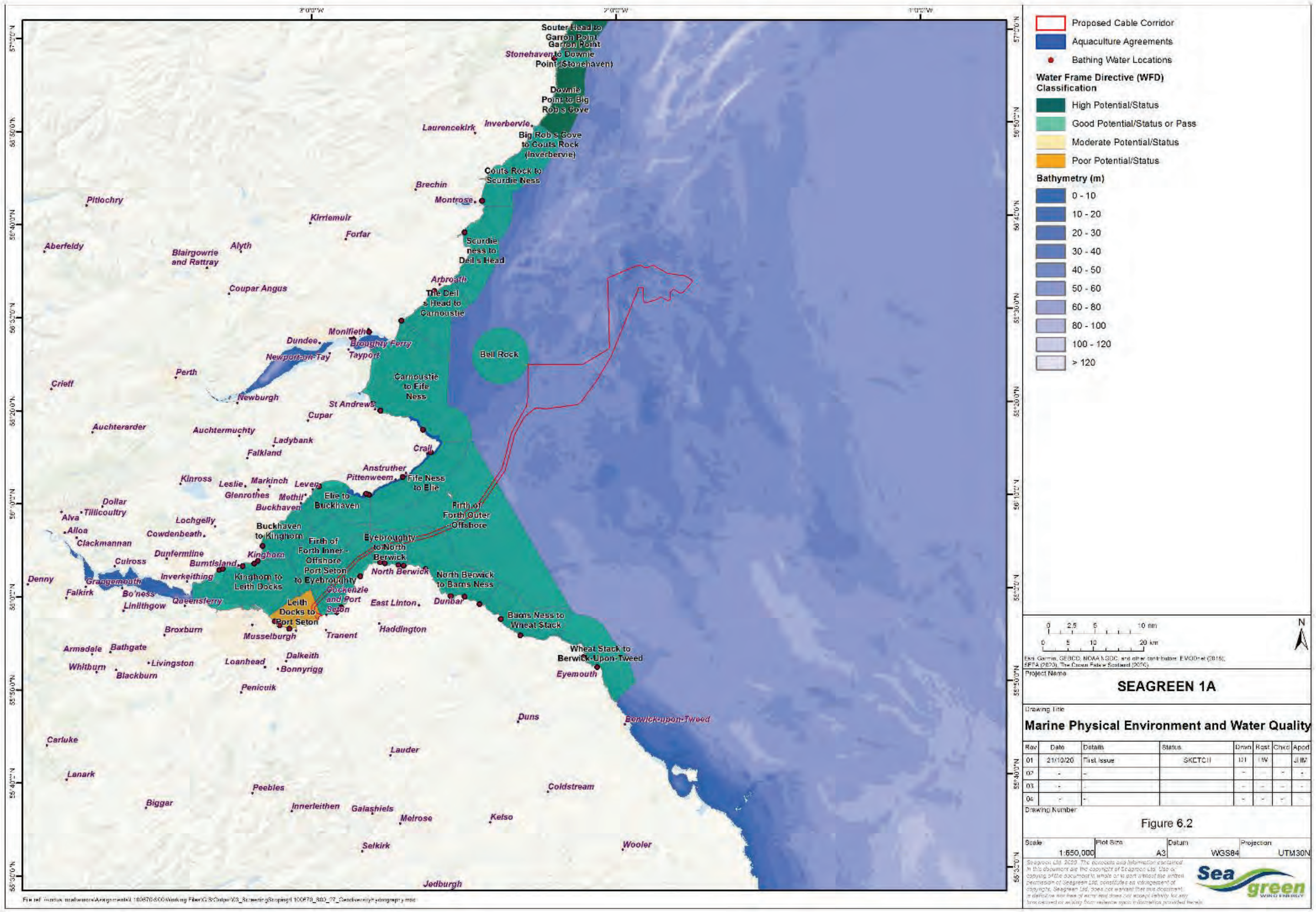

Figure 6.2 - Designated coastal water bodies within Scotland river basin district

Each of the coastal water bodies are assessed as having a Good water quality status, based on recent available information obtained from the SEPA water environment hub. However, the overall condition is Good for all the water bodies except Leith Docks to Port Seton, which is Poor, primarily due to the physical condition in relation to modification to the seabed, banks and shores (SEPA, 2020).

The designated bathing water in proximity to the cable landfall location is Seton Sands at approximately 1 km from the landfall and is at a Good status (SEPA, 2020). The other bathing water approximately 2 km from the SG1A Project is Gullane, with an Excellent status. All other bathing waters are over 2 km from the cable corridor or landfall location and are therefore not applicable to the SG1A Project (Figure 6.3).

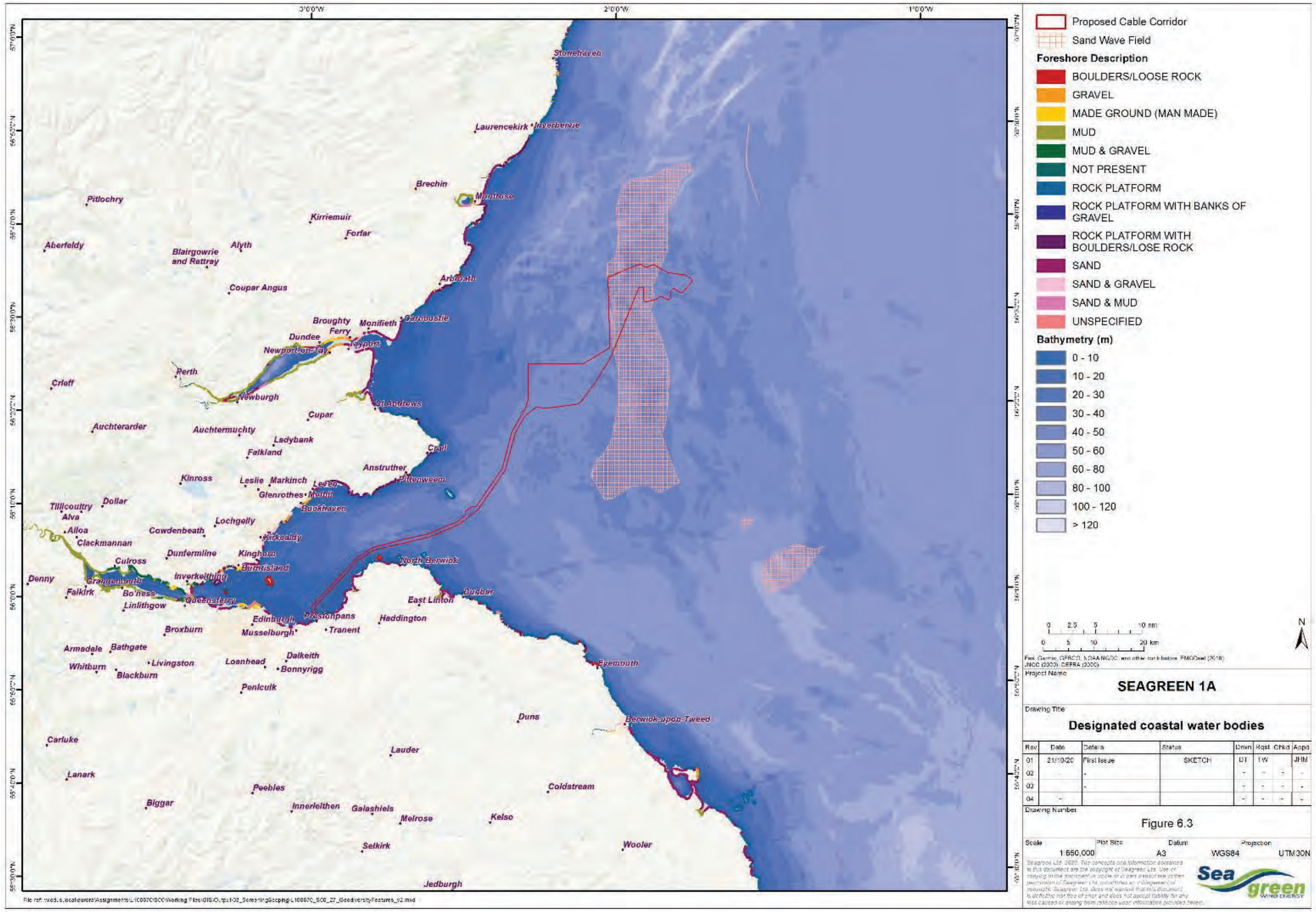

Figure 6.3 Designated Coastal Water Bodies

There are no designated shellfish waters within the Firth of Forth or in proximity to the SG1A Project.

6.2.3.6 Sediment Quality

Sediment contaminant samples were collected and analysed from locations within the Inch Cape development area, with two samples within the Inch Cape export cable corridor (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013l). For the samples located within the Inch Cape export cable corridor contaminant levels were below CEFAS Action Level 1 (AL1) for the majority of contaminants (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013l). However, occurrences of Chromium, Copper and Nickel, did have contamination above AL1, but the levels were only just over the threshold and were not necessarily repeated in both samples taken at each location, indicating the contamination is most likely localised. There were no occurrences of contaminants above Cefas AL1 associated with Poly-Aromatic Hydrocarbons (PAH), Poly-Chlorinated Biphenyls (PCB) and Organotins or any occurrences of contaminants above Cefas AL2 (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013l).

6.2.4 Mitigation and Management Measures

The SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to physical environment features and water and sediment quality. There are no additional mitigations required specific to Physical Environment and Water and Sediment Quality.

6.2.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for physical environment receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence.

In most cases, the physical environment features are not themselves receptors but are instead pathways with the potential to indirectly impact other environmental receptors. The potential changes to the physical environment features and their associated pathways will be used to inform other environmental, biological and human environment receptor topic assessments, including:

- Benthic Ecology;
- Natural Fish and Shellfish Resource;
- Marine Mammals and other Megafauna;
- Marine Ornithology; and
- Marine Archaeology.

Despite the potential for physical environment features to predominantly be considered as pathways, the receptors relevant to this characterisation of potential impacts includes the following:

- Geodiversity features within the intersected Conservation sites;
- The coast; and

- Designated waterbodies and bathing waters.

The following sections consider the potential impacts to the identified receptors as well as the relevant impact pathways to other environmental receptors, while a summary of the potential impacts and conclusions are included in Table 6.3.

6.2.5.1 Changes to the Metocean and Sediment Transport Regimes

The metocean climate are regional processes with localised variations due to the seabed and any morphological features. The SG1A Project involves the installation of a single offshore export cable, which will be localised in extent and short-term in duration. The proposed project design is to bury the cable wherever possible, with a minimum expected burial rate of 80% of the route, achieving suitable depth of cover to reduce any future exposure risk. In locations where cable protection may be required (estimated to be up to 20% of the route), the applied rock protection would be used to achieve an adequate depth of cover for cable protection. Even with the profile above the seabed, the presence of the buried cable or required protection measures would not be enough to disrupt or alter the regional wave and tidal processes or the associated sediment transport in this area of the Firth of Forth.

For this reason, any potential impact associated with changes to the metocean and sediment transport regimes **will not be included** within the Environmental Appraisal.

6.2.5.2 Introduction of Scour Associated with Cable Protection Measures

The use of scour protection measures would be in locations where target depth cannot be achieved, most likely associated with the occurrence of bedrock or solid geology along the SG1A Project. The nature of the solid geology is that it is resistant to erosion, while cable protection measures are designed to limit the development of scour. Therefore, the potential for scour occurring associated with protection measures is considered to be very low and this potential impact **will not be included** within the Environmental Appraisal.

6.2.5.3 Changes to Landfall Morphology

The proposed cable installation at the landfall, is by a trenchless technique, such as HDD or Direct Pipe, from an onshore location out to approximately MLWS. Beyond the duct entrance, trenching methods, including jetting, ploughing or mechanical trenching, may be applied. Following the use of installation equipment in the landfall area, the seabed would be reinstated to its original profile, following best practice for works in the coastal environment. The use of trenchless methods at landfall and the reinstatement of the local profile (either in the intertidal or shallow subtidal) negates any change to the coastal morphology. Therefore, any potential impact on changes to landfall morphology **will not be included** within the Environmental Appraisal.

6.2.5.4 Changes to Sediment Concentration and Bed Level

The assessment completed for the Inch Cape export cable corridor which covered the landfall area and installation of multiple offshore export cables, neither the Firth of Forth SSSI at the coast or offshore

NCMPA were predicted to experience any change to the metocean or sedimentary environment due to cable installation. In consideration of the SG1A Project comprising of a single export cable, and the works being short-term and temporary in nature, any impacts to the SSSI or offshore NCMPA are expected to be less than those defined for Inch Cape (Inch Cape, 2011; 2018). Any increases in SSC in relation to the SG1A Project will also be highly localised and temporary. Therefore, it is considered that there will be no impact on interest features associated with the installation of the single offshore export cable of the SG1A Project and any impact on geodiversity interest features within conservation sites **will not be included** within the Environmental Appraisal.

The potential changes to SSC associated with the Inch Cape export cable corridor were investigated through numerical modelling associated with the installation of several offshore export cables (Inch Cape, 2011; 2018). The Inch Cape study identified the highest SSC to occur in relation to subtidal environments, however these effects were highly localised to the export cable corridor, to within a distance of about 200 m (Repsol Nuevas Energias UK Limited and EDP Renewables , 2013a; b; e; f; I; j; k). Typical SSC of 3-10 mg/l above background levels were modelled, with short duration peaks of up to 300 mg/l. It was estimated that higher concentration of thousands of mg/l could occur, but these would be limited to a few tens of metres from the cable installation activity location. Following the initial seabed disturbance, sediment would quickly settle out within tens to a few hundreds of metres and over a period of seconds to minutes (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; e; f). For the finest sediment, although these may persist in the water column for longer, these would also settle out within hours of disturbance at a maximum dispersion distance of less than 3 km (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; e; f). The resulting sediment deposition thickness over the sediment plume footprints, would be indiscernible at the greatest distance to only a few centimetres beyond the export cable corridor (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a; b; e; f). Overall, the impact assessment associated with the installation of the Inch Cape export cables concluded that modifications to the seabed were minor in the immediate vicinity of the cable installation activity and negligible (minor) over the wider area (Repsol Nuevas Energias UK Limited and EDP Renewables, 2013a). Any impacts associated with SSC for the SG1A Project would be less than those assessed for Inch Cape, as the SG1A project comprises the installation of a single offshore export cable. Therefore, impacts to sediment concentration and bed level **will not be included** in the Environmental Appraisal.

It is considered that information described above and as modelled for the Inch Cape export cable is sufficient to adequately inform the SSC pathways for other sensitive receptors and this is referred to in the following sections.

6.2.5.5 Changes to Water Quality of Designated Waterbodies and Bathing Waters (including accidental spill)

During the cable installation activities, there is the potential for accidental hydrocarbon spills, however, the cable installation vessels will comply with the international requirements of the MARPOL convention, as well as best practice for works in the marine environment. As such, the potential risk of any such accidental spill is reduced. Leaching of materials from the cable is also considered to be highly unlikely given the use of modern cable armour and protection. Increases in SSC associated with cable installation for the Inch Cape export cables were modelled to be typically 3-10 mg/l above background levels, with short duration peaks being localised to the vicinity of the installation activity. Any increases in water quality in relation to the SG1A Project will therefore be highly localised and temporary, quickly reducing to within the range of natural variability of water quality status in the coastal waterbodies and bathing waters. Therefore, the potential impact associated with changes to water quality **will not be included** within the Environmental Appraisal.

6.2.5.6 Disturbance of Contaminated Sediments

The sediment sampling and analyses completed for the Inch Cape export cable corridor identified that contaminant levels were below Cefas AL1 for the majority of metals and all PAH, PCB and organotins. However, for the metal contaminants that were over, these were only just above the threshold levels and were not necessarily repeated across both samples taken, thereby indicating only localised effects. Any disturbances of contaminated sediments in relation to the SG1A Project will therefore be highly localised and temporary, and the levels of contaminants within the sediments of the SG1A Project are very low. Therefore, the potential impact associated with the disturbance of contaminated sediments **will not be included** within the Environmental Appraisal.

Table 6.3-Summary of the characteristics of potential impacts to physical environment and water and sediment quality receptors associated with the SG1A Project

Potential impact	Relevant phase of SG1A Project installation			To Include in Environmental Appraisal
	Cable installation	Cable operation (Maintenance and Repair)	Decommissioning	
Changes to metocean and sediment transport regimes	✓	✓	✓	No
Changes to sediment concentration and bed level	✓	✓	✓	No
Changes to landfall morphology	✓	x	✓	No
Introduction of scour associated with cable protection measures	x	✓	x	No
Disturbance or damage to the geodiversity interest features within conservation site	✓	x	✓	No
Changes to water quality status of designated waterbodies and bathing waters (including accidental spill)	✓	✓	✓	No
Disturbance of contaminated sediments	✓	✓	✓	No

6.2.5.7 Cumulative Impacts

Impacts on physical environment and water and sediment quality receptors are deemed to be minimal in absolute terms, as described above. This is also the case, when considering the potential cumulative impacts relative to nearby offshore wind farm developments. Results of previous assessment work to support the consent of multiple offshore export cables for Inch Cape, identified that any works completed as part of cable installation and associated with cumulative activities in the surrounding developments would lead to effects which are spatially localised and short-lived. The cumulative impact assessment associated with the installation activity for the Inch Cape export cables, determined impacts to range between negligible and minor for the varying impacts associated with the works for the assessed offshore windfarm projects. Given the significant overlap and proximity of the SG1A Project with the Inch Cape cable corridor, it is considered that the installation of one additional offshore export cable, for the SG1A Project, will not give rise to any potential cumulative impacts greater than that already assessed for Inch Cape and concluded to be not significant. For this reason, the potential for cumulative impacts on the physical environment and water and sediment quality from the SG1A Project **will not be included** within the Environmental Appraisal.

6.2.6 Conclusions and Proposed Methodology for the Environmental Appraisal

With consideration of the selection criteria in Schedule 3 of the 2017 EIA Regulations, the characterisation of potential impacts with respect to the physical environment and water and sediment quality is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

No impacts on the physical environment and water and sediment quality from the SG1A Project have been identified as requiring further consideration within the Environmental Appraisal. Any potential changes and impacts would be less than or within the bounds of the determined effects associated with the consented Inch Cape export cable corridor. Furthermore, mitigation that would be employed during cable installation activities (see Section 4.7) would further reduce the potential or scale of any impacts.

6.3 Benthic Ecology

This section provides a description of the benthic ecology baseline and characterises any potential impacts which may affect benthic ecology receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

6.3.1 Key Data Sources

Data sources for benthic ecology characterisation across the SG1A Project comprise a mixture of online resources, providing broad-scale benthic habitat mapping, regional and site-specific survey data and published information specific to protected sites. Key data sources used include:

- EMODnet Broad-scale seabed habitat map for Europe (EUSeaMap);
- JNCC MPA Mapper;
- JNCC evidence base for the Firth of Forth Banks Complex MPA, including Pearce *et al* (2012);
- Inch Cape Offshore Wind Farm Environmental Statement:

- Seagreen Project EIA Report (Seagreen, 2012; 2018);
- Firth of Forth Banks Complex MPA site summary and data confidence assessments;
- Firth of Forth SSSI site management statement; and
- Firth of Forth SSSI Citation.

6.3.2 Study Area

The study area applied to this topic covers the proposed extent of the SG1A Project with a 10 km buffer as shown in Figure 1.1. Seabed habitats in nearby offshore development sites including the Seagreen Project, Inch Cape and Neart na Gaoithe are considered where relevant to inform the baseline. This section considers the benthic habitats, communities and species in the subtidal and intertidal parts of the study area.

6.3.3 Baseline Description

6.3.3.1 Overview of bathymetry, seabed habitats and sediments

Benthic communities comprise the fauna and flora that live on or in the seabed. Their composition and distribution is highly dependent on the type of seabed (e.g. presence of hard or soft substrata, sediment characteristics) and water depth.

An overview of the bathymetry, seabed habitats and sediments in the study area is provided in Section 6.2.3. Section 6.2.3 also provides an overview of the seabed sediments, sediment quality and their distribution in study area and wider in the Firth of Forth.

Predictive mapping highlights the variety of benthic habitats within the study area. Under the EUNIS seabed habitat classification system, the seabed in the furthest offshore parts of the study area, including the SG1A ECR to the west and southwest where it widens and overlaps with Inch Cape Development Area (Figure 6.4), consists of ‘Deep circalittoral sand’ and ‘Deep circalittoral coarse sediment’. Sediments along the cable corridor become increasingly muddy as it passes southeast of the Isle of May and into the Firth of Forth and are classified as ‘Deep circalittoral mud’ and ‘Circalittoral sandy mud’, although patches of exposed rock and biogenic reef are present. Sediments are more mixed closer to the East Lothian coastline and include circalittoral and infralittoral mixed and coarse sediments (Figure 6.4).

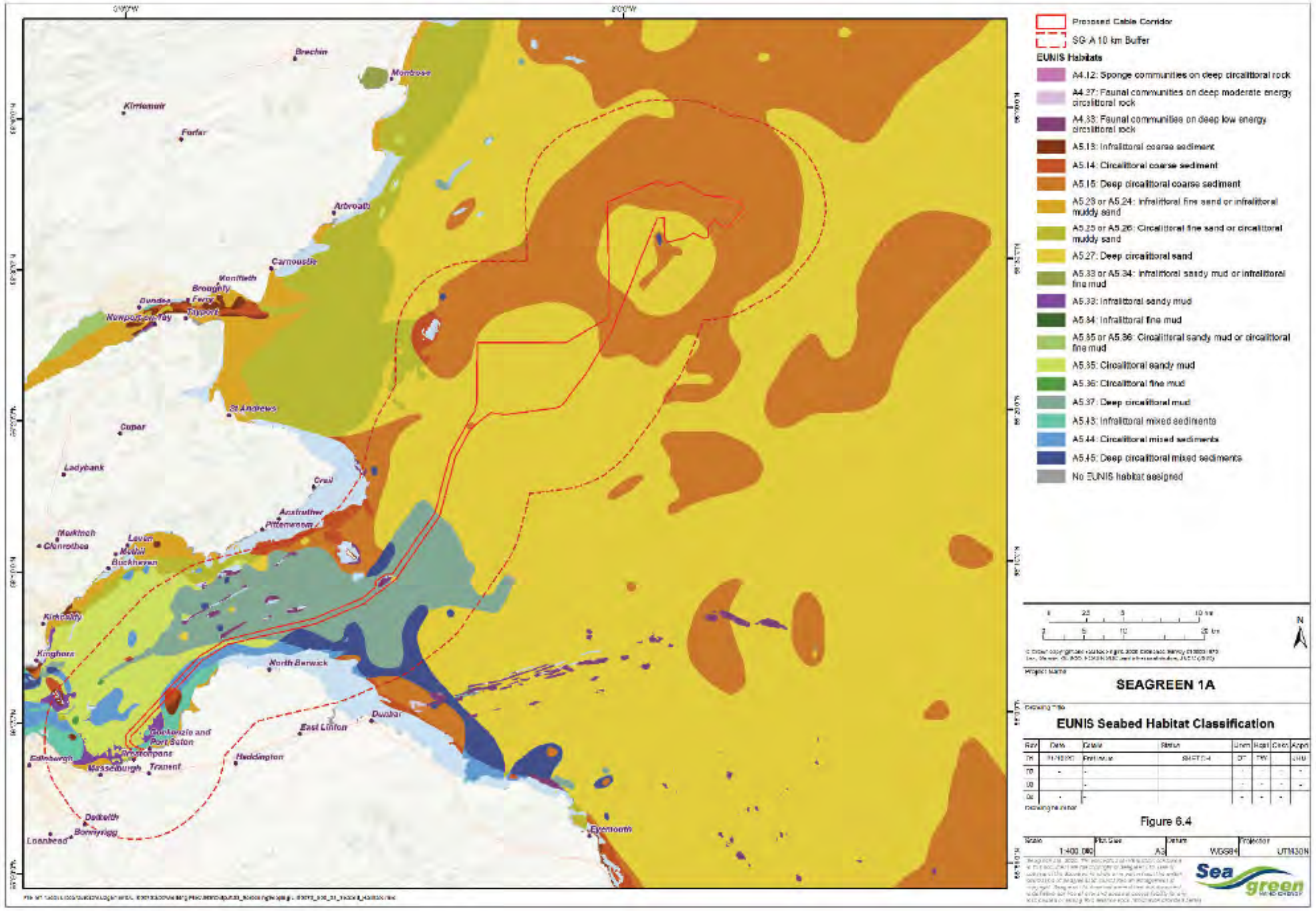

Figure 6.4 - EUNIS Seabed Habitat Classification in the Study Area (EMODnet, 2020)

6.3.3.2 Relevant site-specific survey information

The broadscale habitat mapping described above is supported by a significant amount of survey data collected for the Seagreen Project (Seagreen, 2018), the Inch Cape Development Area and the Inch Cape Offshore Export Cable Corridor (Inch Cape, 2011; 2018), as well as earlier survey data obtained in 2009 for the Neart na Gaoithe development (Cooper and Barry, 2017).

Figure 6.5 shows the locations of site-specific surveys conducted to date within the survey area. Given the significant overlap and proximity of the SG1A Project, the outputs of the Inch Cape surveys, as presented below, are considered relevant to characterising the baseline environment of the SG1A Project and benthic ecology study area.

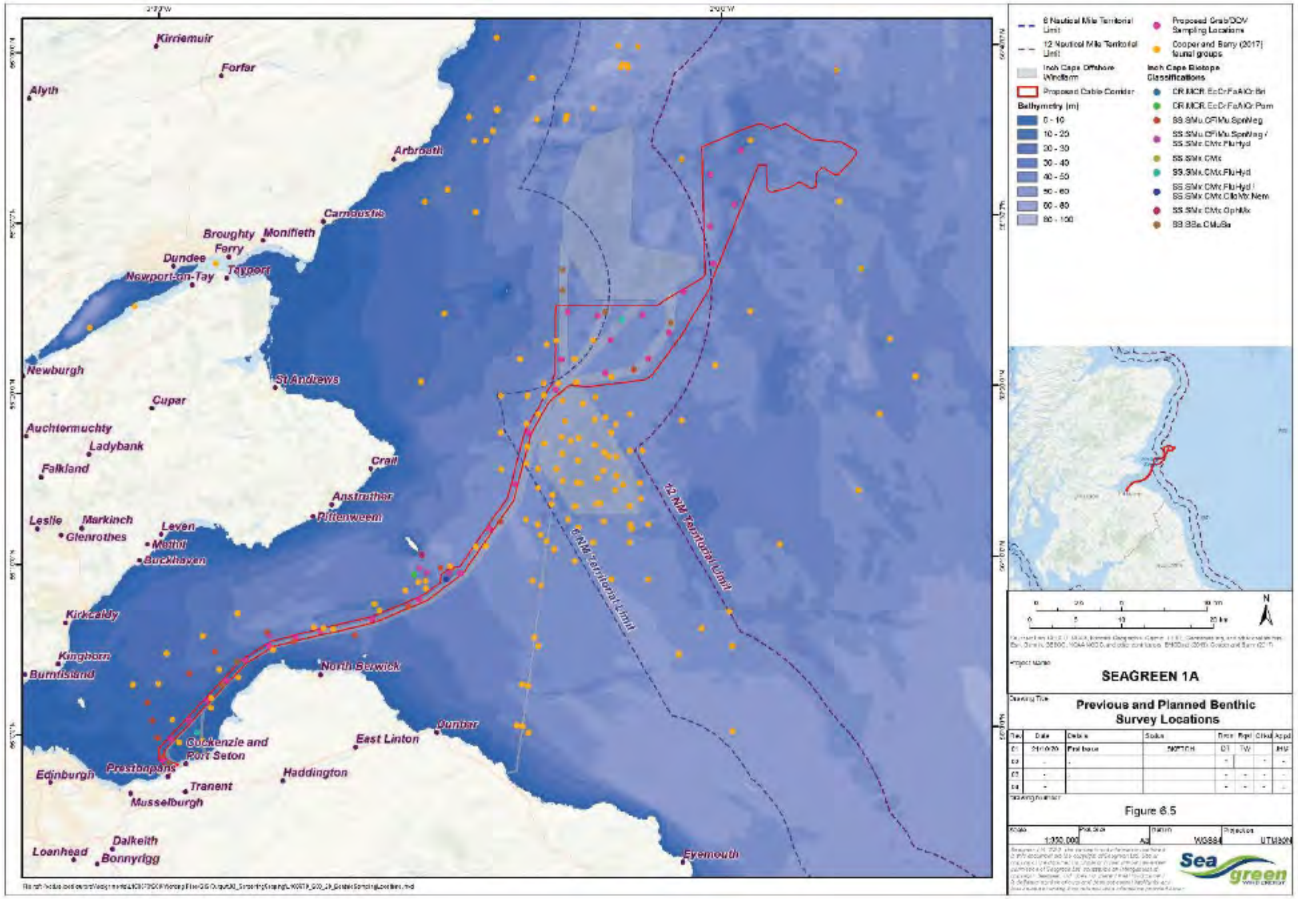

Figure 6.5 - Existing Seabed Survey Data

The results summarised in Table 6.4 and Table 6.5 have been used to characterise the baseline benthic environment in the SG1A study area.

Table 6.4 - Summary of findings from 2012 benthic survey at Inch Cape Development site

Survey Topic	Description
Physical environment	Circalittoral sands and gravelly sands with areas of muddy mixed sediment.
Epibenthic communities	Coarse and mixed sediment communities dominated by species typical of these habitats, i.e. dead man's fingers (*Alcyonium digitatum)*, horned wrack (*Flustra folicacea*), brittlestars (*Ophiothrix fragilis*), hydroids (e.g. *Hydrallmania falcata*) and a number of small fish and mobile benthic invertebrates.
Biotope classification	Predominantly the circalittoral mixed sediment biotope '*Mysella bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment' (SS.SMx.CMx.MysThyMx), with significant areas of '*Glycera lapidum, Thyasira* spp. and *Amythasides macroglossus* in offshore gravelly sand' (SS.SCS.OCS). Some occurrence of '*Mediomastus fragilis, Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel' (SS.SCS.CCS.MedLumVen).
Sediments chemistry and contaminants	Levels of total organic carbon (TOC) and sulphide were low at all stations. PAHs, PCBs and organotins were also low, with concentrations below Cefas Action Levels (AL), Canadian Sediment Quality Guidelines and Dutch Standards. Arsenic, cadmium, chromium, copper, and nickel concentrations exceeded Cefas AL 1. Levels of all contaminants varied across the survey area, but no areas of enhanced contamination were identified, despite the presence of the historical disposal ground at Bell Rock (located partially within the survey area).

Table 6.5 - Summary of findings from subtidal and intertidal benthic surveys along the Inch Cape Offshore Export Cable Corridor

Survey Topic	Summary Description
Subtidal surveys	• Predominant sediment type slightly gravelly muddy sand • Slightly gravelly sand and slightly gravelly sandy mud making up the remaining classes • Dominant mud/sand biotope was 'Seapens and burrowing megafauna in circalittoral fine mud' (SS.SMu.CFiMu.SpnMeg). Towards the intertidal, sediments classified as more heterogeneous infralittoral mixed (IMx) and circalittoral mixed (CMx) derived biotopes.
Intertidal surveys – A) Cockenzie	Cockenzie was divided into two main areas, hard substratum and mixed substrata. In south of survey area, substrate ranged from sandy gravel on the upper to mid shore, to sandy gravel and cobbles on the mid to lower shore • Small boulders present on the extreme low shore and sub-tidal area. • Algal growth onmid to lower shore with biotope 'Barnacles and *Littorina* spp. on unstable eulittoral mixed substrata' (LR.FLR.Eph.BLitX), • Down the shore, *Fucus spiralis* on full salinity upper eulittoral mixed substrata' (LR.LLR.F.Fspi.X) weremore prevalent. The hard substrata in the northern half showed • '*Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock' (LR.MLR.BF.PelB) on the upper shore; • '*Chthamalus* spp. on exposed upper eulittoral rock' (LR.HLR.MusB.Cht.Cht) on the mid shore • 'Fucus spiralis on exposed to moderately exposed upper eulittoral rock' (LR.MLR.BF.FspiB) on the mid to lower shore

	• kelp biotope of '*Laminaria digitata* on moderately exposed sublittoral fringe bedrock' (IR.MIR.KR.Ldig.Ldig) and 'Lanice conchilega in littoral sand' (LS.LSa.MuSa.Lan). on the extreme low shore Previous sampling (EMU, 2010), identified a thin band of a mussel bed (LS.LBR.LMus.Myt.Mx) on mid shore mixed cobble and gravel substrates. During the EMU (2012) survey this habitat was not present, suggesting that this is likely to have been a naturally ephemeral feature.
Intertidal surveys – B) Seton Sands	• Seton Sands consisted predominantly of fine sand habitats, though a small area of hard substrata'*Fucus spiralis* on full salinity sheltered upper eulittoral rock' (LR.LLR.F.FSpi.FS) occurred within a fine sand biotope on the upper shore. • Upper to mid shore mobile sand banks (LS.LSa.MoSa.AmSco.Sco) led to a large mid to low shore polychaete dominated biotope (LS.LSa.FiSa.Po) • Polychaete worms were present in large numbers to the low shore but the bivalve mollusc, • *Angulus tenuis*, was present on the extreme low shore, • '*Nephtys cirrosa*-dominated littoral fine sand' (LS.LSa.FiSa.Po) biotope further classified to 'Polychaetes and *Angulus tenuis* in littoral fine sand' (LS.LSa.FiSa.Po.Aten).
Sediments chemistry and contaminants	Please see Section 6.2.3.6

6.3.3.3 Protected sites and species

There are no SACs designated for benthic habitats or species within the SG1A Project or benthic study area.

The northeastern part of the SG1A Project lies within the Firth of Forth Banks Complex Nature Conservation MPA (Figure 6.1) which is designated for the following biodiversity features (JNCC, 2020a):

- Offshore subtidal sands and gravels;
- Ocean quahog (*Arctica islandica*) aggregations; and
- Shelf banks and mounds.

As part of the evidence base for the Firth of Forth Banks Complex MPA, JNCC commissioned an analysis of benthic grab data collected at the site location in 2011 (Pearce *et al*, 2012).

The report provides information on sediment physical characteristics, faunal assemblages, and the assignment of a biotope to each of the faunal samples, including the proposal of new biotopes based on the information gathered during the survey. The study also identified the occurrence within the survey area of features of conservation interest including Annex I habitats, MPA search features and rare or alien species. The data gathered and analysed provides important information that has been used to inform the baseline for impact assessments in this area.

The SG1A Project landfall location at Cockenzie passes through the Firth of Forth SSSI, which covers long sections of the Firth of Forth coastline, including the intertidal zone. Notified features of SSSIs do not extend below the low water mark. The only biological features of the site within the intertidal zone are mudflats, which provide feeding grounds for birds. The most important mudflats are found in the estuary part of the Firth of Forth, outside of the SGIA Project area (NatureScot, 2020a).

6.3.4 Mitigation and Management Measures

The SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to benthic ecology (including the installation methods and measures which will be set out in the CEMP, SOPEP and MCMP). No additional mitigation specific to benthic ecology will be implemented. The SG1A Project is undertaking a benthic survey to validate existing available baseline data and inform detailed design and the results of this survey will be provided to MS-LOT once available. No further mitigation measures will be implemented specifically for benthic ecology.

6.3.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for benthic ecology receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence. A summary of the potential impacts and conclusions are included in Table 6.6.

6.3.5.1 Temporary direct disturbance of benthic habitats and species

Direct disturbance to benthic habitats and species has the potential to occur during the installation of the single export cable which is expected to take place between Q2 and Q3 2023.

The proposed use of a trenchless technique (HDD or Direct Pipe) for installing the cable from the onshore landfall to the lower intertidal area will avoid significant impacts within the intertidal zone. The offshore (subtidal) parts of the cable will be installed using jetting, ploughing or mechanical trenching techniques. The maximum width of the trench is estimated to be 3 m, with a cable burial depth of up to 3 m. Depending on the installation methods used, temporary direct impacts may occur within an anticipated maximum working width of 100m for the length of the ECR. Further direct impacts may occur during the placement of rock or mattress protection, or the installation of grout bags (estimated to be required for up to 20% of the cable length) over a maximum width of 6 m, and by the use of anchors by the cable installation vessels.

During the operational phase, the only potential source of direct disturbance is likely to be during maintenance activities, which would be temporary and highly localised.

As stated in Section 4.6, a detailed decommissioning programme will be prepared at the appropriate time. The programme will be developed based on technological, legislative and environmental requirements at the time. The impacts during decommissioning are expected to be similar, and less significant, than those predicted during installation.

As described above in Section 6.3.3, the benthos of the SG1A Project area is well understood from comprehensive surveys conducted and nearby areas of similar water depth and seabed type. Seagreen 1A will conduct a validation survey, to provide further assurance of the understanding gained from previous surveys in the area. The proposed survey will also confirm habitats and biotopes along the ECR and provide up-to-date data.

Potential impacts from cable laying within a significant proportion of the SG1A ECR, including the two landfall options, has previously been assessed as not significant in the ES for the consented Inch Cape Export Cable (Inch Cape, 2011; 2018). As detailed in the key project parameters (Table 4.1), the SG1A Project has a small construction working corridor (100 m) and works will be short term only (Q2/Q3 2023) with direct disturbance being highly localised and temporary. Therefore, it is unlikely the SG1A project will have any potential significant direct impacts on benthic ecology. With consideration of the above, the potential impacts to benthic habitat from direct disturbance from the SG1A Project **will not be included** within the Environmental Appraisal.

6.3.5.2 Indirect impacts from temporary resuspension and resettlement of sediments

Trenching activities and the placement of cable protection materials on the seabed may result in resuspension of sediments, which will settle to the seabed over a wider area and have the potential to impact benthic communities by smothering and temporary increases in suspended sediment concentrations.

Indirect impacts from cable installation have been assessed for much of the SG1A ECR in the ES for the consented Inch Cape Export Cable and were assessed as not significant (Inch Cape, 2011; 2018). Given the small scale of works for SG1A (only one export cable), any potential impacts which are associated with the SG1A export cable, will be less than those identified for Inch Cape. As detailed in the key project parameters (Table 4.1), the SG1A Project has a small construction working corridor (100 m) and works will be short term only (Q2/Q3 2023) with any changes in suspended sediment concentrations being highly localised and temporary. Therefore, it is unlikely the SG1A project will have any potential significant indirect impacts on benthic ecology. With consideration of the above, the potential indirect impacts from temporary resuspension and resettlement of sediments **will not be included** within the Environmental Appraisal.

6.3.5.3 Release of contaminants bound in sediments

The information presented in Section 6.2.3 demonstrates the absence of significant contamination of surface sediments within the SG1A ECR. The impact assessments conducted for the consented Inch Cape and Seagreen Project predict that there will be no significant impacts from the release of sediment contaminants during the installation, maintenance or decommissioning of the export cables (Inch Cape, 2011; Inch Cape, 2018; Seagreen, 2018). In consideration of the SG1A Project key project parameters (Table 4.1) and known contaminants (Section 6.2.5.4), any disturbance of sediment will be temporary in duration and highly localised. Therefore, the potential impact associated with the disturbance of contaminated sediments **will not be included** within the Environmental Appraisal.

6.3.5.4 Long-term loss of original habitat and introduction of hard substrate

The SG1A export cable will be trenched and buried wherever possible along its entire length and therefore the seabed is expected to return to its original condition, with recovery and re-colonisation commencing immediately following cable installation. It is possible that there will be requirement for cable protection, using rock or concrete mattresses or grout bags, but this is only anticipated along up to 20% of the route. The deposited protection materials will be different from the natural seabed, however, the affected areas will only be along up to 20% of the ECR and with a width of up to 6 m in these locations. This highly localised and small footprint, in the context of natural habitats in the wider region, is not considered likely to give potential significant impacts. In addition, no significant impacts were determined from the placement of protection in the ES for the consented Inch Cape export cable (Inch Cape 2011; 2018). Therefore, potential impacts to benthic habitat from long term loss of habitat **will not be included** in the Environmental Appraisal.

Table 6.6 - Summary of the characteristics of potential impacts to benthic ecology receptors associated with SG1A

Potential impact	Relevant phase of Project			To include in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Temporary direct disturbance of benthic habitats and species	✓	✓	✓	No
Indirect impacts from temporary resuspension and resettlement of sediments	✓	✓	✓	No
Release of contaminants bound in sediments	✓	x	✓	No
Long-term loss of original habitat and introduction of hard substrate	✓	x	x	No

6.3.5.5 Cumulative Impacts

Given the highly localised and temporary nature any disturbance, resuspension or release of contaminants from the SG1A Project, no significant cumulative impacts are anticipated, even when considered cumulatively with other planned offshore wind farm installation activities.

In relation to long term loss of habitat, the areas of seabed likely to be affected by the SG1A project are extremely small in relation to overall areas of similar seabed habitat.

Given the very wide distribution of the sedimentary habitats in the wider region, together with the presence of natural hard substrata in the SG1A study area, there are unlikely to be significant cumulative impacts in relation to long term loss of habitat.

Therefore, cumulative impacts on benthic ecology **will not be included** in the Environmental Appraisal.

6.3.6 Conclusions and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations, the characterisation of potential impacts with respect to the benthic ecology is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

No impacts on benthic ecology from the SG1A Project have been identified as requiring further consideration within the Environmental Appraisal.

6.4 Natural Fish and Shellfish Resource

This section provides a description of the Natural Fish and Shellfish Resource baseline and characterises the potential impacts which may affect natural fish and shellfish receptors during the Construction, Operation and Maintenance and Decommissioning phases of the SG1A Project.

6.4.1 Key Data Sources

The following key data sources have been used to inform the natural fish and shellfish resources baseline:

- Inch Cape Offshore Environmental Statement (Inch Cape, 2011; 2018)
- Neart Na Gaoithe OWF ES (Neart Na Gaoithe, 2012)
- The Seagreen Project EIA Report (Seagreen, 2012; 2018)
- Fisheries statistics per ICES Rectangle (MMO, 2020)
- Marine Scotland NMPi (NMPi, Marine Scotland, 2020);
- Scottish Biodiversity List (NatureScot, 2020b)
- International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN, 2020)
- Coull *et al*. (1998) Fisheries sensitivity maps in British waters. Available online at https://www.cefas.co.uk/media/o0fgfobd/sensi_maps.pdf
- Ellis *et al*. (2012) Spawning and nursery grounds of selected fish species in UK waters. Available online at https://www.cefas.co.uk/publications/techrep/TechRep147.pdf.
- MarLIN (2020). The Marine Life Information Network. Available online at https://www.marlin.ac.uk/; and
- National Biodiversity Network (NBN) (2015). NBN Atlas. Available online at https://nbn.org.uk/content-block/nbn-gateway/;

Citations for other sources have been included throughout the baseline, which are referenced in Section 0.

The SG1A Project overlaps considerably with the consented Inch Cape export cable corridor, and also is in proximity to other consented projects Neart na Goaithe and the Seagreen Project. These projects provide a large amount of data which has been used to inform this assessment. It is also highlighted, that the Inch Cape cable corridor is consented for up to six offshore export cables (and is likely to install less), whereas the SG1A Project is for a single offshore export cable, which is a notable differential considered in the following natural fish and shellfish section.

6.4.2 Study Area

The SG1A Project is located in ICES Division IVb (Central North Sea) (see Section 6.7, Figure 6.10), within the ICES Ecoregion of the Greater North Sea. Natural fish and shellfish stocks are monitored, and advice is provided at a scale of ICES Ecoregion and Division level. For the purpose of this report, the natural fish and shellfish resource study area is provided on two scales:

1. SG1A study area which is the exact footprint of the SG1A Project on the seabed; and
2. ICES Division study area which is the Central North Sea (IVb).

6.4.3 Baseline Description

This section characterises the natural fish and shellfish resource in areas relevant to the SG1A Project. Many fish species are highly mobile. They can move easily to avoid a temporary change in their environment and are therefore not vulnerable to disturbance. However, species which are seabed-dependent for some or all of their life-cycle, or are not highly mobile, are typically more vulnerable to the potential direct impacts associated with disturbance. Seabed dependent species have therefore been considered in detail in the following baseline, with other fish and shellfish species also documented.

6.4.3.1 Designated Sites

There are no protected sites which are designated due to presence of qualifying natural fish or shellfish species which overlap with the SG1A Project. However, the River Teith SAC is a protected site within the Ecoregion study area, located ~55km west of the landfall of the SG1A Project, which is designated for migratory fish species which may use waters relevant to the SG1A Project as migratory pathways. These species include Atlantic salmon *Salmon salar* and Sea Lamprey *Petromyzon marinus*. This SAC will be considered as part of the HRA screening process which will accompany the Marine Licence application.

6.4.3.2 Fish and Shellfish Assemblage

This section should be read in conjunction with Section 6.8.4, which details the commercially exploited species that are recorded in areas relevant to the SG1A Project. According to landings per ICES rectangle (MMO, 2020), the SG1A Project supports a number of commercially exploited fish and shellfish species, with Nephrops, lobster and crab comprising the majority of the landed weights from the ICES rectangles in which SG1A Project is located. The average landings weights (2014-2018) of the top 20 commercially exploited species from the ICES rectangles with which the SG1A Project overlaps is provided in Table 6.7

Table 6.7 Average landings weights (tonnes, 2014-2018) of commercially exploited fish and shellfish from the ICES rectangles in which the SG1A Project is located (MMO, 2020)

	ICES rectangle				
Species	**40E7**	**41E7**	**41E8**	**42E7**	**42E8**
Nephrops (Norway Lobster) *Nephrops norvegicus*	290.4	1171.4	7.2	56.2	2.3
European lobster *Homarus Gammarus*	22.7	142.3	180.9	252.9	763.6
Brown crab *Cancer pagurus*	135.3	161.7	77.1	326.8	4.1
Scallop *Pectinus maximus*	84.6	197.7	16.8	167.5	2.4

Whelk *Buccinum undatum*	23.2	47.6	2.0	76.9	0.6
Velvet crab *Necora puber*	55.5	31.8	1.8	25.6	8.7
Razor clam *Ensis spp*	4.4	70.5	0.0	6.3	0.0
Mackerel *Scomber scombrus*	4.3	8.6	3.1	24.9	12.6
Mixed Squid *Loligo spp* and Octopi	1.0	45.1	0.0	1.6	0.0
Clams *Mya arenaria*	12.7	16.2	0.0	7.5	0.9
Surf Clams *Mactridae*	0.0	0.1	0.2	3.4	12.1
Squid *Loligo spp*	0.0	9.8	0.0	3.5	0.0
Monks/anglerfish *Lophius sp*	0.0	13.1	0.0	0.1	0.0
Haddock *Melanogrammus aeglefinus*	0.7	1.1	0.0	1.7	5.0
Dab *Pleuronectidae sp*	0.7	1.0	0.5	0.1	0.9
Atlantic cod *Gadus morhua*	0.6	1.8	0.1	0.1	1.0
Whiting *Merlangius merlangus*	0.3	1.7	0.2	0.2	1.7
Plaice *Pleuronectes platessa*	0.7	1.7	0.0	0.1	0.0
Green Crab *Carcinus maenas*	0.2	1.0	0.1	0.1	0.1

The SG1A Project overlaps with areas of surveys carried out to inform the baselines for Inch Cape, the Seagreen Project and is in proximity to Neart na Gaoithe and Berwick Bank (EMU, 2010 AMEC, 2013; IECS, 2012; Berwick Bank, 2020). In particular, the SG1A Project overlaps considerably with the consented Inch Cape export cable corridor. It is considered that information which was collected and presented in relation to the Inch Cape export cable, the Seagreen Project, and Neart Na Gaoithe is sufficient to adequately inform the natural fish and shellfish resource baseline for the SG1A Project and has therefore been used to corroborate and further elaborate on the landings data described above, in relation to natural fish and shellfish resources. The full lists of species which were recorded during these surveys can be found within the relevant appendices (EMU, 2020; AMEC, 2011; IECS, 2012). For the purpose of this Screening Report, focus has been given to seabed-dependent species which may be more vulnerable to disturbance of habitat. The following natural fish and shellfish species have been described below:

- Sandeel: seabed dependent, Priority Marine Feature (PMF) and Scottish Biodiversity List species, notable prey species;
- *Nephrops*: seabed dependent and commercially exploited;
- Scallops: seabed dependent, sedentary (king scallop) and commercially exploited; and
- Herring: seabed dependent for spawning and egg maturation, commercially exploited, Scottish Biodiversity List species and PMF

Sandeel, are a bony fish, and are commercially targeted in the North Sea. Sandeel trawling in some grounds relevant to the SG1A Project including Wee Bankie and Marr Bank have been closed to commercial fishing since 2000 (Article 29a from Council Regulation No 850/88)). Sandeel are seabed-dependent for almost their entire life-cycle (except feeding and spawning), inhabiting medium to coarse grained sandy substrates of sandbanks (Holland *et al*, 2005). Sandeels form an important role in the North Sea foodweb, comprising a food source for marine birds, mammals (Frederiksen *et al*, 2006). As evidenced by existing survey data collected on behalf of Neart Na Gaoithe, the SG1A Project which is located within the 12nm territorial limit is unlikely to support sandeel populations (Neart Na Gaoithe, 2014) due to the muddy substrate composition in this area (Section 6.3; EMODnet, 2020) which is not suitable habitat for sandeel (Greenstreet *et al*., 2010). Further offshore, where the SG1A Project extends beyond 12nm, the seabed is understood to be composed of sand and coarse substrate (EMODnet, 2020) which may be more favourable sandeel habitat and is in proximity to locations where sandeel was recorded during Seagreen benthic surveys. According to the Scoping Report for the Seagreen optimised project (2017) parts of the western area of the Seagreen OWF, where the SG1A Project eastern end is located, are likely to be unsuitable for sandeel. It should be noted that Sandeel, and particularly Raitt's sandeel (*A. marinus*) which were found in most abundance in benthic surveys of the Seagreen study area (IECS 2012) are understood to have slow growth and recovery rates.

Nephrops is commercially exploited throughout Scottish waters and are known to be present in abundances in areas relevant to the SG1A Project, especially within the 12nm territorial limit nearshore of the Marr Bank sandbanks, as confirmed by existing benthic surveys in the region (EMU, 2020; AMEC, 2011; IECS, 2012). *Nephrops* inhabit muddy sediments and spend almost all their life cycles in epibenthic burrows, except for feeding and mating. *Nephrops* are understood to be relatively resilient to the effects of smothering and disturbance due to their inherent ability to burrow into substrates, and fast growth/reproductive rates (Inch Cape, 2011; 2018).

King Scallop and Queen Scallop (*Aequipecten opercularis*) are present in the offshore area the SG1A Project according to survey data and landings, with King Scallop particularly commercially exploited due to being less mobile than Queen Scallop. Scallops are bivalve, sedentary, filter-feeders which settle on clean firm sand and sandy gravel (Seagreen, 2018). It is understood that scallop are not typically present in the SG1A Project located in ICES 41E7 but are present in ICES 43E7 and 42E8. Scallop are potentially vulnerable during the larval phase to increased SSC or disturbance, however, in areas of commercial fishing activity the levels of seabed disturbance from dredging and trawling is expected to exceed the temporary disturbance which may result from installation of the SG1A cable (Seagreen, 2018; Black and Perry, 1999).

Herring is a Scottish Biodiversity List species and PMF and is commercially exploited throughout the UK. It should be noted that the North Sea herring stock crashed due to over-fishing in the 1890s, resulting in the current monitoring and regulation applicable to the fishery (ICES, 2020). Herring stocks are categorised regionally and have varying spawning/nursery periods at different locations. The Buchan stock is understood to be of relevance to the SG1A Project. Herring are pelagic but are seabed-dependent (with relatively diverse seabed type affiliation) for spawning, with eggs remaining on the seabed until larvae hatch (approximately 3 weeks in August and September for the Buchan Herring stock). Data from the Working Group of International Pelagic Surveys (WGIPS, 2020) indicates that the Buchan spawning activity is primarily located to the north of the SG1A Project. The Seagreen Optimised Project EIA (2018) found that disturbance was not expected to exceed the baseline levels of disturbance from existing activities.

6.4.3.3 Spawning and Nursery Grounds

As noted in Section 6.4.3.2, species which are seabed dependent for all or some of their life stages, such as spawning, have been carefully considered within this report. The fish and shellfish species which may use areas relevant to the SG1A Project and are known to be dependent on the seabed for spawning are sandeel, *Nephrops* and potentially herring. A full list of all fish and shellfish species which may use the SG1A Project study area for spawning or nursery habitat is provided in Appendix A.

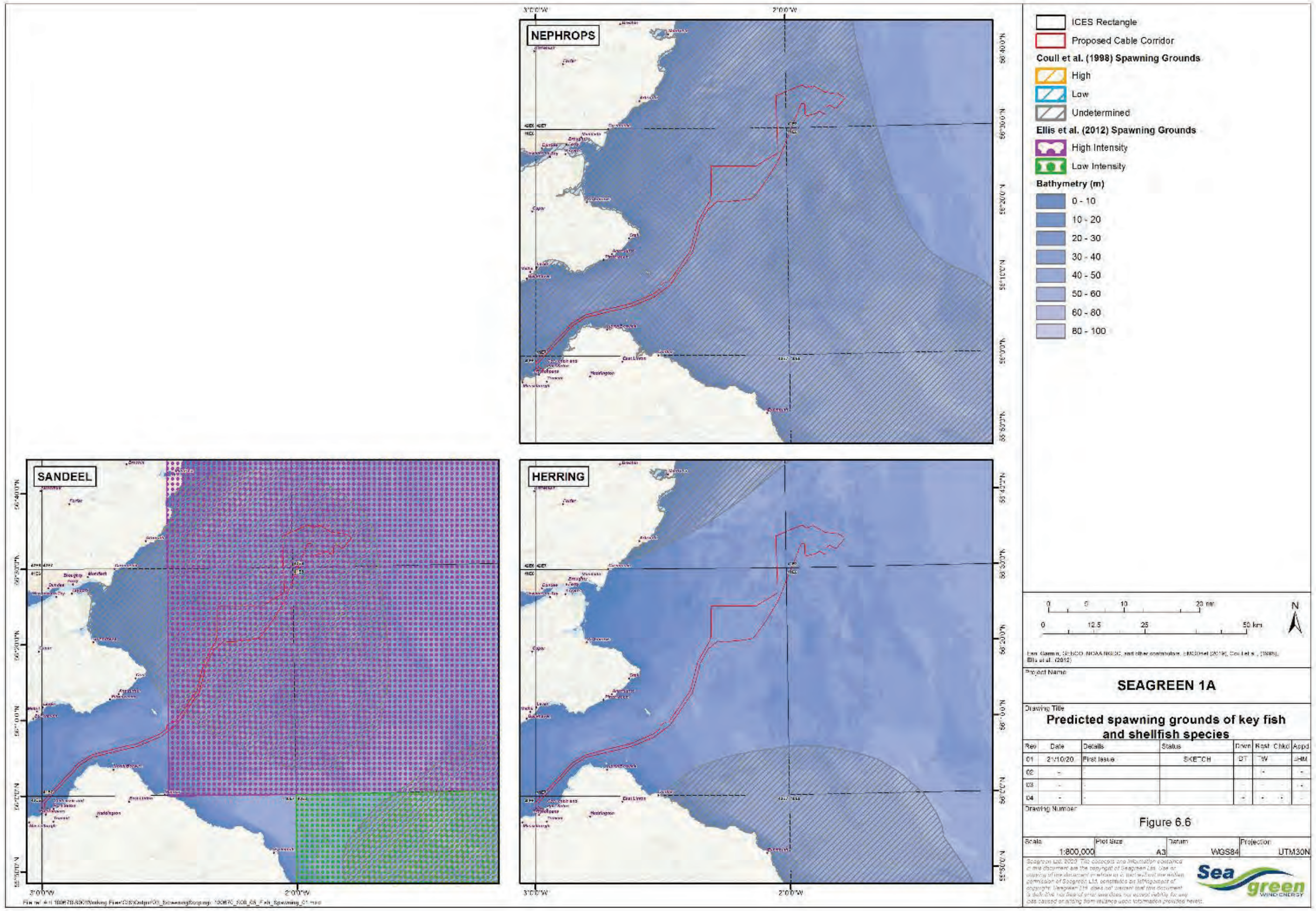

Figure 6.6 Predicted spawning grounds of key seabed-dependent fish and shellfish species in the vicinity of the SG1A Project

6.4.3.4 Noise Sensitive Species

Auditory detection in fish species remains poorly understood. Fish have diverse inner ears and accessory hearing structures. While accessory hearing structures enhance hearing, the function of the diversity of inner ears is not completely clear (Ladich and Hulz-Mirbach, 2016).

Hawkins and Popper (2014) have divided fishes into several different categories based on the structures associated with hearing. The functional groups include:

- Low sensitivity to noise - fishes without a swim bladder (these can only detect kinetic energy – e.g., sharks, common skate complex, mackerel, whiting);
- Medium sensitivity to noise - fishes with a swim bladder that is far from the ear and thus not likely to contribute to pressure reception, so the fishes are primarily kinetic detectors (e.g., salmon, sea trout) and eggs and larvae that are less mobile than adult fish and therefore not able to readily move away from the noise source; and
- High sensitivity to noise - fishes with a swim bladder or other air bubble that is close to the ear and enables sound pressure to be detected, broadening the hearing range and increasing hearing sensitivity (e.g., herring, sprat, cod).

There is potential for a number of noise sensitive species such as cod, herring, sprat, and Atlantic salmon to be present along the proposed SG1A Project.

6.4.3.5 Migratory and Electro-magnetic Field (EMF) sensitive species

There is the potential for several elasmobranch species to be present along the SG1A Project. These include Lesser spotted dogfish (*Scyliorhinus canicula*), cuckoo ray (*Raja naevus*), spurdog (*Squalus acanthias*), tope (*Galeorhinus galeus*) and common skate (*Dipturus batis* – complex). Other EMF-sensitive species present in waters relevant to the SG1A Project include cod, and lobster. Migratory species such as Atlantic salmon (*Salmo salar*), sea trout (*Salmo trutta*), the European eel (Anguilla anguilla), allis and twaite shad (Alosa alosa and Alosa fallax), and sparling (Osmerus eperlanus) may use waters relevant to the SG1A Proejct for migration. Particular focus has been provided here on species which have been highlighted in the EIAs of Inch Cape and Neart Na Gaoithe as being potentially sensitive to the impacts from offshore developments (Inch Cape, 2011; Inch Cape, 2018; Neart Na Goithe, 2012).

Atlantic salmon is an Annex II species and are diadromous spending most of their lives at sea, only returning to freshwater rivers to spawn, and returning to the sea in April/May as smolts (Malcolm *et al*, 2015). It is assumed from the Seagreen Project (Seagreen 2012, 2018) and existing studies in the region that Atlantic Salmon may utilise the SG1A area for migration (Seagreen, 2018; Malcolm *et al*., 2010; Beatrice Offshore Windfarm Limited (BOWL), 2017). Atlantic salmon and the associated rod, line and net fisheries were studied in detail in the EIA for the Seagreen optimised project (Seagreen, 2018), noting an overall decline in salmon catch returns since 1990s (Seagreen, 2018). European eels, are critically endangered according to IUCN (2020), a Scottish Biodiversity Species, and are also diadromous; migrating to sea to spawn with the larvae making the return journey back to freshwater. European eel are unlikely to use the SG1A Project intensively, but may pass through the area during migration. The migration of the European eel is not fully understood, and uncertainties remain on the duration and route of migration (Malcolm *et al*., 2010 and Righton *et al*., 2016). A proportion of the total European eel population, at the adult (silver eel) migratory stage, may pass through Scottish coastal waters. Waters bordering the northern coast of mainland Scotland, Orkney, Shetland and the Outer Hebrides are most likely to contain migratory eels from northern continental Europe as well as the UK. However, a potential migration route has been identified from the North Sea along the Scandinavian coast crossing into the north Atlantic to the north of Shetland, meaning that continental European eels may by pass Scottish coastal waters or that the migration routes may not be geographically confined (Malcom *et al*., 2010).

6.4.4 Mitigation and Management Measures

The SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to natural fish and shellfish ecology. There are no additional mitigations required specific to natural fish and shellfish ecology.

6.4.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for natural fish and shellfish receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence. A summary of the potential impacts and conclusions are included in Table 6.8.

6.4.5.1 Habitat disturbance, loss or creation

It is acknowledged that certain fish and shellfish receptors may be vulnerable to disturbance due to their affiliation with certain sediment types and therefore the potential impact pathway of disturbance to the species or its habitat has been carefully considered. The Forth and Tay region supports an active commercial fishing industry including demersal trawling, dredging and creeling (Section 6.7). On the basis of the findings of the baseline, and considering the results of the Seagreen and Inch Cape EIAs (Seagreen 2012; 2018; Inch Cape, 2011; 2018) the localised nature and short duration of any direct disturbance which may be caused by the SG1A installation or decommissioning works will be less than the disturbance which is consistently recorded within the existing environment. Wherever possible, the SG1A cable will be buried with a worst case anticipated burial of 80%. If burial is not possible protection will be placed over the cable. In areas where burial is not possible, the seabed is expected to be hard or rocky, and so the placement of cable protection is not expected to change the seabed characteristics significantly for fish and shellfish which are present. For most fish and shellfish species, the sensitivity to disturbance is low according to the Inch Cape and Seagreen EIAs (Inch Cape, 2011; 2018; Seagreen 2012; 2018), except for sandeel which are not confirmed to be present throughout the SG1A Project area in high densities. In light of the temporary and highly localised nature of any disturbance, the sensitivity of the fish and shellfish species which are most abundance in the vicinity of the SG1A Project, and in consideration of the Inch Cape EIA (Inch Cape, 2011; 2018) the potential impacts of disturbance, changes or creation of habitat **will not be included** within the Environmental Appraisal.

6.4.5.2 Indirect disturbance due to sediment deposition (smothering) and temporary increases in suspended sediment concentrations

Sediment disturbance will be limited to the direct vicinity of cable trenching operations and no impacts from the low levels of sediments disturbance by trenching activity are expected, including to diadromous fish or shellfish species. Any disturbed sediment is expected to be rapidly dispersed by tidal currents (Section 6.2). with the rates of deposition or increased SSC not expected to surpass the levels which may cause negative impacts to fish and shellfish species. For the most part, species which are bottom-dwelling, are relatively resilient to SSC/sediment deposition. In light of the temporary and localised nature of any SG1A activities which may cause increases in SSC/sediment deposition, and the relatively low sensitivity of most of the key species in the SG1A Project area, this impact **will not be included** within the Environmental Appraisal.

6.4.5.3 Underwater noise

With respect to underwater noise, the limited number of vessels expected to be involved in any seabed preparation and cable installation activities and the short duration and temporary nature of cable installation activities for SG1A is unlikely to produce significant levels of underwater noise volumes or frequencies. The overall underwater noise levels from trenching, jetting or burial will be negligible when compared to the noise levels which were considered in previous EIAs in the region (Inch Cape, 2018; Seagreen, 2018). Therefore, the potential for impacts of underwater noise on fish and shellfish receptors associated with SG1A activities **will not be included** within the Environmental Appraisal.

6.4.5.4 Electromagnetic fields (EMFs)

EMF emissions are generated from the transmission of electricity through subsea cables. The cables produce electromagnetic fields which have both electric (E) measured in volts per metre (V m-1) and magnetic components (B) measured in micro tesla (µT). While the direct electric field is mostly blocked with the use of conductive sheathing, the magnetic field penetrates most materials and therefore are emitted into the marine environment with the resultant induced electric (iE) field.

It is commonly recommended that cable burial is used to increase the distance between the cable and the electro-sensitive species (Gill *et al*., 2005; 2012). However, where burial is not possible; cable protection, e.g. concrete mattresses or rock placement increases the distance between marine species sensitive to EMF and the EMF source.

As detailed in Section 4, the SG1A cable will be buried wherever possible, and is expected to be buried to a depth of between 1 m and 3 m. Where cables are buried to a depth of up to 1 m, the predicted magnetic field strength at the seabed is expected to be below the earth's magnetic field (assumed to be 50 µT) (Moray Firth Offshore Renewables Limited, 2012) and not detectable by elasmobranch or electro-sensitive species (fish and crustaceans). Considering the available information, while acknowledging the current uncertainties and ongoing research which is being carried out on this topic, the potential for significant impacts due to EMF emissions are expected to be minimal and unlikely to occur for all species concerned and therefore this impact **will not be included** within the Environmental Appraisal.

6.4.5.5 Barrier effects to migratory species

It is understood that there is the potential for migratory fish species, such as Atlantic Salmon and European Eel to be impacted by activities during installation of the SG1A cable. The existing research on migratory species in waters relevant to SG1A indicates that usage of the area is relatively low. In addition, the overall footprint of any physical barriers (e.g. an installation vessel) or indirect barriers such as noise will be localised and the duration temporary. Indirect effects from operational EMF are expected to be negligible mitigated by effective burial and other embedded design mitigations of the cable itself. Therefore, the potential for significant impacts due to barrier effects are minimal and unlikely to occur for all species concerned and therefore this impact **will not be included** within the Environmental Appraisal.

Table 6.8 Summary of the characteristics of potential impacts to fish ecology receptors associated with SG1A

Potential impact	Relevant phase of Project			To include in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Habitat disturbance, loss or creation	✓	x	✓	No
Indirect disturbance due to sediment deposition (smothering) and temporary increases in suspended sediment concentrations	✓	x	✓	No
Disturbance or injury due to underwater noise	✓	x	✓	No
Effects of EMF	x	✓	x	No
Barrier effects to migratory fish species	✓	x	✓	No

6.4.5.6 Cumulative Impacts

The potential impacts for natural fish and shellfish receptors identified for the Seagreen Project, Neart Na Gaoithe and Inch Cape OWFs have been assessed to have no significant impact both alone and cumulatively with other developments (Seagreen 2012; 2018, Inch Cape, 2011; 2018, Neart Na Gaoithe, 2012). For the SG1A Project, all potential impacts for natural fish and shellfish resources are unlikely to occur and will be temporary in duration and localised in spatial extent. Therefore, given the significant overlap and proximity of the SG1A Project with the Inch Cape cable corridor, and the northeastern overlap with the consented

Seagreen OWF site, it is considered that the installation of an additional single offshore export cable for the SG1A Project will not give rise to any potential cumulative impacts. For this reason, the potential for cumulative impacts on natural fish and shellfish resources receptors from the SG1A Project **will not be included** within the Environmental Appraisal.

6.4.6 Conclusions and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to natural fish and shellfish resources is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

No significant impacts on natural fish and shellfish resources from the SG1A Project have been identified and therefore this topic will not be considered further within the Environmental Appraisal. The mitigation and management measures provided in Section 4.7 and Section 6.4.4 would reduce the potential or scale of any impacts.

6.5 Marine Ornithology

This section provides a description of the marine ornithology baseline and characterises any potential impacts which may affect marine ornithology receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

This Screening Report, and the Marine Licence application for the SG1A Project, will only consider the marine bird species relevant to the offshore and inshore marine habitat zones. The inshore marine waters are defined as marine areas between 1 and 4 km of the coast. The ornithology interests for the intertidal, nearshore (up to 1 km from the coast) and onshore habitat zones will be considered in the SG1A Project's onshore consent application and are not considered further in this report.

6.5.1 Key Data Sources

The areas potentially affected by the SG1A Project have received considerable ornithological survey and research effort over the past two decades, and consequently there is a wealth of information to inform this report. The SG1A Project ornithology survey strategy (Seagreen 1A, 2020) provided a review of the key sources of information available which are:

- Commissioned surveys undertaken to inform wind energy developments in the Firth of Forth, including the Seagreen Project;
- Aerial surveys undertaken by JNCC;
- National and regional volunteer-based surveys (for example those coordinated by the BTO); and
- Breeding seabird research by Centre for Ecology & Hydrology (CEH) and universities on the Forth island breeding colonies).

These studies provide site-specific information on the abundance, distribution, habitat preferences, ranging behaviour and seasonality of the marine bird species that occur in the areas of interests. The key sources of site-specific survey information are listed below:

- Seagreen Alpha and Bravo OWFs: monthly boat-based surveys of Seagreen Round 3 Zone, 2009-2011.
- Seagreen Alpha and Bravo OWFs: monthly boat-based surveys of OWF sites buffered to 2 km, 2017.
- Seagreen Alpha and Bravo OWFs: monthly aerial surveys of OWF sites buffered to 12 km, March 2019 to September 2020.
- Seagreen Berwick Bank and Marr Bank OFWs: monthly aerial surveys of OWF sites buffered to 12 km, March 2019 ongoing, planned to end April 2021
- Seagreen 1A Project (offshore cable): intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), July and August 2020.
- Inch Cape OWF: monthly boat-based surveys of development site buffered to 4 km, 2010 - 2012.
- Inch Cape OWF: monthly aerial surveys of OWF sites buffered to 12 km, April 2019 to March 2020.
- Neart na Gaoithe OWF: monthly boat-based surveys of development site buffered to 8 km, 2010 - 2013.
- Neart na Gaoithe OWF: monthly aerial surveys of OWF sites buffered to 12 km, June 2018, ongoing, planned to continue until wind farm construction is completed.
- Inch Cape offshore cable: intertidal and nearshore bird surveys up to 1.5 km from shore (MHWS), January 2012 to January 2013.
- BTO Wetland Bird Surveys data: abundance and distribution of non-breeding (wintering) coastal and estuary birds, including nearshore waters. Data are available for the count sections corresponding to coast and nearshore parts of SG1A Study Area.
- JNCC Seabird Monitoring Programme: online database that is the national repository of count and productivity data for seabird breeding colonies, including all the Firth of Forth colonies.
- JNCC Surveillance surveys of wintering seaduck, divers and grebes: periodic aerial surveillance surveys of important wintering areas. Data are available Firth of Forth. (Dean *et al*., 2003 and 2004)

There is also a wealth of wider ornithological literature that provides context information required for impact assessment, for example publications that provide information on species' vulnerability to potential impacts, and receptor population size and conservation status (for example, Mitchell *et al*., 2004; Forrester and Andrews, 2007; Furness *et al*., 2013, Furness, 2014; Eaton *et al*., 2015; Lawson *et al*., 2015; JNCC 2018; Frost *et al*., 2019).

6.5.2 Study Area

The Marine Ornithology Study Area is defined as follows:

- The marine habitat within the SG1A Project area buffered to 2km

The size of the buffer is based on the maximum realistic distance to which effects on marine birds may extend from the SG1A Project activities and infrastructure.

It is also relevant to note that the highly mobile nature of birds means that there is potential for connectivity between the Study Area and protected sites designated for their bird interests. Therefore, the characterisation of potential ornithology impacts also considers the potential for the SG1A Project to interact with bird interests that primarily lie outside the Study Area.

6.5.3 Baseline Description

The description of baseline conditions divides the Marine Ornithology Study Area into two habitat zones, these reflecting the major environmental differences within the Study Area and their associated bird community. These habitat zones are:

- Offshore marine waters
- Inshore marine waters

The species known to use the Marine Ornithology Study Area are listed in Appendix B, together with summary information on their status, seasonality and other information relevant to to this screening assessment. The status of a species in each habitat zone presented in Appendix B is based on a qualitative evaluation of existing survey information and is categorised as either 'Scarce' or 'Regular'. Regular here is loosely defined as likely to be commonly present (at the appropriate season) and scarce is loosely defined as likely to be only occasionally present (at the appropriate season) and in only low numbers in the context of the numbers known to occur in the wider Firth of Forth.

6.5.3.1 Offshore marine waters

The offshore marine waters in the Study Area lie between 4 and approximately 30 km from the nearest coast and mostly have seabed depths between 30 and 60 metres. The offshore areas of the Study Area are well within the regular forging range (Woodward *et al*., 2019) of several seabird species breeding on islands in the Firth of Forth, in particular Isle of May, Bass Rock and Craigleith. All these islands are part of the Forth Islands SPA and support large numbers of breeding seabirds in particular, gannet, European shag, gull species (herring gull, lesser black-backed gull and kittiwake), tern species (Sandwich tern, common tern and Arctic tern [redacted]) and auk species (common guillemot, razorbill and puffin) (Appendix B). A number of seabird species regularly occur as passage migrants or winter visitors, most notably little gull (a species listed on Annex 1 of EU Birds Directive), Sandwich tern, Arctic skua and little auk (Appendix B).

The ornithological importance of the offshore part of the Study Area is recognised through two nature conservation designations:

- Forth Islands SPA
- Outer Firth of Forth and St Andrews Bay pSPA

These two designations are designed to complement one another (Figure 6.7), with the Forth Islands SPA covering the islands in the Firth of Forth used by breeding seabirds, and the Outer Firth of Forth and St Andrews Bay pSPA covering a very large marine area that provides foraging habitat for the same breeding seabirds plus other non-breeding species that visit the area in the winter months and/or on passage (Appendix B). The offshore marine habitat in the Study Area lies within the Outer Firth of Forth and St Andrews Bay pSPA and thus qualifying species using the offshore parts of the Study Area will have direct connectivity with this pSPA. At its closest point, the offshore part of the SG1A Project passes approximately 4 km south of the Isle of May and thus, based on seabird foraging range metrics (Woodward *et al*., 2019), there will connectivity between the Study Area and the breeding seabird qualifying interest of the Forth Islands SPA.

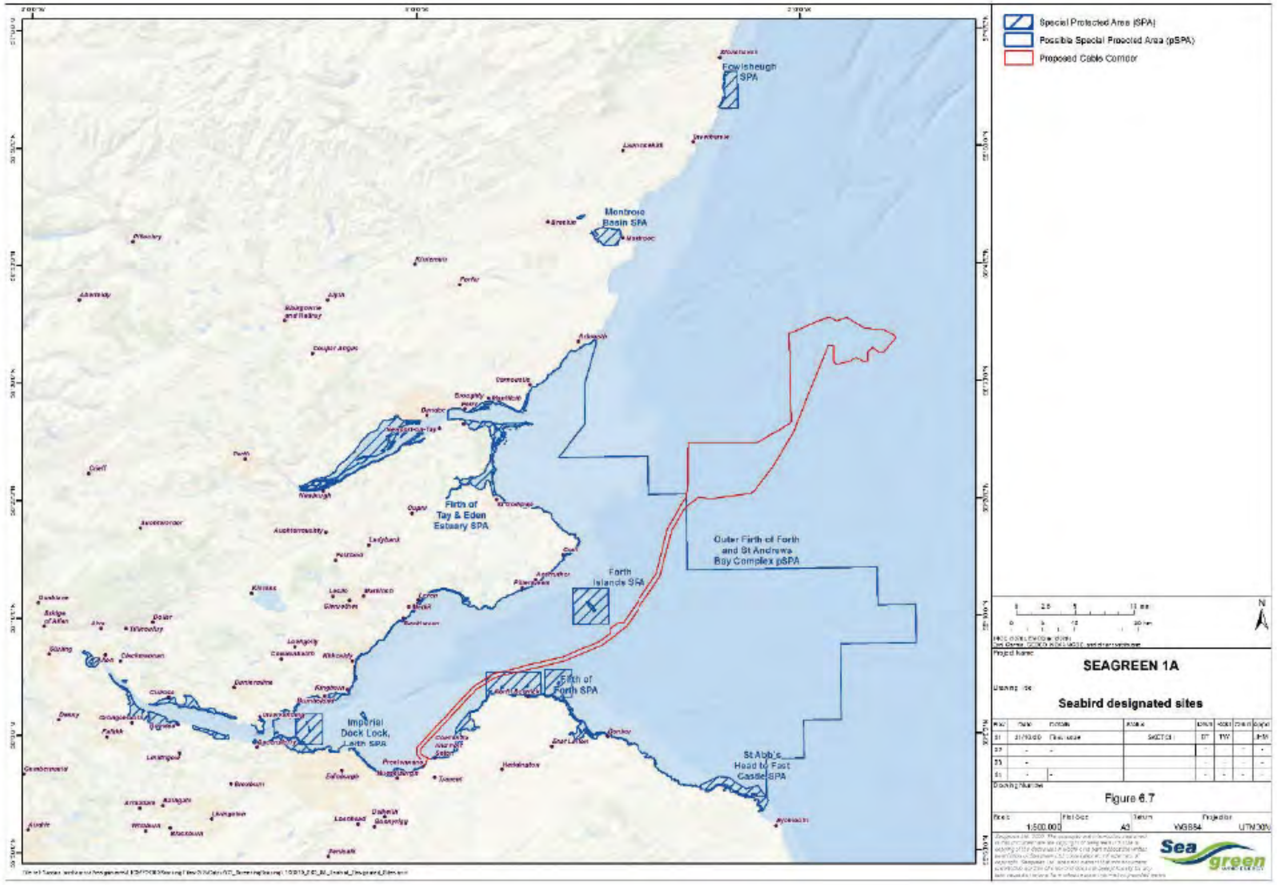

Figure 6.7 - Seabird Designated Sites

6.5.3.2 Inshore marine waters

The south-western most 16 km of the SG1A Project (i.e. the marine parts to the south west of North Berwick headland) pass thorough inshore marine waters. These differ from the offshore areas (though the change occurs gradually) in having greater shelter, shallower depths (<25m) and being closer to the coast (between 1 and 4 km). These inshore waters provide foraging for breeding seabirds in particular shag, gull and tern species (Appendix B). They also provide important foraging and resting habitat for wintering red-throated diver, grebe and seaduck species (Appendix B).

The ornithological importance of the inshore waters part of the Study Area is recognised through three nature conservation designations:

- Firth of Forth SPA
- Forth Islands SPA
- Outer Firth of Forth and St Andrews Bay pSPA

All the inshore marine habitat in the Study Area lies within the Outer Firth of Forth and St Andrews Bay pSPA and thus qualifying species using the inshore parts of the Study Area will have direct connectivity with this pSPA.

6.5.4 Mitigation and Management Measures

The SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to offshore ornithology. Additionally, the SG1A Project's Vessel Management Plan (VMP) will provide additional mitigation measures to prevent or reduce any potential impacts to ornithology. The VMP measures will also apply to times when vessels operate outside the Study Area, for example when transiting to and from ports. The proposed VMP measures are based on the findings and recommendations of Schwemmer et al. 2010, and include the following:

- The number of vessel movements will be minimised through careful planning.
- Vessels will, where possible, use indicative routes which will aim to avoid sensitive locations when transiting between the SG1A Project and ports.
- Compliance with best practise on use of vessel work lights, for example controlling spillage of light away from the target area requiring to be lit.
- Compliance with MARPOL regulations and best-practise protocols to prevent and manage incidents of accidental release of marine contaminant.

6.5.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for offshore ornithology receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence.

6.5.5.1 Disturbance/Displacement from vessel activity, Disturbance from construction noise and seabed habitat loss change effects on prey species

Vulnerability to vessel disturbance and loss of foraging habitat is examined in reviews by Garthe and Hüppop (2004) and by Furness *et al*., (2012 and 2013) and the studies by Jarret *et al*. (2018) and Goodship and Furness (2019) and are presented in Table 6.9. As there will only be two construction vessels required for the SG1A Project, there will be low vessel activity (Table 4.1) of short term duration and small extent associated for all development phases, compared with the high numbers of existing vessels which presently operate across the study area (including fishing vessels and cargo ships, Section 6.8). The installation programme currently planned for the SG1A Project will occur in Q2/Q3 of 2023, which would avoid the over-wintering season for many birds in the study area such as the red throated diver and scoter which are understood to be potentially more susceptible to disturbance than other bird species. The seabed disturbance potentially associated with the SG1A Project (and knock-on effects to prey species) are expected to be highly localised, small scale and temporary (Sections 6.3 and 6.4). In addition, any noise associated with the construction activities is expected to be localised and at low levels when compared to existing noise from existing vessel activity in the study area. Taking this into account and considering the findings of the Inch Cape and Seagreen EIAs (Inch Cape, 2011, 2018; Seagreen 2012, 2018), the potential impacts of direct disturbance, disturbance due to construction noise and seabed habitat loss effects on prey **will not be included** within the Environmental Appraisal.

6.5.5.2 Effects of lighting on nocturnal species

The vulnerability of species to the effects of bright lights is informed by the studies by Merkel (2010) and Syposz *et al*. (2015) and information on the tendency for a species to be nocturnally active (Furness *et al*., 2012), and information is provided for various species in Table 6.9. It is concluded that bird species in the study area are not typically vulnerable to vessel lighting. The exception is Manx shearwater. As there will only be two construction vessels required for the SG1A Project, there will be low levels of light produced from the SG1A Project (Table 4.1) compared with the typical levels of light emitted from vessels which are present in the study area. Taking the above into account, along with the temporary short-term nature of any night time construction works, the potential impact of effects of lighting on nocturnal species **will not be included** in the Environmental Appraisal.

6.5.5.3 Accidental release of contaminants

The likelihood of significant levels of surface pollutions being released by the SG1A Project construction activities or vessels is very low, especially in consideration of the mitigation measures relevant to control of pollutants (Section 4.7). In light of this low probability of occurrence, and with consideration of mitigation measures, the potential impact of the accidental release of contaminants to marine birds **will not be included** in the Environmental Appraisal.

Table 6.9 – Characterisations of species specific impact pathways for marine ornithology receptors

Potential impact	Duration	Extent of area affected	Receptors Species	Receptor seasonal sensitivity	Receptor spatial sensitivity	Potential consequence	Details
Construction phase							
Visual disturbance and displacement from vessel activity/presence	Short term and temporary	All of SG1A Project, localised at any one time	- divers, grebes and seaducks	Sept – March	Inshore marine waters (<25m depth)	Localised reduced foraging time and temporary displacement to alternative feeding areas	- Birds in the Study Area experience relatively high levels of baseline potential disturbance from commercial and recreational vessel activity. - All species have extensive to very extensive areas of alternative foraging habitat available locally. - Project's Vessel Management Plan includes measures to prevent or reduce disturbance to birds including avoiding sensitive areas, speed limits and using approved low sensitivity transit routes to ports. -Impacts are unlikely to be significant
			- auk species, shag	All year, esp. June – Sept	All Study Area		
			- all other species	All year	All Study Area		
Noise disturbance	Short term and temporary	All of SG1A Project, localised at any one time	- all species	All year	All Study Area	Localised reduced foraging time and temporary displacement to alternative feeding areas	- All species have low sensitivity to noise disturbance - The justification provided for visual disturbance above are applicable to noise disturbance - Impacts are unlikely to be significant

Potential impact	Duration	Extent of area affected	Receptors Species	Receptor seasonal sensitivity	Receptor spatial sensitivity	Potential consequence	Details
Effects of work-lights on nocturnal species (navigation lights excepted)	Short term and temporary	All of SG1A Project	- Manx shearwater (fledglings only)	Mid/late September only	Localised within 10 km of Isle of May	Potential disruptions of fledglings from Isle of May (if this species is breeding there) caused by bright lights	- The low levels of light introduced by a maximum of 2 installation vessels compared with the light levels from existing high numbers of night time vessel traffic. - SG1A Vessel Management Plan includes best-practise recommendations on use of bright work lights. - Impacts are unlikely to be significant
			- all other species (most species are sometimes active at night)	All year	All Study Area	Rare incidences of potentially lethal collisions with vessels in low visibility weather conditions	
Seabed habitat loss/change leading to effects on prey availability	Medium term	All of SG1A Project	- seaduck species (mainly feed on benthic molluscs and crustaceans)	Sept – March	Inshore marine waters (<25m depth)	Temporary localised effects to benthic prey, which may alter potential foraging rate. Localised area in the context of area habitat available	- Benthic feeding seaduck species may undergo short-term and highly localised reduction in foraging habitat - All species have extensive areas of alternative foraging habitat available locally and regionally. - Project mitigation measures are designed to minimise the area of seabed disturbed. - Benthic communities in disturbed areas of seabed expected to quickly recover. - Impacts are unlikely to be significant
			- all other species (mainly feed on fish prey)	All year	All Study Area		
Accidental release of contaminants	Short term and temporary	SG1A Project, localised at any one time	- divers, grebes, shag, auks and seaducks	All year	All Study Area, but especially inshore waters	Potential for temporary and localised negative effects to small numbers of individuals	- Project mitigation in the form of full compliance with MARPOL regulations and best practise mean that pollution incidents are

Potential impact	Duration	Extent of area affected	Receptors Species	Receptor seasonal sensitivity	Receptor spatial sensitivity	Potential consequence	Details
			- all other species				unlikely to occur, and if they do would be small in scale, highly localised and quickly contained and dealt with. - Impacts are unlikely to be significant
Operation phase							
Visual disturbance and displacement from vessel activity/presence	Short term and occasional (much less frequent than during construction)	All of SG1A Project, localised at any one time	- divers, grebes and seaducks	Sept – March	Inshore marine waters (<25m depth)	Localised reduced foraging time and temporary displacement to alternative feeding areas	- Vessel activity in the operational stage will be substantially less than during construction, highly localised and short-term. - Impacts are unlikely to be significant
			- auk species, shag	All year, esp. June – Sept	All Study Area		
			- all other species	All year	All Study Area		
Accidental release of contaminants	Short term and occasional	All of SG1A Project, localised at any one time	- all species	All year	All Study Area	Potential for temporary and localised negative effects to small numbers of individuals	- Same as for construction stage, see above - Impacts are unlikely to be significant
Decommissioning phase							
Visual disturbance and displacement from vessel activity/presence	Short term and occasional	All of SG1A Project, localised at any one time	- divers, grebes and seaducks	Sept – March	Inshore marine waters (<25m depth)	Localised reduced foraging time and temporary displacement to alternative feeding areas	- Same as for construction stage, see above - Impacts are unlikely to be significant
			- auk species, shag	All year, but especially June – Sept	All Study Area		

Potential impact	Duration	Extent of area affected	Receptors Species	Receptor seasonal sensitivity	Receptor spatial sensitivity	Potential consequence	Details
			- all other species	All year	All Study Area		
Effects of work-lights on nocturnal species (navigation lights excepted)	Short term and occasional	All of SG1A Project	- Manx shearwater (fledglings only)	Mid/late September only	Especially parts within 10 km of Isle of May	Potential for fatal grounding or collision of fledglings from IoM (if this species is breeding there) caused by bright lights	- Same as for construction stage, see above
			Low vulnerability - all other species (most species are sometimes active at night)	All year	All Study Area	Potential for lethal and sub-lethal harm to small numbers of individuals	- Same as for construction stage, see above

Based on the information presented in Table 6.9, a summary of the potential impacts on ornithology are presented in Table 6.10.

Table 6.10 Summary of the characteristics of potential impacts to marine ornithology receptors associated with SG1A

Potential impact	Receptor species	Relevant phase of Project			To Include in Environmental Appraisal
		Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Vessel disturbance	Divers, grebe, seaduck species	✓	X	✓	No
	Other marine bird species	X	X	X	No
Noise	All marine bird species	✓	✓	✓	No
Lighting (navigation lights excepted)	Manx shearwater	✓	X	✓	No
	Other marine bird species	X	X	X	No
Seabed habitat loss/change	Divers, grebe, seaduck species	✓	X	X	No
	All marine bird species	X	X	X	No
Accidental release of contaminants	All marine bird species	X	X	X	No

6.5.5.4 Cumulative Impacts

Vessel activity associated with these offshore wind energy projects, both within the vicinity of their respective offshore development sites and between these sites and ports, may act cumulatively to the potential disturbance impact on marine birds. In addition, there is known to be considerable vessel activity in the Firth of Forth from other commercial, military and recreational activities.

The potential for vessels to cause significant disturbance of birds is greatest in the inshore areas of the Firth of Forth frequented by wintering red-throated divers and seaduck and grebe species, and in the close vicinity (approximately within 2 km) of the island seabird colonies. All the consented windfarm projects have gone through a rigorous EIA process and have project-specific VMPs that include measures designed to prevent and reduce bird disturbance, such as avoiding ornithologically sensitive areas. The part of the SG1A Project that passes through inshore water and is therefore likely to be used by wintering seaduck, shares the same footprint as the Inch Cape cable route, therefore reducing the overall levels of disturbance to marine bird species. As both the SG1A Project and the consented Inch Cape will have approved VMPs prior to construction commencing, the cumulative disturbance from these two projects is not expected to increase the potential effects of disturbance, construction noise or lighting impacts on nocturnal species and therefore **will not be included** in the Environmental Appraisal.

SG1A will contribute to the cumulative loss/change effect of seabed habitat. However, this is only anticipated to have potential for adverse effects on birds where the habitat loss/change affects areas of inshore water used by benthic-feeding seaduck species. The potential magnitude of this cumulative effect will be reduced because of the overlap and close proximity of the SG1A Project and the consented Inch Cape export cable corridor. Benthic habitats disturbed by cable laying operations are anticipated to rapidly recover their value as a foraging habitat for seaduck species, thus it is considered unlikely that there will be a cumulative seabed habitat loss/change impact in inshore waters and this **will not be included** in the Environmental Appraisal.

All projects identified as relevant to cumulative impacts are required to comply with MARPOL regulations. The offshore wind industry has an excellent track record for successfully avoiding accidental release of contaminants into the marine environment. For these reasons the cumulative impact on bird receptors from the accidental release of contaminants are unlikely to occur and **will not be included** in the Environmental Appraisal.

6.5.6 Conclusion and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to marine ornithology receptors is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

It is concluded that the SG1A Project lies within an area of high value for a wide variety of breeding and non-breeding marine bird species, many of which are qualifying interests of sites designated for bird conservation. However, based on the extensive information available for the region and the justifications provided in Section 6.5.5, no potential impacts for marine bird receptors **will be considered** within the Environmental Appraisal.

6.6 Marine Mammals and Other Megafauna

This section provides a description of the marine mammals and other megafauna baseline and characterises any potential impacts which may affect these receptors during construction, operation and maintenance and decommissioning phases of the SG1A project.

6.6.1 Key Data Sources

The key data sources used to inform the marine mammal and other megafauna section include:

- Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys, (Hammond *et al.,* 2017);
- Atlas of cetacean distribution in north-west European waters, (Reid *et al.,* 2003);

- Estimated at-sea Distribution of Grey and Harbour Seals - updated maps 2017, (SMRU and Marine Scotland, 2017);
- Scientific Advice on Matters Related to the Management of Seal Populations: 2019; Report to the National Environment Research Council, (SCOS, 2019); and
- Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters (Hague *et al.,* 2020).

6.6.2 Study Area

The study area applied to this topic covers the proposed extent of the SG1A Project area and a wider region covering the outer area of the Firth of Forth, approximately between Arbroath in the north and Dunbar in the south (Figure 1.1).

6.6.2.1 Key Legislation and Guidance for Marine Mammals

Marine mammals are afforded varying levels of protection under international and national legislation depending upon their genus. Within UK waters, cetaceans (whales, dolphins and porpoises) protected through the listing of European Protected Species (EPS) under Annex IV of the Habitats Directive and are provided full protection within Scottish territorial waters through the Conservation (Natural Habitats, &C.) Regulations 1994 (as amended) and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in UK Offshore Waters . The deliberate or reckless injury or disturbance of these species is therefore prohibited.

Bottlenose dolphin *(Tursiops truncatus)*, harbour porpoise *(Phocoena phocoena)*, grey seals (*Halichoerus grypus*) and harbour seals (*Phoca vitulina*) gain additional protections through Annex II of the Habitats Directive, which includes provisions for their consideration in designating SACs. While pinnipeds are not EPS, they also protected through provisions set out in Annex V of the Habitats Directive, which defines them as species of community interest, meaning that any taking of these species in the wild is subject to management measures. Additionally, seals are further protected at designated seal haul-outs, which are coastal habitat locations that seals use to breed, pup, moult and rest designated through the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended). All haul-outs in Scotland are protected under Section 117 of the Marine (Scotland) Act 2010.

Additionally, all marine mammal species which regularly occur within Scottish waters are designated as PMFs (Tyler-Walters *et al.,* 2016). PMF are habitats and species that are considered to be marine nature conservation priorities in Scottish waters (NatureScot, 2020c). The following list of cetaceans are also protected under Schedule 5 of the Wildlife and Countryside Act (1981): all dolphin species, all whale species and harbour porpoise.

Basking sharks are afforded protection in numerous ways, in the UK they are protected under Schedule 5 of the Wildlife and Countryside Act (1981) and the Nature Conservation (Scotland) Act 2004, they are also listed as a PMF in Scottish waters. Globally they appear on the IUCN Red List meaning they are considered to have a high risk of extinction in the wild, they also appear on the Convention on International Trade in

Endangered Species (CITES) list, Appendices I and II on the Convention of Migratory Species (CMS) and Annex I (highly migratory species) of the United Nations Convention on the Law of the Sea (UNCLOS).

6.6.3 Baseline Description

6.6.3.1 Cetaceans

Seven cetacean species are known to frequently or seasonally visit the waters off the east coast of Scotland and the Firth of Forth including Atlantic white-sided dolphins (*Lagenorhynchus obliquidens*), killer whale (*Orcinus orca*), Risso's dolphin (*Grampus griseus*), fin whale *(Balaenoptera physalus)*, long-finned pilot whale (*Globicephala melas*), humpback whale (*Megaptera novaeangliae*) and short-beaked common dolphin (*Delphinus delphis*), but the occurrences of such sightings and densities of each species are very low (exhibiting densities of <0.01 individual/km^2) (Reid *et al.,* 2003; Robinson *et al.,* 2007; Robinson *et al.,* 2017; Hague *et al.,* 2020; NMPi, 2020).However, the following cetacean species have been recorded in the region covered by the SG1A Project: harbour porpoise; bottlenose dolphin; minke whale (*Balaenoptera acutorostrata*) and white-beaked dolphin (*Lagenorhynchus albirostris*).

Density estimates from the most recent Small Cetaceans in the European Atlantic and North Sea (SCANS-III) surveys indicated harbour porpoise as the most abundant species within the vicinity of the SG1A Project (Hammond *et al.,* 2017). This estimate is very high compared with density estimates of other cetacean species taken from these surveys, namely: bottlenose dolphin, white-beaked dolphin, white-sided dolphin and minke whale (Hammond *et al.,* 2017; Table 6.11).

Table 6.11 Cetacean densities in the vicinity of the SG1A Project (Hammond et al., 2017)

Cetacean name	Density estimates (animals/km^2)
Harbour porpoise	0.5-0.6
Bottlenose dolphin	0.025-0.050
White-beaked dolphin	0.20-0.25
White-sided dolphin	0.010
Minke whale	0.035 – 0.040

The density of white beaked dolphin and minke whale in the vicinity of the SG1A Project is considered high compared to other region of North Sea. While harbour porpoise, bottlenose dolphin and white-sided dolphin densities in the vicinity of the SG1A Project are considered moderate (Hammond *et al.,* 2017).

There are no protected sites immediately adjacent to the SG1A Project designated for cetaceans (Figure 6.8). The closest is the Southern Trench pNCMPA located 91.7 km from the SG1A Project which is designated for the protection of minke whales (NatureScot, 2019). Additionally, the Moray Firth SAC is located 147.7 km from the SG1A Project and is designated for supporting the only known resident population of bottlenose dolphins in the North Sea (JNCC, 2020b). It is recognised that bottlenose dolphins from the Moray Firth are known to transit to the Firth of Forth.

Based on available survey data, the waters in the vicinity of the SG1A Project supports a high-low density of cetaceans (depending on the species), however the area is not considered to be of elevated importance to feeding, breeding, nursing or migrating cetaceans (Hammond *et al*., 2017; Reid *et al.,* 2003). In addition, the highly mobile nature of cetaceans and the temporary, spatially constrained conditions of the project dramatically reduce the likelihood of interactions between project activities and cetacean receptors.

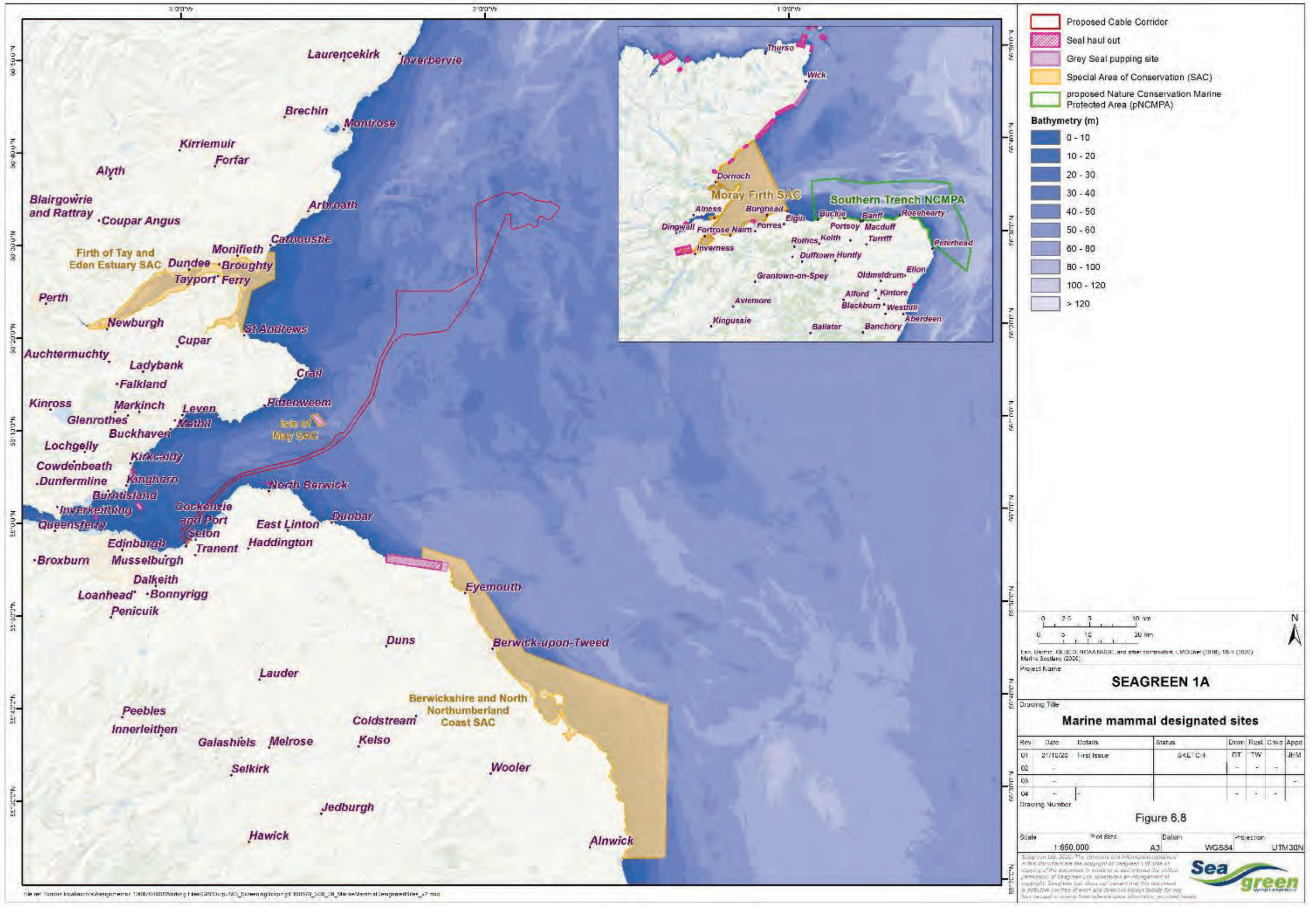

Figure 6.8 Marine mammal designated sites

6.6.3.2 Pinnipeds

Two species of pinniped regularly occur in the North Sea: grey and harbour seals. Scotland supports the greatest numbers of seals within the UK, providing habitat to approximately 80% of the grey seals and 81% of the harbour seals therein (SCOS, 2019).

Grey and harbour seals forage in coastal and offshore waters, depending on the seasonal distribution of their prey. However, both species tend to be concentrated close to shore, particularly during the pupping seasons which occurs from May to July for harbour seals and September to December for grey seals (Marine Scotland, 2014). Grey seals have larger foraging ranges than harbour seals, often travelling hundreds of kilometres, whereas harbour seals will generally forage within 50 km of their selected haul out sites (Cronin *et al.,* 2012; Thompson *et al*., 1996). Within 50 km of the SG1A Project, there are two SACs designated for the protection of grey seals (i.e. Isle of May SAC and Berwickshire and North Northumberland Coast SAC) and one for the protection of harbour seals (i.e. Firth of Tay and Eden Estuary SAC).

Tagging studies indicate that at-sea habitat use by harbour seals is estimated as an mean average of between 0-1 animals/25 km^2 across the majority of the SG1A Project, with the greatest densities of individuals likely to occur near the southwest landfalls where estimates increase to 5-10 animals/25 km^2 (Figure 6.9) (SMRU and Marine Scotland, 2017). At-sea density estimates for grey seals were higher further from shore than for harbour seals, with an estimated mean average of between 10-50 animals/25 km^2 across southwestern section of the SG1A Project. The majority of the SG1A Project falls within an area of lower grey seals usage of between 1-5 animals/25 km^2 (SMRU and Marine Scotland, 2017). Grey seal habitat use illustrated an opposite pattern to that of harbour seals, with the greatest density of individuals likely to occur near the southern landfalls (Figure 6.9). At-sea usage by grey seals is considered moderate to high across the SG1A Project area compared to other regions of the North Sea (SMRU and Marine Scotland, 2017).

Seals at designated haul-outs garner strict protection under Marine (Scotland) Act 2010, and it is an offence to cause disturbance to any hauled-out seals. One designated haul-out is located in the vicinity of the landfall of the SG1A Project, the Craigleith haul-out located 2 km to the south of the SG1A Project. Additionally, there are four other seal haulouts within 30 km of the SG1A Project, including Inchkeith, Kinghorn Rocks and Inchmickery and Cow & Calves located to the southwest, and Fast Castle located to the southeast. Figure 6.9 displays the location of this seal haul out and others referentially to the proposed SG1A project area.

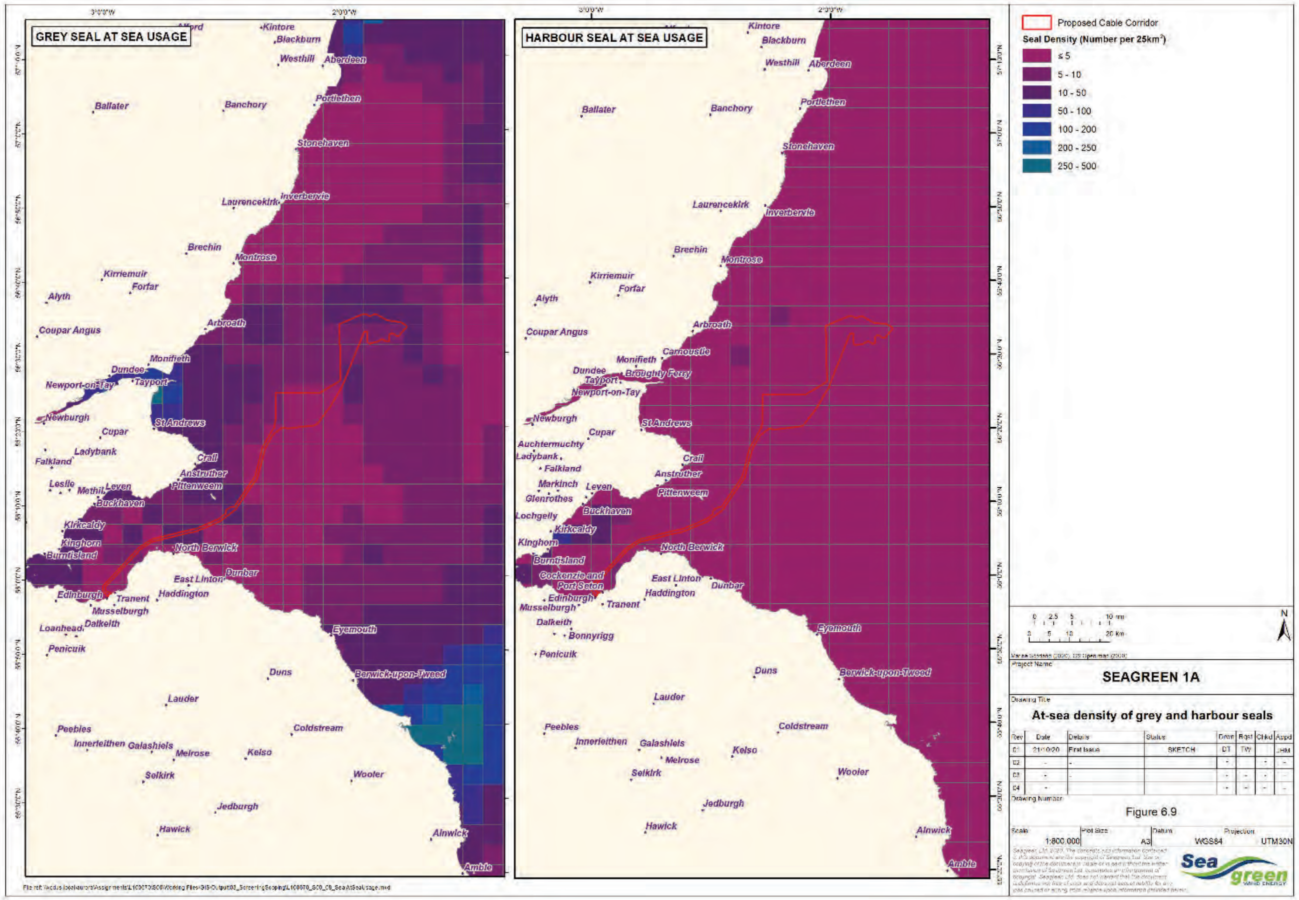

Figure 6.9 - At-sea density of grey and harbour seals

Due to the closest seal haul-out being located 2 km from the SG1A Project, the development is unlikely to result in disturbance of seals within a designated haul-out. Therefore, disturbance to seals onshore will not be included within the Environmental Appraisal.

6.6.3.3 Other Megafauna

Basking sharks have been sighted along the SG1A Project, however, there are no hotspots for basking shark sightings within the Firth of Forth (NatureScot, N.D). Basking sharks are only very rarely present within the Firth of Forth marine region (Paxton *et al.,* 2014). Considering information on their known distribution, it is considered extremely unlikely that interactions with basking sharks will occur, hence the potential for the proposed survey activities to result in intentional or reckless disturbance or harassment of this species is equally limited. Therefore, a derogation licence under the Wildlife and Countryside Act (1981) will not be required for basking sharks and this species is not considered further in this report.

6.6.4 Mitigation and Management Measures

SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to marine mammals. There is no additional mitigation required specific to marine mammals and other megafauna.

6.6.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for marine mammal receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence.

6.6.5.1 Underwater Noise

The most likely potential impact to cetaceans and seals from SG1A project activities is disturbance resulting from underwater noise generated by pre and post-installation surveys and cable installation vessels, including those involved in trenching and cable laying activities.

The underwater noise emissions from cable laying, trenching, jetting or burial activities will be negligible when compared to the noise levels resulting from survey activities and vessel noise (Inch Cape, 2018; Seagreen, 2018). Therefore, the potential for significant impacts on marine mammals from these noise sources is considered to be negligible, hence these activities **will not be included** within the Environmental Appraisal.

As detailed in Section 4.2.1, pre-construction geophysical surveys will take place at predefined locations within the SG1A Project using low to high frequency survey devices such as multibeam echosounders (MBES), side scan sonar (SSS) sub-bottom profilers (SBP). Additionally, subsea survey and cable installation equipment, such as ROVs, trenchers, and ploughs, may employ ultra-short baseline (USBL) technology to monitor their positions. These technologies all have the capacity to generate sounds which are audible to marine mammals, particularly high-frequency hearing specialists, such as harbour porpoise, therefore posing a potential risk of disturbance and injury.

However, survey activities will be limited to within the SG1A ECR, and are expected to be of short duration, meaning that potential impacts on marine mammals will be spatially and temporally limited, and are not anticipated to result in local or population level effects. In addition, any potential effects of pre-construction surveys to marine mammals and megafauna will be fully considered and assessed as part of the European Protected Species Licence (disturbance) application required for the surveys. In light of the above, the short-term and temporary duration of any construction activities, the highly localised extent of activity at any one time, and considering that the assessment of this impact was not significant in relation to the consented Inch Cape Project (Inch Cape, 2011; 2018) potential impacts of noise from geophysical surveys **will not be included** within the Environmental Appraisal.

It is recognised that vessel noise during installation may also be a source of disturbance to marine mammals. However, the number of vessels anticipated to undertake cable installation and associated survey works will be limited, in the context of existing vessel activity in the area (see Section 6.8). At present it is expected that up to two primary installation vessels will be operating during the installation phase at any one time (one dynamic positioning (DP2) cable lay vessel, approximately 150 m in length and one DP2 cable protection vessel approximately 100 m length), which will be assisted by a number of smaller support and guard vessels. The associated survey works are expected to utilise an offshore DP2 survey vessel of up to 100 m in length, accompanied by a smaller inshore survey vessel. The additional installation, support, and survey vessels in the project area is not considered to be a substantive change from baseline vessel activity in the Firth of Forth, considering the moderate to high density of shipping present in the area, as detailed in Section 6.8. As such, the project's vessel noise emissions will not be significantly above ambient vessel noise levels, and hence are not expected to result in significant adverse impacts to marine mammal receptors, and will not be considered further (Marine Scotland, 2019; Merchant *et al.,* 2016). Therefore, this impact **will not be included** within the Environmental Appraisal.

During the project's operational and decommissioning phases, the only activities that may result in underwater noise emissions with the potential to adversely affect marine mammals are routine inspection and maintenance utilising geophysical survey devices and USBL. Noise emissions will be broadly similar to those resulting from the installation phase, but the activities will be shorter in duration and more localised. As such the potential impacts on marine mammals resulting from the operation and decommissioning of the cable will be analogous to those resulting from installation, and **will not be included** within the Environmental Appraisal.

6.6.5.2 Collision Risk

Vessel presence during cable installation and associated survey activities poses a potential collision risk to marine mammals occupying the SG1A Project. Collision risk associated with vessel strikes are greatest for large vessels (i.e. greater than 80 m) travelling at speeds in excess of 14 knots (Laist *et al.,* 1997). Erratic vessel movement, such as short, sharp turning, is also thought to contribute to collision risk with marine megafauna (Laist *et al.,* 1997). Project vessels engaged in cable installation and survey activities will be moving at low speeds and where possible using indicative transit routes within the SG1A Project which will be detailed in the VMP. In addition, as detailed in Section 4.7, all vessels will adhere to the Scottish Marine

Wildlife Watching Code (NatureScot, 2017). As such, the risk of collision is minimal. Furthermore, as detailed above, the temporary, localised presence of two construction vessels and installation activities along with any maintenance works for the SG1A project will not result in a substantive change to baseline vessel activity in area, and as such no significant risks to marine mammals resulting from vessel collisions are expected, and no further consideration is necessary. Therefore, this impact **will not be included** within the Environmental Appraisal.

6.6.5.3 Electromagnetic Fields (EMF)

EMF emissions are generated from the transmission of electricity through subsea cables as discussed in Section 6.4.5.4.

Historical data has indicated some level of EMF sensitivity in cetaceans (Klinowska, 1985; Klinowska, 1988). However, experimental evidence of EMF detection in cetaceans has only recently been confirmed (Kremers *et al*., 2014). Dolphins have been shown to be able to detect and discriminate between magnetised objects, and it is likely that they are able to detect variations in magnetic fields (Kremers *et al*., 2014). These observations present the possibility that dolphins, and perhaps other cetaceans, may be able to detect the EMFs emitted from the subsea cable whilst in operation. The repercussions of this detection may range from negligible (i.e. acknowledgement of its presence) to potentially more dramatic, such as interference with navigation or broad scale movement which may result in stranding incidences (NIRAS, 2-15).

However, EMFs attenuate rapidly with distance from the cable, and considering the embedded mitigation that the cables will be trenched to a depth of 1 m or greater, or covered to an equivalent level through the use of external protection (e.g. rock placement), the range of EMF impacts is expected to be minimal (Section 4.7). Studies conducted for OWF HVAC export cables have shown that EMF densities at the seabed are expected to be less than the earth's magnetic field (assumed to be 50 µT in the Firth of Forth), assuming a 1m depth of cover (MORL, 2012, Neart na Goaithe, 2013). Given the extremely localised nature of the EMF expected to result from the operation of the SG1A Project, which will be limited to the immediate vicinity of the seabed in the SG1A Project area, and in consideration of the comparatively higher levels of EMF expected from the consented Inch Cape project (containing six offshore export cables compared to one export cable for the SG1A Project), EMF impacts on marine mammals are anticipated to be negligible, and **will not be included** within the Environmental Appraisal.

6.6.5.4 Water Quality

Seabed sediment disturbance from cable installation activities has the potential to generate localised, short term increases in sediment suspension, known as turbidity (Section 6.2.4). Increases in turbidity beyond ambient levels may reduce light penetration within the water column, thereby reducing visibility in species occupying those waters. Seals are most likely to be affected by such changes in visibility, as they are dependent upon visual cues to track prey (Scottish Executive, 2007). Grey and harbour seals have been identified as having a high sensitivity to reductions in light penetration, while cetaceans have a moderate sensitivity to this impact (Dunstone and Gorman, 1998). Nonetheless, seals can be found inhabiting areas of near-persistent turbidity (e.g. the southern North Sea and The Wash, and the Thames Estuary on the south-east coast of England), so it appears unlikely that increased turbidity would place significant constraints on the foraging success of these species. In addition to using their eyesight to find prey and navigate, seals are also able to forage in turbid and unlit waters using tactile cues from their highly sensitive vibrissae (whiskers) (Mills and Renouf, 1986). There is evidence that harbour seals use their whiskers to sense very low frequency vibrations and minute movements in water, such as those generated by small fish (Dehnhardt *et al.,* 1998). Cetaceans supplement deficits in their ocular abilities with auditory information, including sophisticated call signatures and, for the toothed species such as dolphins and porpoises, the employment of echolocation when foraging. As increases in turbidity from cable-laying are expected to be short-term and highly localised (see Section 6.2.5), and the installation programme in Q2/Q3 is expected to avoid the pupping season of the nearby grey seal population on the Isle of May, the resulting impacts on marine mammals are expected to be negligible and **will not be included** within the Environmental Appraisal.

6.6.5.5 Accidental Pollution Events

All marine mammal species are considered to possess some level of sensitivity to accidental pollution events. However, the potential for an unplanned fuel release to result in an accidental pollution event from the proposed SG1A Project activities is very low (as described in Section 6.2.5). In the event of an accidental fuel release, appropriate standard management practice procedures will be implemented. Standard pollution prevention measures are laid out in the Schedule of Mitigation and/ or the CEMP and for all vessels over 400 GT (gross tonnage) a SOPEP will be in place, further reducing the magnitude of potential environmental impacts, in the unlikely event of an accidental pollution event (Section 4.7). As such, accidental pollution events resulting from the project are not considered to have the potential to result in significant adverse impacts to marine mammals, and **will not be included** within the Environmental Appraisal

A summary of the potential impacts associated with marine mammals and other megafauna have been summarised in Table 6.12.

Table 6.12 Summary of the characteristics of potential impacts to marine mammals and other megafauna receptors associated with SG1A

Potential impact	Relevant phase of Project			To include to Environment Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Temporary disturbance / displacement due to noise emissions	✓	✓	✓	No
Collision risk	✓	✓	✓	No
Increased sedimentation affecting ability to forage	✓	x	✓	No
Magnetic fields interfering with navigation	x	✓	x	No
Accidental pollution	✓	✓	✓	No
Disturbance at landfall	✓	x	x	No

6.6.5.6 Cumulative Impacts

The nearby developments considered for the cumulative impact assessment have been outlined in Section 0. The SG1A project is not expected to have any potential significant impacts on marine mammal receptors. In addition, the other nearby developments are expected to be required to follow the same industry guidance on mitigation and management measures, therefore, cumulative impacts on marine mammals **will not be** included in the Environmental Appraisal.

6.6.6 Conclusion and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to marine mammals and megafauna is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

No potential impacts associated with marine mammals and other megafauna will be included for further consideration in the Environmental Appraisal. Any potential changes and impacts would be less than or within the bounds of the determined effects associated with the consented Inch Cape export cable corridor. Furthermore, mitigation that would be employed during cable installation activities would further reduce the potential or scale of any impacts. These aspects mean that the characterisation of potential impacts with respect marine mammals and other megafauna is such that the proposed SG1A Project would not result in any adverse impact to the environment.

6.7 Commercial Fisheries

This section provides a description of the commercial fisheries baseline and characterises any potential impacts which may affect commercial fisheries receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

Commercial fisheries is defined for the purpose of this report as activity by licensed fishing vessels undertaken for the legitimate capture and sale of finfish and shellfish in the marine environment. Recreational fishing, salmon netting, rod and line fishing, fishing activities in rivers, and aquaculture are not considered here. This section should be read in conjunction with Section 6.4 Natural Fish and Shellfish Resources and Section 6.8 Shipping and Navigation.

6.7.1 Key Data Sources

A variety of publicly available desk-based data sources have been used to inform the commercial fisheries baseline, which are described in Table 6.13. In addition, where applicable reference was made to the existing EIAs which have been produced in the Forth and Tay region (Inch Cape, 2011; 2018; Seagreen 2012; 2018; Neart Na Goithe, 2012) along with the Berwick Bank OWF Scoping Report (Berwick Bank, 2020).

Table 6.13 - Key Data Sources

Data & Source	Description
Fisheries statistics per ICES Rectangle (Marine Management Organisation (MMO), 2019)	Landings values and effort for UK registered fishing vessels of all lengths, averaged per year for 2014-2018
Average intensity (effort) of fishing for Nephrops and crustaceans with bottom trawls (ICES/Marine Scotland, 2020)	Average effort from Vessel Monitoring System (VMS) data for vessels of 15m in length and above between 2009 and 2017
Average intensity (effort) of fishing with bottom trawls (ICES/Marine Scotland, 2020)	Average effort from VMS data for vessels of 15m in length and above between 2009 and 2016
Average intensity (effort) of fishing for with dredges (ICES/Marine Scotland, 2020)	

6.7.2 Study Area

The SG1A Project is located in ICES Division IVb (Central North Sea). ICES rectangles provide a standardised spatial scale for data on commercial fishing activity, and so have been used to delineate the commercial fisheries study area of ICES rectangles 40E7, 41E7, 41E8, 42E7 and 42E8 (Figure 6.10). Where relevant, commercial fishing activity from outside of the defined study area have been referred to for context.

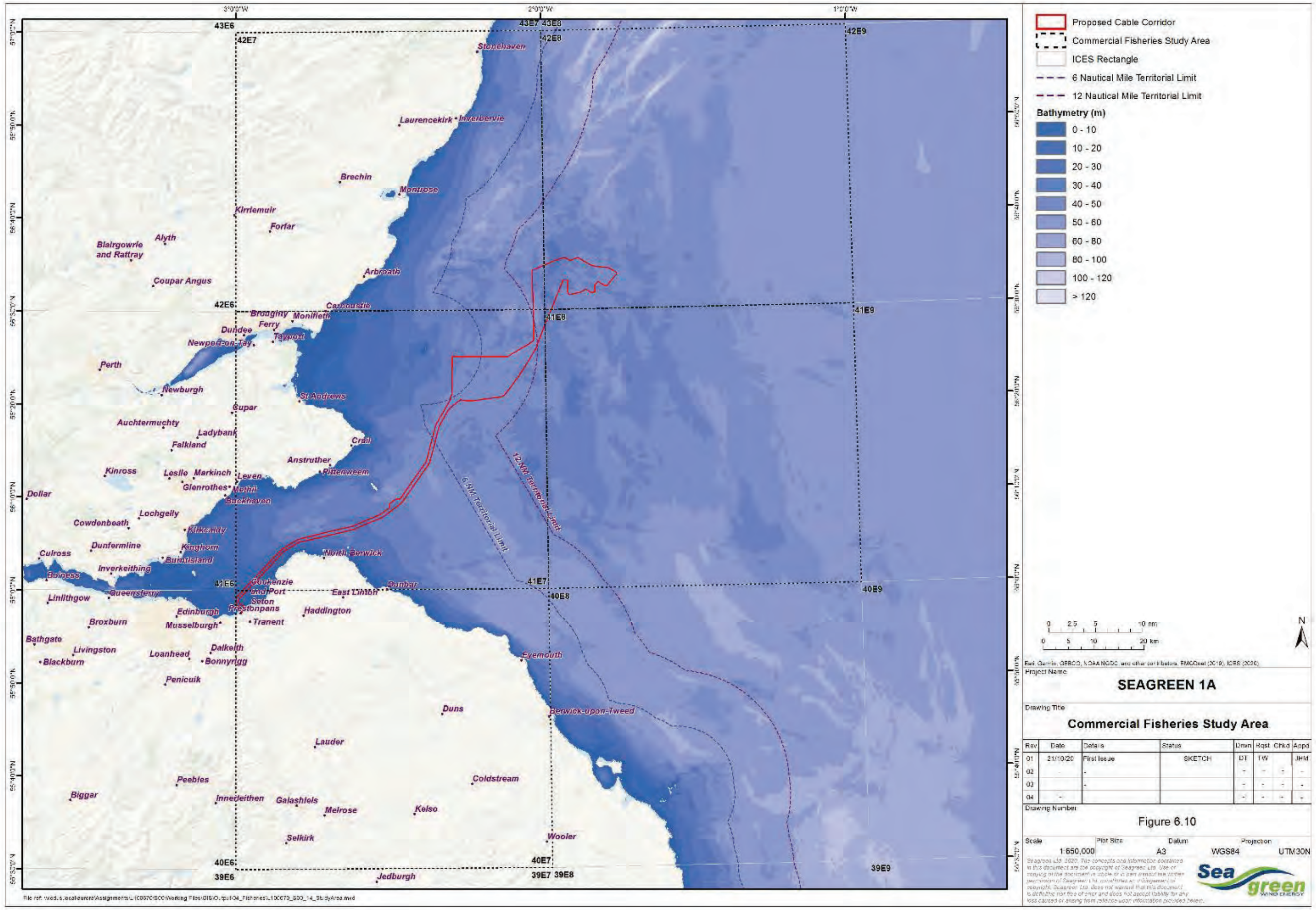

Figure 6.10 - Commercial Fisheries Study Area

6.7.3 Baseline Description

Landings values from 2014 to 2018 per ICES rectangle have been used to calculate the annual average by vessel length, fishing method and species, and are presented in Figure 6.11 to Figure 6.13. In the study area, overall average landings values are higher in ICES 41E7 compared with the surrounding ICES rectangles.

Average landings values by vessel length (< 10m and >10m in length) show that vessels of over 10m comprise the majority of landings values from ICES 41E7 (Figure 6.11). Proportionately more landings values from vessels of over 10m are recorded in the offshore ICES rectangles 40E8, 41E8, 42E8; (Figure 6.11), than those nearshore. As shown in Figure 6.12, the fishing method which comprises the majority of average landings values from ICES rectangle 41E7 is demersal trawls (average £5,093,438), followed by pots/traps and dredging at comparatively low values. The average value of demersal trawls from ICES 41E7 accounts for almost all of the average landings value of *Nephrops* from ICES 41E7 (average £5,112,492). Further analysis of the landings values by fishing method and vessel length illustrate that the majority (80.9%) of the landings values by demersal trawl from ICES 41E7 are from vessels of over 10m in length (MMO, 2020). Figure 6.12 indicates that average landings values are similar between ICES rectangles of vessels operating pots/traps from ICES 41E7, 40E8 and 42E7, with pots/traps comprising the majority of landings values recorded from 42E7 where the north western boundary line of the SG1A Project is located. As shown in Figure 6.12, in ICES 42E8 where the north eastern offshore section of the SG1A Project is located, most average landings values are recorded by dredging vessels which target scallops, at comparatively lower values than the prominent fishing methods operated in surrounding ICES rectangles.

As noted above and shown in Figure 6.13, landings values by species indicate that *Nephrops,* comprise the highest proportion of average landings values in ICES 40E7 and 41E7. Demersal trawlers also record comparably lower landings values of squid*,* primarily from ICES 42E7 and 42E8. Lobsters and to a lesser extent crab which are targeted by vessels operating static fishing gear, comprise the majority of landings values from ICES 40E8 and 42E7 (average £1,986,283 in 40E8 and £2,184,989 in 42E7). Scallops are recorded in the landings values at low levels in ICES 40E8, 41E7, 41E8 and 42E7, and comprise higher proportionate average value of landings from ICES 42E8 (average £1,738,641). Razor clams are also landed to a lesser degree from ICES 41E7, 42E7 and 40E7. Other species which are landed from the study area include demersal fish species such as haddock, monkfish and plaice and pelagic species such as mackerel and herring (MMO, 2020).

Average fishing intensity (effort) for three mobile fishing methods has been presented in Figure 6.14 and Figure 6.15. In relation to activity by fishing vessels operating demersal trawls which target *Nephrops*, in accordance with the landings values detailed above, there is an area of high intensity activity in ICES 41E7, especially within the 6nm territorial limit of Scotland. This activity corresponds with the existing seabed characterisation (Sections 6.2 and 6.3) which shows muddy sediment types, favoured by *Nephrops* as predominant habitat, in this area. Figure 6.15 shows the average fishing intensity (2009-2016) by vessels operating scallop dredges and indicates that there are areas of moderate scallop dredging activity in the north eastern proportion of the SG1A Project, which overlaps with ICES 41E7, 42E7 and 42E8. Most vessels operating scallop dredges in the study area are over 15m in length, and many are nomadic, meaning they operate across the North Sea including intensively in the English Channel, to opportunistically fish in a pattern which corresponds to the cyclical and fluctuating nature of scallop density in a location over time.

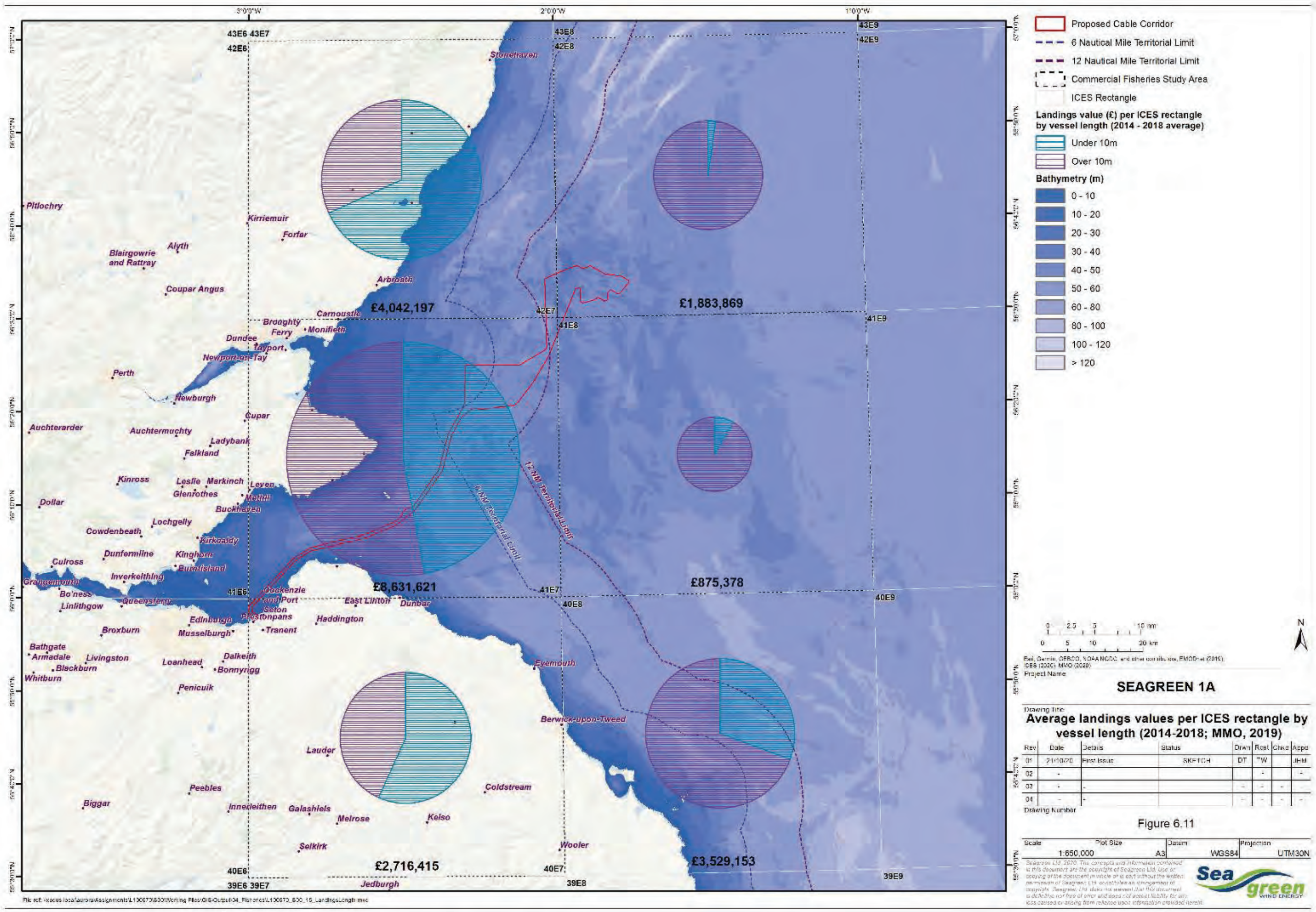

Figure 6.11 - Average landings values per ICES rectangle by vessel length (2014-2018; MMO, 2019)

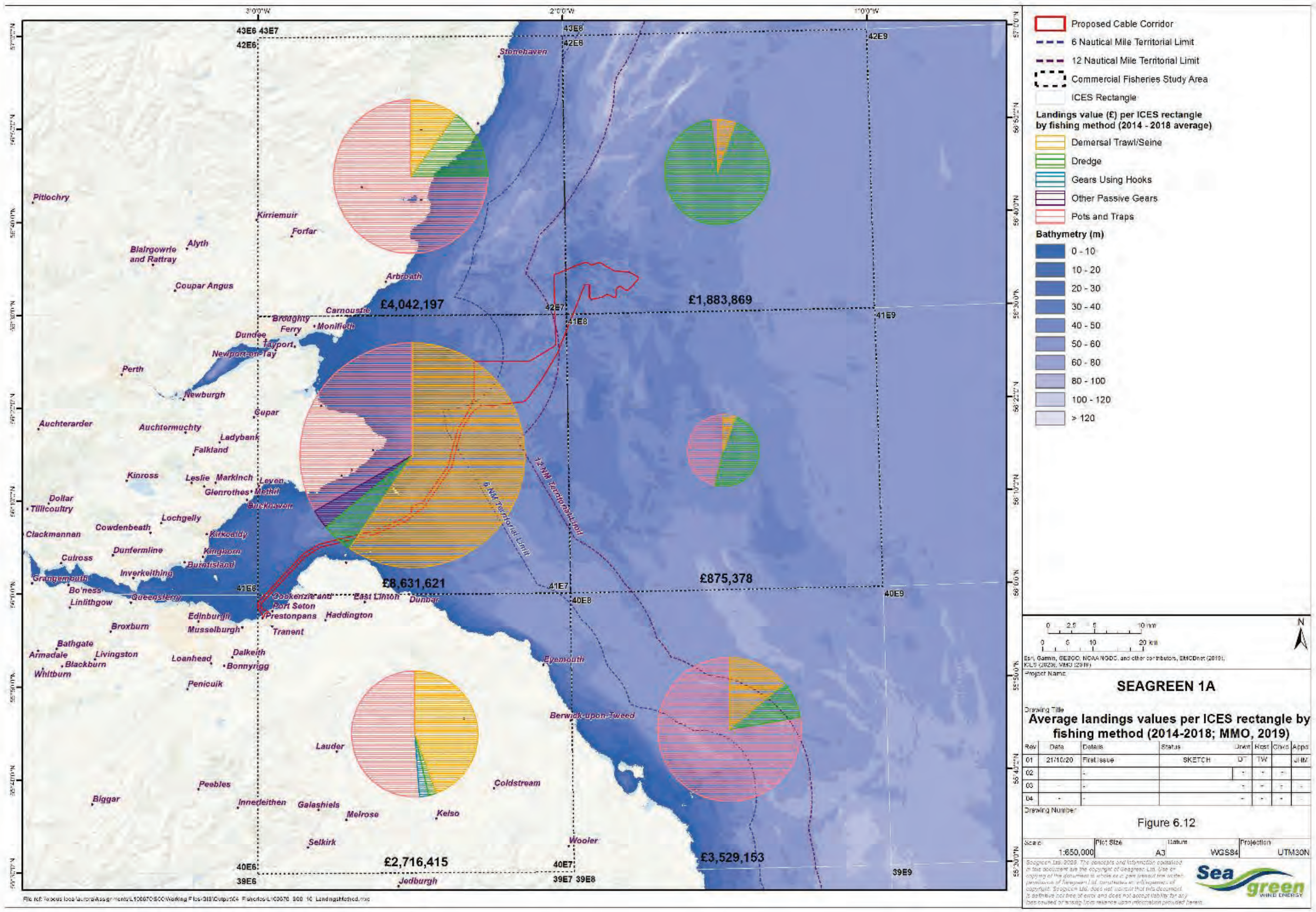

Figure 6.12 - Average landings values per ICES rectangle by fishing method (2014-2018; MMO, 2019)

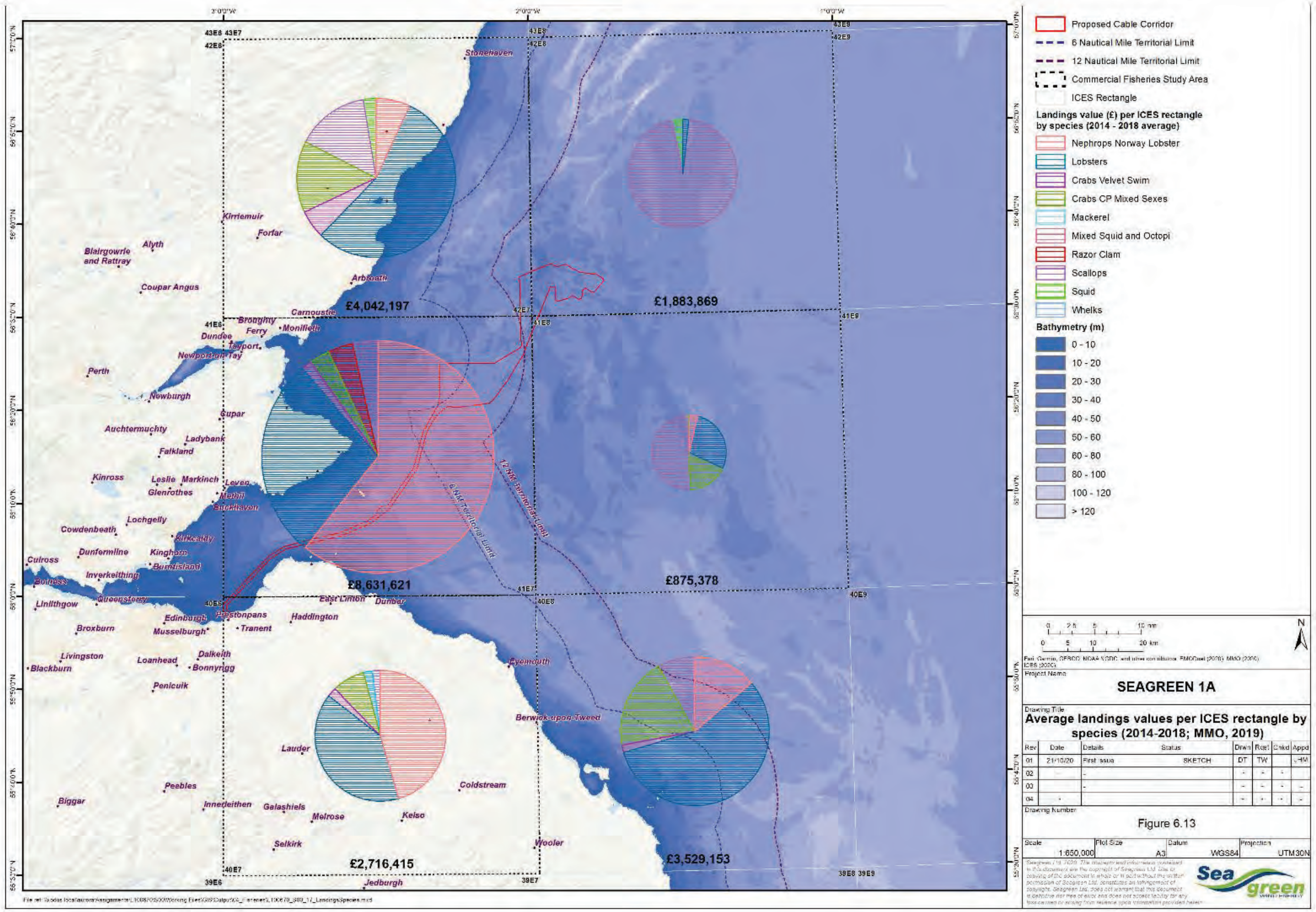

Figure 6.13 - Average landings values per ICES rectangle by species (2014-2018; MMO, 2019)

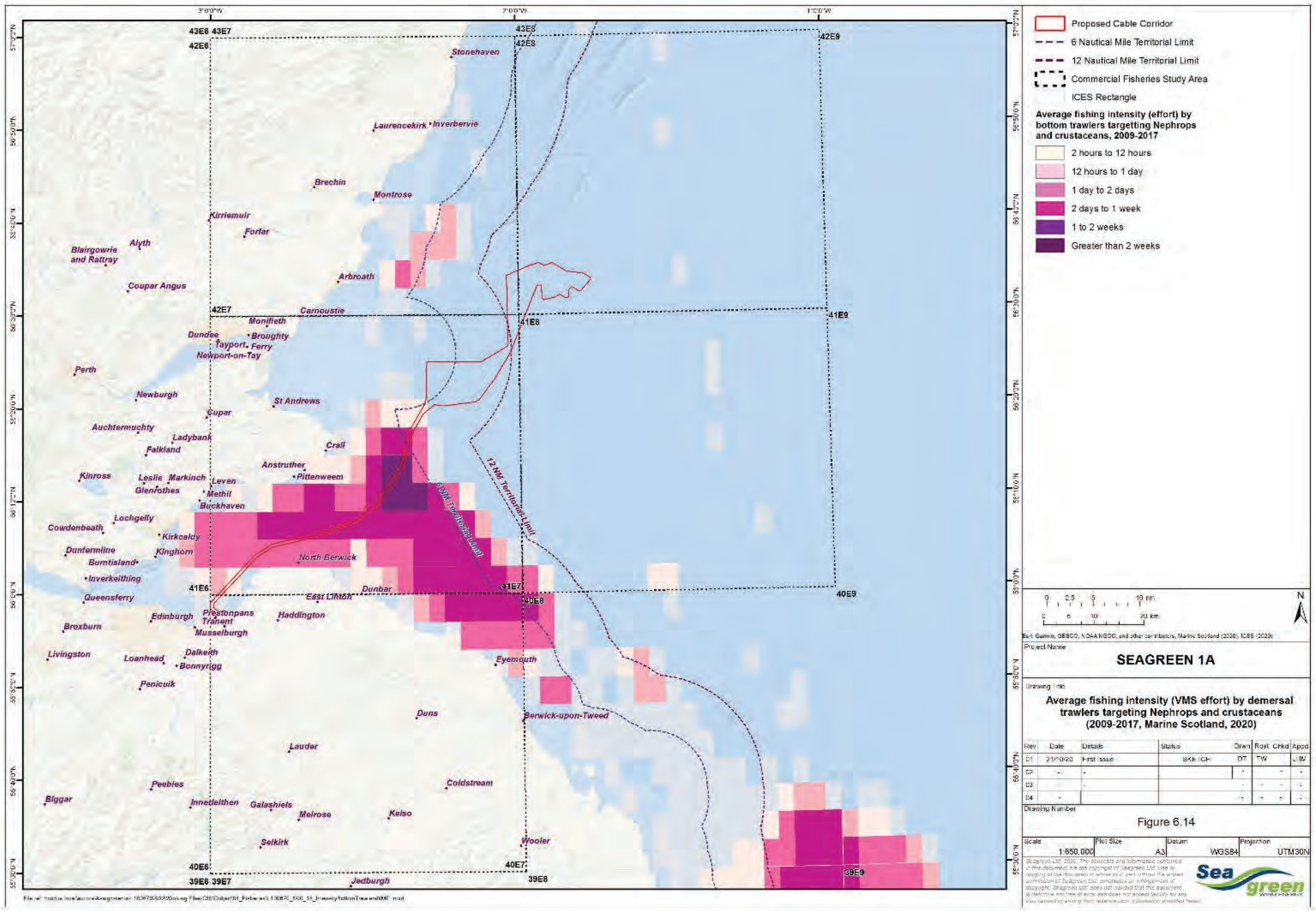

Figure 6.14 - Average fishing intensity (VMS effort) by demersal trawlers targeting Nephrops *and crustaceans (2009-2017, Marine Scotland, 2020)*

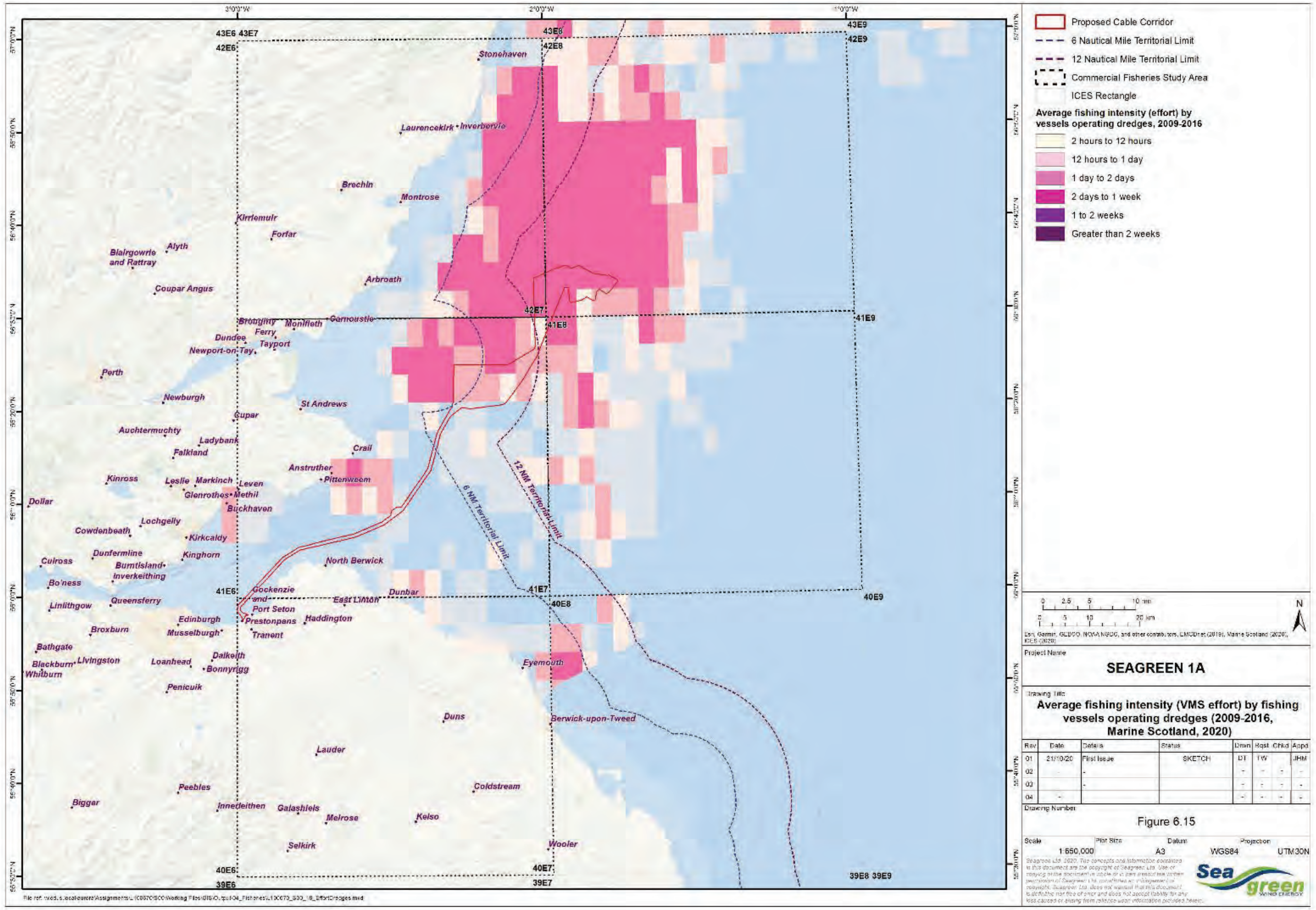

Figure 6.15 - Average fishing intensity (VMS effort) by fishing vessels operating dredges (2009-2016, Marine Scotland, 2020)

6.7.4 Mitigation and Management Measures

SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to commercial fisheries. Detailed refinements of the SG1A Project design and engineering, along with reference to guidance have allowed the identification of mitigation measures. The following additional mitigation measures are proposed to be implemented to reduce or avoid potential impacts to commercial fisheries receptors:

- Ongoing proactive consultation with the fishing industry and the appointment of a FLO;
- The development of a FMMS;
- Adherence to best practice guidance with regards to fisheries liaison (e.g. FLOWW, 2014; 2015);
- Timely and efficient distribution of Notice to Mariners (NtM), Kingfisher notifications and other navigational warnings of the location, expected duration and nature of works associated with the SG1A Project;
- The use of guard vessels, where required, for example at exposed sections of cable;
- The appointment of Offshore Fisheries Liaison Officers (OFLOs) on board SG1A contracted vessels, as appropriate;
- The development of, and adherence to, a VMP;
- All vessels will comply with the provisions of the International Regulations for the Prevention of Collision at Sea (COLREGs), including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre;
- Procedures for dropped objects, and claim processes for loss/damage to fishing gear/vessels attributable to SG1A activities;
- Notification to the UK Hydrographic Office (UKHO)/Kingfisher of the proposed works /installed cable to facilitate the promulgation of maritime safety information and updating of nautical /admiralty charts and publications;
- Production of a CBRA and Cable Plan (CaP), which will include details on the planned approach for tasks such as post-installation and cable burial inspection surveys; and
- Maximise cable burial: the SG1A Project will endeavour to bury cable following installation where possible, and it is estimated that burial will be achieved for a minimum of 80% of the SG1A ECR.

6.7.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for commercial fisheries and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence.

The majority of the commercial fishing activity which is recorded in areas relevant to SG1A Project is due to:

- Vessels operating demersal trawls to target *Nephrops;*
- Vessels operating static fishing gear to target lobster and crab; and

- Vessels operating dredges to target scallop

It is acknowledged some pathways for potential impacts to commercial fisheries receptors are present as a result of various phases of development of the SG1A Project. These pathways for potential impacts require consultation with commercial fisheries stakeholders, including vessel operators and local fisheries associations to characterise. In recognition of this, some potential impacts to commercial fisheries will be considered in an Environmental Appraisal (Table 6.14) that will be submitted to accompany the Marine Licence application. Consultation will also permit the refinement of any relevant mitigation or management measures (as detailed in Section 6.7.4) which may reduce or avoid potential impacts.

6.7.5.1 Loss or restricted access to fishing grounds

In relation to the potential impacts of temporary loss or restricted access to fishing grounds, for the construction and decommissioning phase, any effects on commercial fisheries receptors are expected to be temporary, short term (a small number of months) and localised to the maximum working width of 100m, and will be mitigated through the measures outlined in Section 6.7.4. maintenance and operation activities. This impact is anticipated to be only applicable to safety zones around installation activities with access to fishing grounds expected to resume following construction. As described in the Project Description (Section 4), the SG1A Project will involve the construction and operation of a single export cable which overlaps considerably with the proposed Inch Cape OWF export cable corridor, within which installation and operation of six export cables have previously been consented. Therefore, the presence of installation vessels, safety zones or installed infrastructure associated with SG1A will be less than the already consented cable capacity of the corridor, and any associated impacts are expected to be localised, temporary in the case of construction and minimal in the case of installed infrastructure and maintenance vessel activities. However, acknowledging the variable sensitivity of fishing fleets dependent on their fishing method and the need for consultation data this potential impact **will be considered** further within the Environmental Appraisal.

6.7.5.2 Displacement of fishing activity into other areas

There is the potential that due to the effects of the temporary loss or access (Section 6.7.5.1) to fishing grounds which may occur, fishing activity may be temporarily displaced to surrounding areas. It is assumed that this would be temporary, short term and localised due to the reasons outlined in Section 6.7.5.1. In acknowledgement for the need of larger context of fishing activity distribution, the requirement of defined assumptions and extent for this impact **will be considered** further within the Environmental Appraisal.

6.7.5.3 Interference with fishing activity

The presence and transiting of construction vessels may have the potential to cause interference with fishing activity. Interference could include fouling of static gear surface markers. The mitigation measures of continued engagement with the commercial fishing sector and the development of a VMP and CEMP will reduce the likelihood of a significant impact of interference. In addition, the number of primary construction vessels which could cause interference will be limited to two at any one time. Taking into consideration the existing environment and the findings of the Inch Cape ES (2011, 2018), Seagreen Project EIA (2011, 2018) and Neart Na Gaoithe ES (2011), which in each case predicted impacts to be not significant, this impact **will not be included** within the Environmental Appraisal.

6.7.5.4 Increased steaming times

The potential impacts described in Sections 6.7.5.1, 6.7.5.2 and 6.7.5.3 have the potential to result in changes to a chosen transit route to fishing grounds. However, in consideration of the maximum working width of 100m, along with the temporary nature of any construction activities or presence of construction vessels, any adjustments to transit routes or steaming times required to access fishing grounds is expected to be negligible. Taking into account the findings of the Inch Cape ES (2011, 2018), Seagreen Project EIA (2011, 2018) and Neart Na Gaoithe ES (2011), which in each case predicted impacts to be not significant, this impact **will not be included** within the Environmental Appraisal.

6.7.5.5 Safety issues for fishing vessels, including allision and collision and potential for snagging with project infrastructure

The safety issues associated with fishing activity in terms of potential risk of gear snagging and the manoeuvrability of vessels is given below. Safety risks associated with potential for collision with construction vessels and allision with project infrastructure are addressed in Section 6.8 Shipping and Navigation.

Pre-construction, Seagreen 1A will undertake a cable burial risk assessment when ground investigation results are available. This will determine the appropriate target cable burial depth to achieve sufficient protection of cables from any activity which crossed the SG1A Project which may pose a risk to cable integrity, including scallop dredging and trawling for *Nephrops*. The estimated minimum burial depth has been assigned at this stage to be between 1 and 3 m. Seagreen 1A will endeavour to maximise burial depth and has estimated this will be achieved for 80% of the SG1A ECR. In cases where burial is not possible, for example due to unsuitable ground conditions, cable protection, such as rock placement will be used. Cable burial depths and any protection measures will be confirmed post installation, and within the CaP to assist fishing vessel skippers in their individual assessments in respect of fishing over the cable. It is expected that any rock placement will be in line with industry standards in its composition and design which have been accepted and developed in consultation with fisheries representatives. It should be noted, however, that safety zones will be in place around construction works. In addition, in instances where sections of cables are exposed, a full protocol will be initiated, including distribution of the nature and location of the exposure to fisheries stakeholders and applied recommended safety zones. Based on the above, but in acknowledgment of the potential magnitude of this impact, safety issues for fishing vessels **will be considered** within the Environmental Appraisal.

6.7.5.6 Impacts to commercially exploited species

The potential impacts to commercially exploited fish and shellfish species have been identified and the subsequent recommendations for further assessment have been provided in Section 6.4.5. As described, based on the highly localised and temporary nature of all activities associated with the SG1A Project which may affect commercially exploited species, it is not expected that potentially significant impacts will occur to commercially exploited species during any phase of the SG1A Project, therefore this impact **will not be included** within the Environmental Appraisal.

A summary of the potential impacts associated with commercial fisheries have been summarised in Table 6.14.

Table 6.14 - Summary of the characteristics of potential impacts to commercial fisheries receptors associated with SG1A

Potential impact	Relevant phase of Project			To be included in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Temporary loss or restricted access to fishing grounds	✓	✓	✓	Yes
Displacement of fishing activity into other areas	✓	x	✓	Yes
Interference with fishing activity	✓	x	✓	No
Increased steaming times	✓	X	X	No
Safety issues for fishing vessels, including allision and collision and potential for snagging with project infrastructure	✓	✓	✓	Yes
Impacts to commercially exploited species	✓	✓	✓	No (Section 6.4.5)

6.7.5.7 Cumulative Impacts

It is assumed that all potential impacts which are considered within the Environmental Appraisal in relation to construction phase, will also be considered for cumulative effects with other developments, in line with the approach set out in Section 0. The projects or activities which are included in the cumulative assessment may vary depending on the fishery under consideration (e.g. depending on the extent of grounds and operational range of the vessels involved).

6.7.6 Conclusions and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to commercial fisheries receptors is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

However, as presented above in Table 6.14, some impacts will be considered in further detail in support of the Marine Licence application. Further consideration of the following potential impacts will be included in the Environmental Appraisal:

- Temporary loss or restricted access to fishing grounds;
- Displacement of fishing activity to other areas; and
- Safety issues for fishing vessels.

On the basis of the localised and temporary nature of the proposed works during installation of the SG1A Project, the relatively small proportion of commercial fishing grounds which the operational SG1A cable will occupy and the extensive industry accepted mitigation that will be implemented, no potentially significant impacts are likely to occur to commercial fisheries receptors either from the project in isolation or when considered cumulatively with other plans or projects.

The proposed approach for considering potential impacts to commercial fisheries within the Environmental Appraisal will be defined following receipt of the screening opinion, initial consultation responses and discussions with MS-LOT.

6.7.6.1 Environmental Appraisal Data Sources

In addition to the data sources listed in Section 6.7.1, the following sources will be used to inform further development of the commercial fisheries baseline during production of the Environmental Appraisal:

- Data collected during consultation with commercial fisheries stakeholders;
- MMO VMS data;
- Automatic Information System (AIS) data on commercial fishing vessel tracks;
- Best practice guidance from the Fisheries Liaison Offshore Wind and Wet Renewables group (FLOWW, 2014; FLOWW, 2015);
- Best practice guidance for fishing industry financial and economic impact assessments (UK Fisheries Economics Network (UKFEN), 2012);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010); and
- Fishing and Submarine Cables - Working Together (International Cable Protection Committee (ICPC), 2009).

6.8 Shipping and Navigation

This section provides a description of the shipping and navigation baseline and characterises any potential impacts which may affect shipping and navigation receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

6.8.1 Key Data Sources

The following data sources have been used to inform the shipping and navigation section of this Screening Report:

- Two months of AIS data from July and December 2019, covering seasonal variation;
- Admiralty Charts 734, 735, 1407;
- UKHO Admiralty Sailing Directions; North Sea (West) Pilot NP54 (UKHO, 2016)

AIS equipment is required to be fitted on all vessels of 300 Gross Tonnage (GT) and upwards engaged on international voyages, cargo vessels of 500 GT and upwards not engaged on international voyages, and passenger vessels irrespective of size, built on or after 1st July 2002. All European Union (EU) registered fishing vessels of length 15m and above are required to carry AIS equipment by EU Directive. Smaller fishing vessels (below 15m) as well as recreational craft are not required to carry AIS. It is also noted that military vessels are not obligated to broadcast on AIS at all times. Therefore, these vessels (e.g. fishing, recreational and military vessels) will be under-reported within the AIS data; however, it is noted that smaller vessels are increasingly observed to utilise AIS voluntarily, given the associated safety benefits.

6.8.2 Study Area

For the baseline vessel traffic analysis, a study area was defined to cover an area of 5 nautical miles (nm) around the SG1A Project, cropped to the coastline. This is considered sufficient to characterise the shipping activity and navigational features close to the SG1A Project and to encompass any vessel traffic that may be impacted by the cable and associated operations. Where appropriate, the 5nm buffer has been extended to consider navigational features outside the study area that may impact vessel activity. The study area is presented in Figure 6.16.

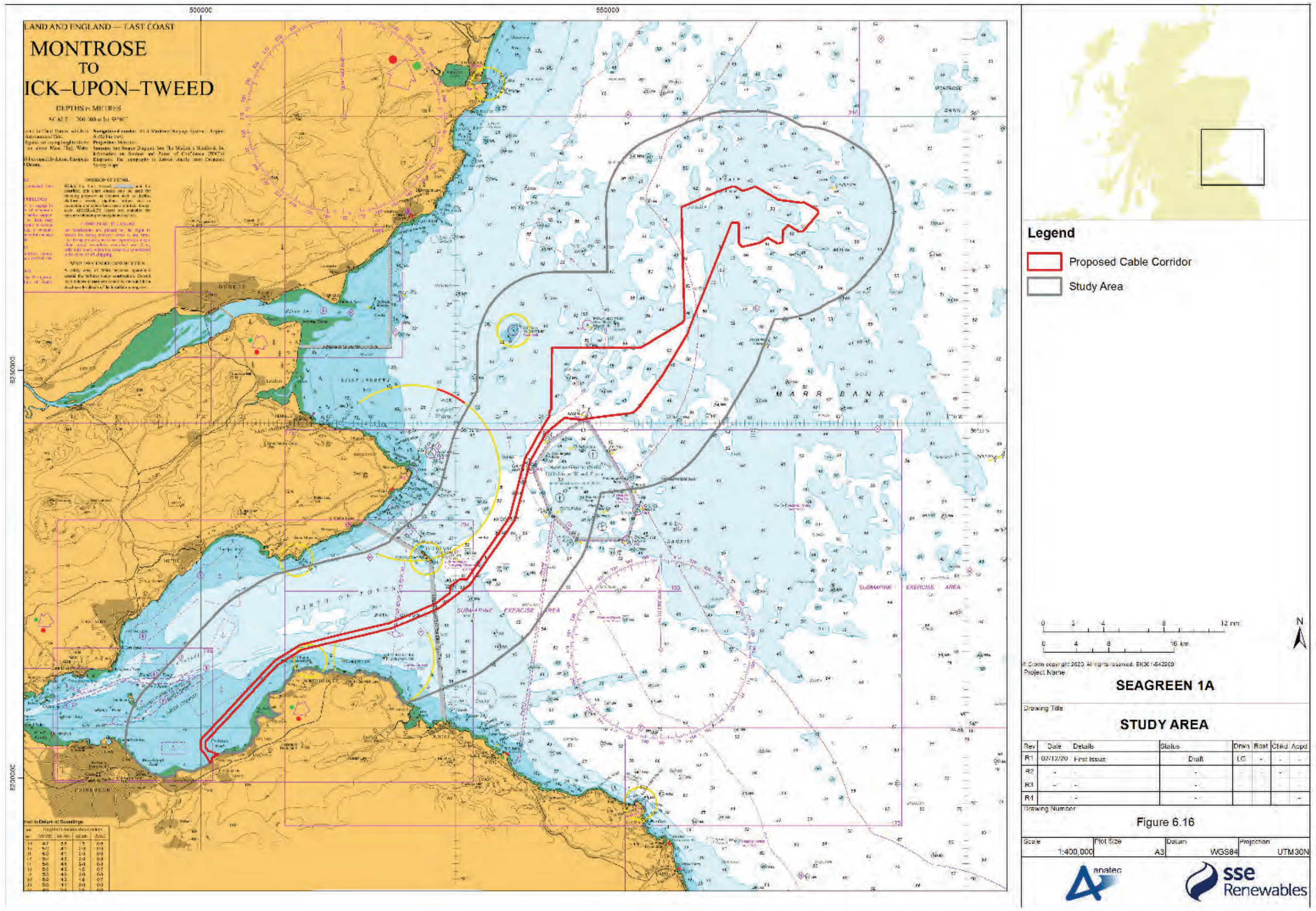

Figure 6.16 Study Area in relation to Shipping and Navigation

6.8.3 Baseline Description

6.8.3.1 Navigational Features

This section identifies the key navigational features in the vicinity of the SG1A Project, which have been identified via a review of Admiralty charts and the local UKHO Admiralty Sailing Directions as per Section 0.

There are two charted ammunition dumping grounds (disused) approximately 1km north of the SG1A Project. There is also a foul area located approximately 4nm north of the SG1A Project, on the western side of the Isle of May. Vessels are cautioned from anchoring or fishing within this area due to the existence of foul area and obstructions on the seabed.

A number of designated anchorage areas and anchor berths are located in the Firth of Forth and along the east coast of Scotland, one of which intersects the SG1A Project. Two anchorages are located south of the ECR at Firda (approximately 1nm from the ECR) and Craigleith (approximately 1.3nm from the ECR).

Neart na Gaoithe is the closest wind farm site in proximity to the SG1A Project, located 200m to the south. The Inch Cape development area is located 600m north of the SG1A Project. The SG1A Project is adjacent to the consented (but not yet constructed) Inch Cape Offshore Wind Farm cable corridor route to minimise disturbance across the Forth and Tay area.

The SG1A Project intersects a number of Ministry of Defence (MoD) practice and exercise areas (PEXA), including submarine exercise and firing practice areas. No restrictions are placed on the right to transit the firing practice areas at any time. Exercises and firing only take place when the areas are considered to be clear of all shipping.

Leith approach channel is located approximately 3nm north of the SG1A Project. Leith approach channel from Leith approach buoy to the entrance lock is maintained at a dredged depth of 6.71m below Admiralty chart datum. The Forth Deep Water Channel which runs through the North Channel is approximately 4nm north of the SG1A Project.

Within the area are the ports of Leith, Rosyth and Grangemouth, the oil terminal at Hound Point and the gas terminal at Braefoot. The Forth ports handle about 5,000 vessel movements and over 48 million tonnes of cargo annually. The most important commodities are oil, petro-chemicals and liquefied gases, which pass through the port of Grangemouth and the two marine terminals at Hound Point and Barefoot. There is also considerable trade in cargo and containers through Grangemouth. Port Edgar lies in proximity to the ECR and accommodates a yacht marina administrated by City of Edinburgh Council.

Forth Ports Limited exercises jurisdiction over all the waters of Firth of Forth and the River Forth. Approximately 31km of the ECR lies within the limit of authority of Forth Ports Ltd.

A Vessel Traffic Service (VTS) scheme, The Forth and Tay Navigation Service, with full radar and AIS surveillance, is operated from Grangemouth.

There are 5 pilot boarding areas in proximity to the SG1A Project. Pilotage is compulsory within the Forth area for:

- Vessels carrying 12 or more passengers;
- Vessels of 45m or more bound for the North Channel and Forth Deep Water Channel;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 80m or more bound for the Leith Channel;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Methil;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Kirkcaldy.

There is one gas pipeline that intersects the SG1A Project, stretching across the mouth of the Firth of Forth. Anchoring is prohibited within an area covering approximately 1nm either side of this pipeline.

Based on admiralty charts of the Forth and Tay area, the locations of wrecks in the vicinity of the SG1A Project have been identified.

A plot of the navigational features is presented in Figure 6.17.

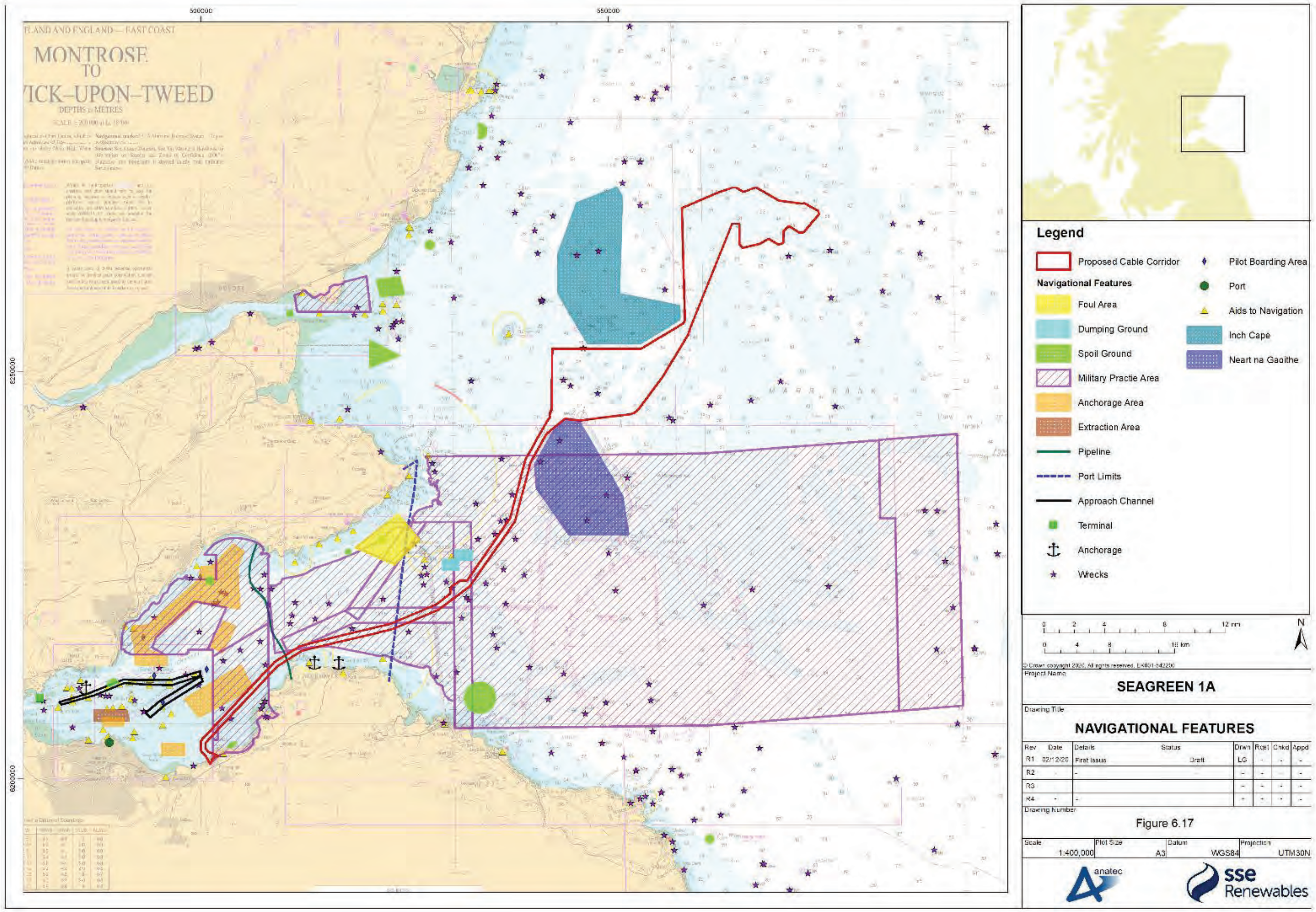

Figure 6.17 Navigational Features

6.8.3.2 AIS Analysis

A total of two months AIS data from 2019, one month in summer (July 2019) and one month in winter (December 2019), was analysed. 2019 data has been used as vessel numbers have been noted to significantly reduce during 2020 due to the Covid-19 pandemic and the 2019 data is therefore considered to be more representative of shipping activity.

An overview plot of the vessel tracks, colour-coded by vessel type, recorded within the study area for summer and winter are presented in Figure 6.19 and Figure 6.20 respectively. Figure 6.18 shows the type distributions for vessels passing within the study area during each month.

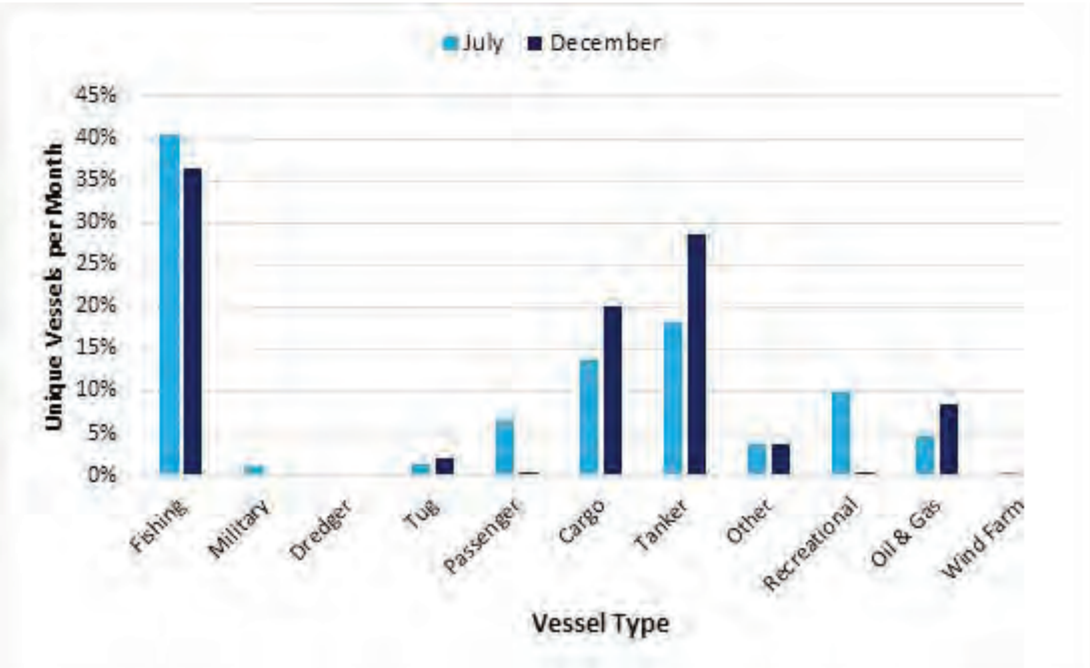

Figure 6.18 Vessel Type Distribution

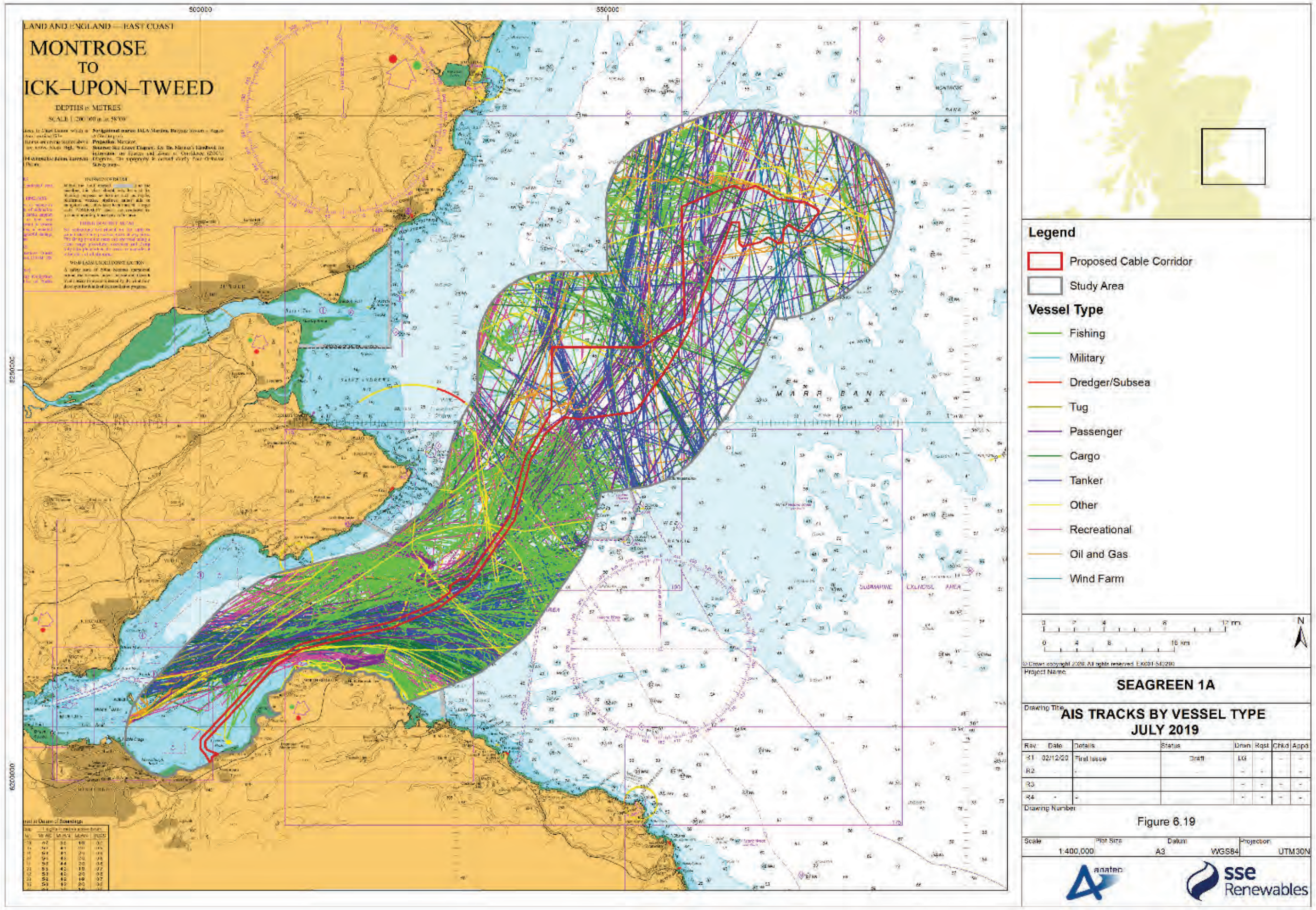

Figure 6.19 AIS tracks by vessel type in July 2019

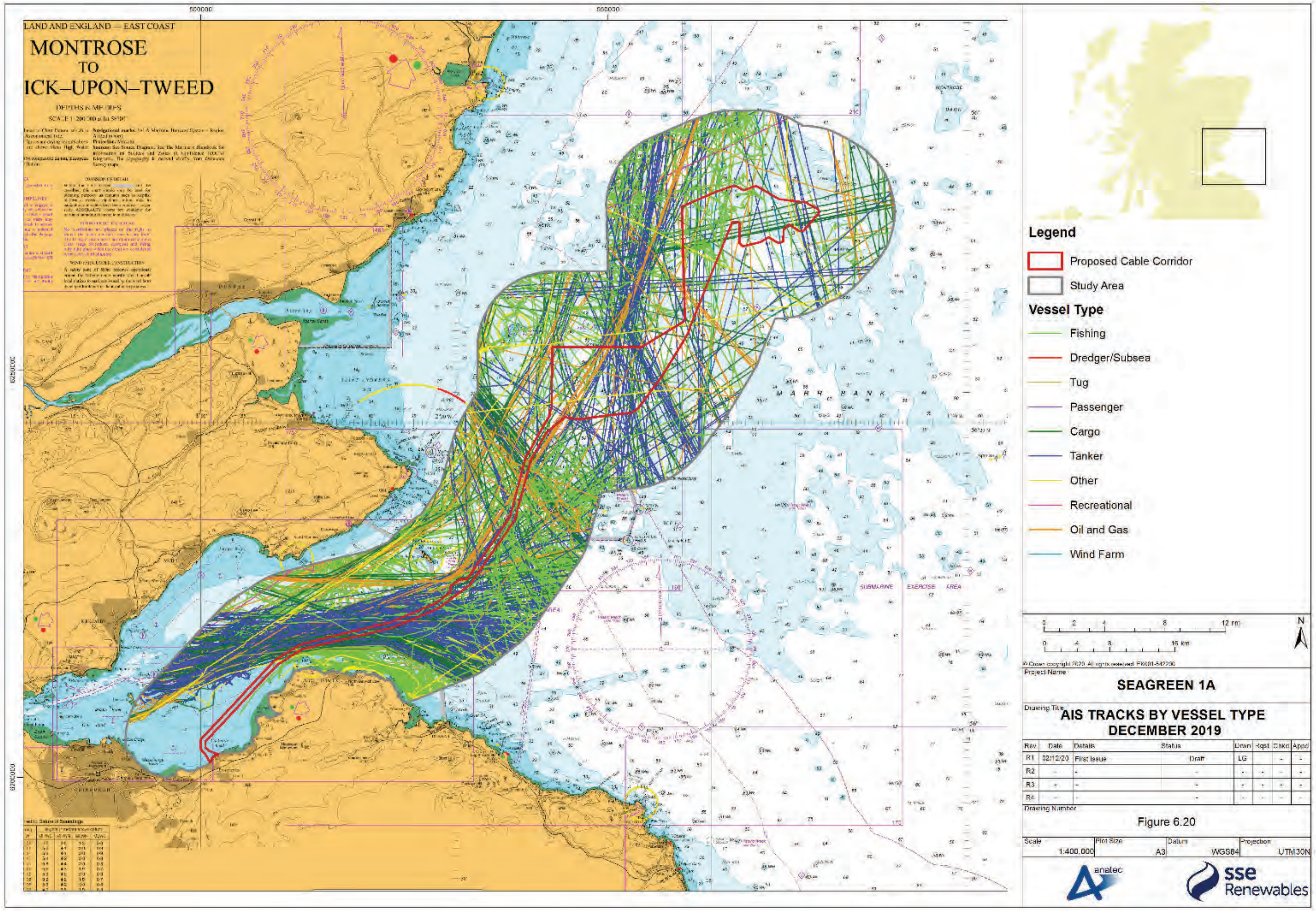

Figure 6.20 AIS tracks by vessel type in December 2019

In July, there was an average of 49 unique vessels per day recorded within the study area and an average of 25 intersecting the SG1A Project. The most common vessel types recorded during summer were fishing vessels (40%), tankers (18%) and cargo vessels (14%).

In December, there was an average of 34 unique vessels per day recorded within the study area and an average of 20 intersecting the SG1A Project. The most common vessel types recorded during winter were fishing vessels (36%), tankers (29%) and cargo vessels (20%). Vessel activity in winter was considerably lower due to a significant reduction in recreational and passenger vessels, both accounting for less than 1% of the overall distribution for the winter period.

The majority of vessels passing through the study area during the combined study periods were fishing vessels, tankers and cargo vessels. The average length of vessels passing through the study area was 61m in the summer period and 75m in the winter period. For vessels intersecting the cable corridor only, the average recorded lengths were 79m in the summer period and 89m in the winter period.

High levels of fishing activity was recorded in both the summer and winter periods. The majority of fishing vessels were found operating closer to the coast. It is noted that fishing vessels less than 15 m in length are not obliged to broadcast via AIS and as such are likely to be under-represented.

The majority of commercial (cargo and tanker) traffic within the study area was observed to be associated with Grangemouth Port and Aberdeen Harbour. As detailed in the navigational features section, the main commodities passing through the Port of Grangemouth are oil, petro-chemicals, liquified gases and containers.

The main destinations recorded by passenger vessels within the study area were Grangemouth Port, Pittenweem and Aberdeen Harbour. Passenger vessels can be seen transiting to the Isle of May and Bass Rock from destinations such as Anstruther, Dundee and Edinburgh.

The majority of recreational vessels were found operating closer to the coast. Only three unique recreational vessels were recorded during the winter period. Recreational vessels can mainly be associated with Port Edgar Marina which has a sailing school and 300 berths.

The highest density areas for both the summer and winter period can be seen in coastal waters, this can be associated with the large volume of fishing vessels transiting within the study area and tankers travelling between Pittenweem and North Berwick.

Vessel density plots for the summer and winter period are shown in Figure 6.21 and Figure 6.22 based on the number of track intersects per cell of a 500 m x 500 m grid.

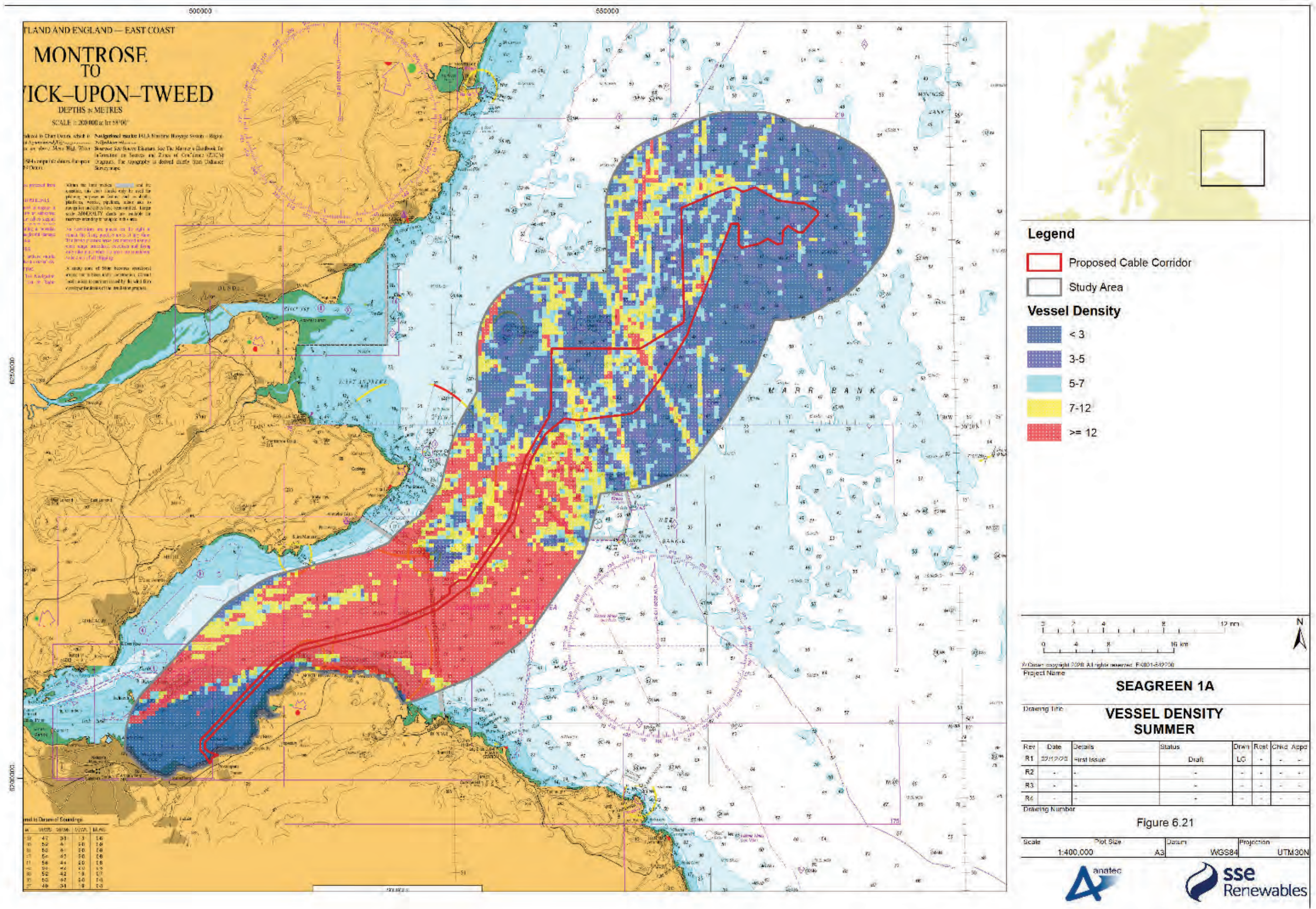

Figure 6.21 Vessel density in July 2019

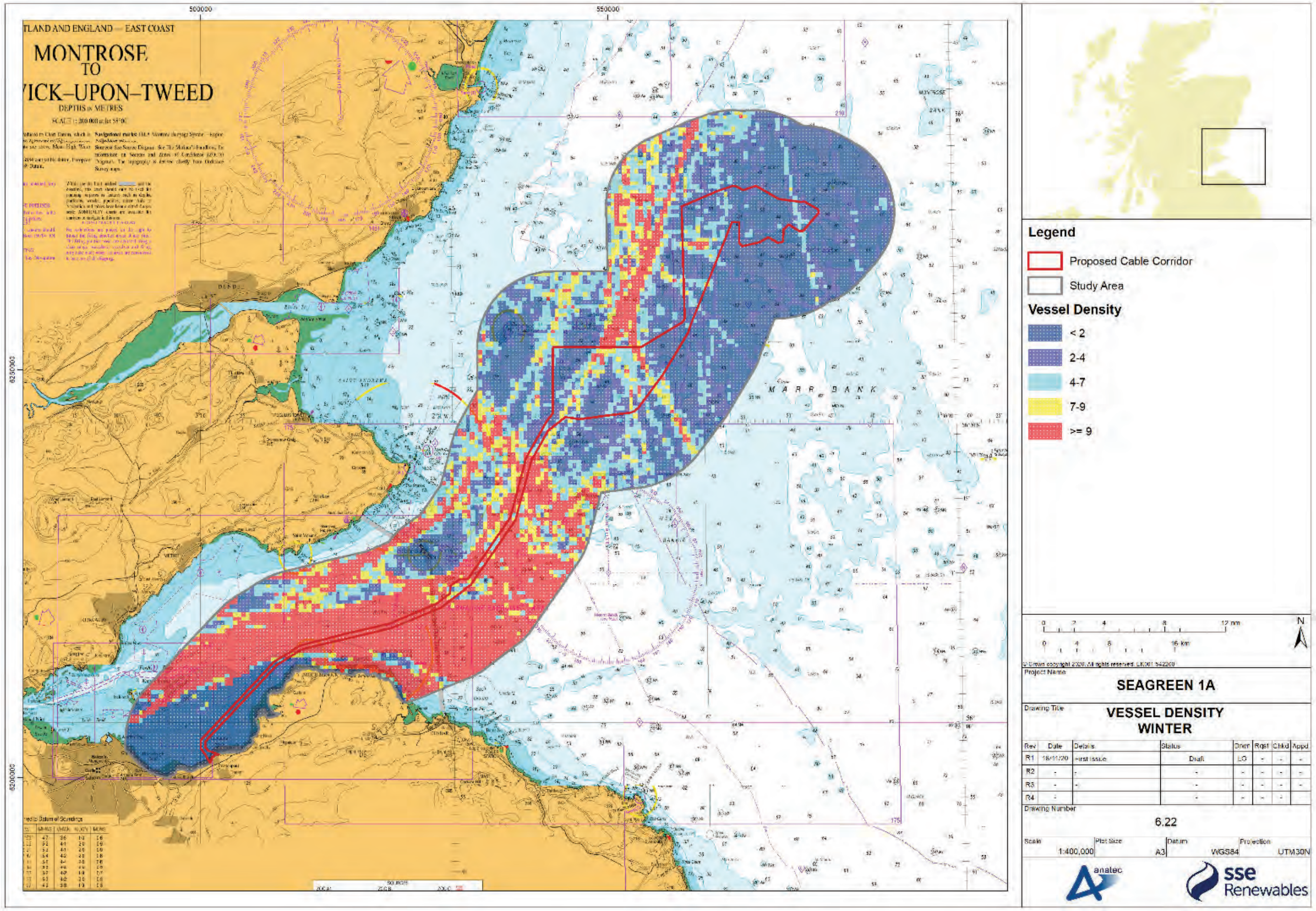

Figure 6.22 Vessel density in December 2019

6.8.3.3 Fishing Analysis

Based on the two months AIS data (July 2019 and December 2019), there are high levels of AIS tracks from fishing vessels within the study area. The AIS tracks recorded from fishing vessels during the combined two month study periods are presented in Figure 6.23. Commercial fishing activity in the vicinity of SG1A Project is detailed in Section 6.7.

It should be noted that fishing vessels below 15 m in length are not required to broadcast via AIS and thus are likely to be under-represented in the above figure. Additional satellite data (Vessel Monitoring System (VMS)) will be used in the Navigational Risk Assessment (NRA) to cover vessels 12 m and above, further validating the findings of the AIS data.

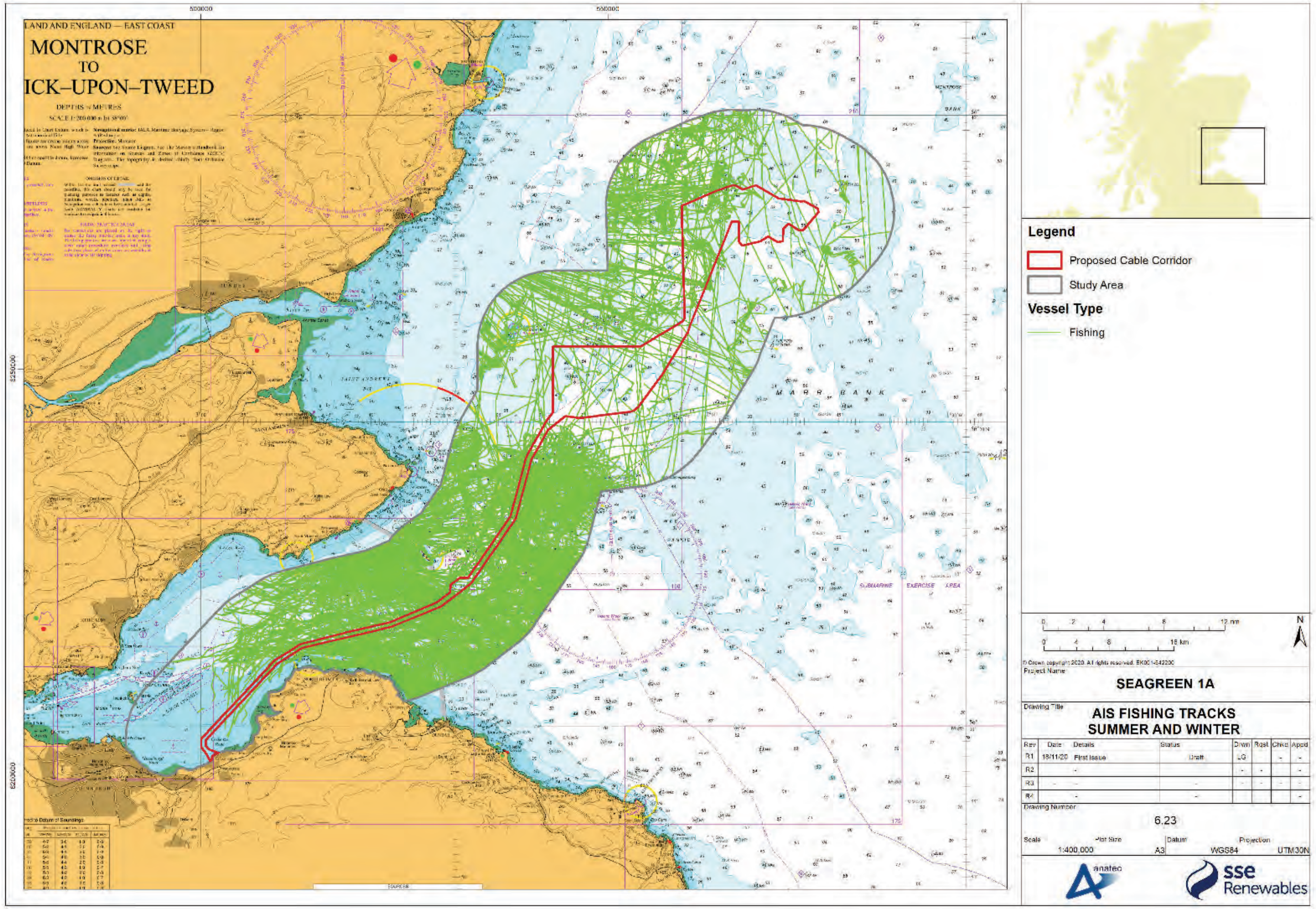

Figure 6.23 Fishing vessel AIS analysis

6.8.3.4 Anchoring Analysis

Vessels recorded at anchor within the study area, for the combined two month survey period, have been identified through the vessels' navigation status (transmitted via AIS).

The majority of anchored vessels were anchored in designated anchorage areas. A plot of anchored vessels, colour-coded by vessel type is presented in Figure 6.24.

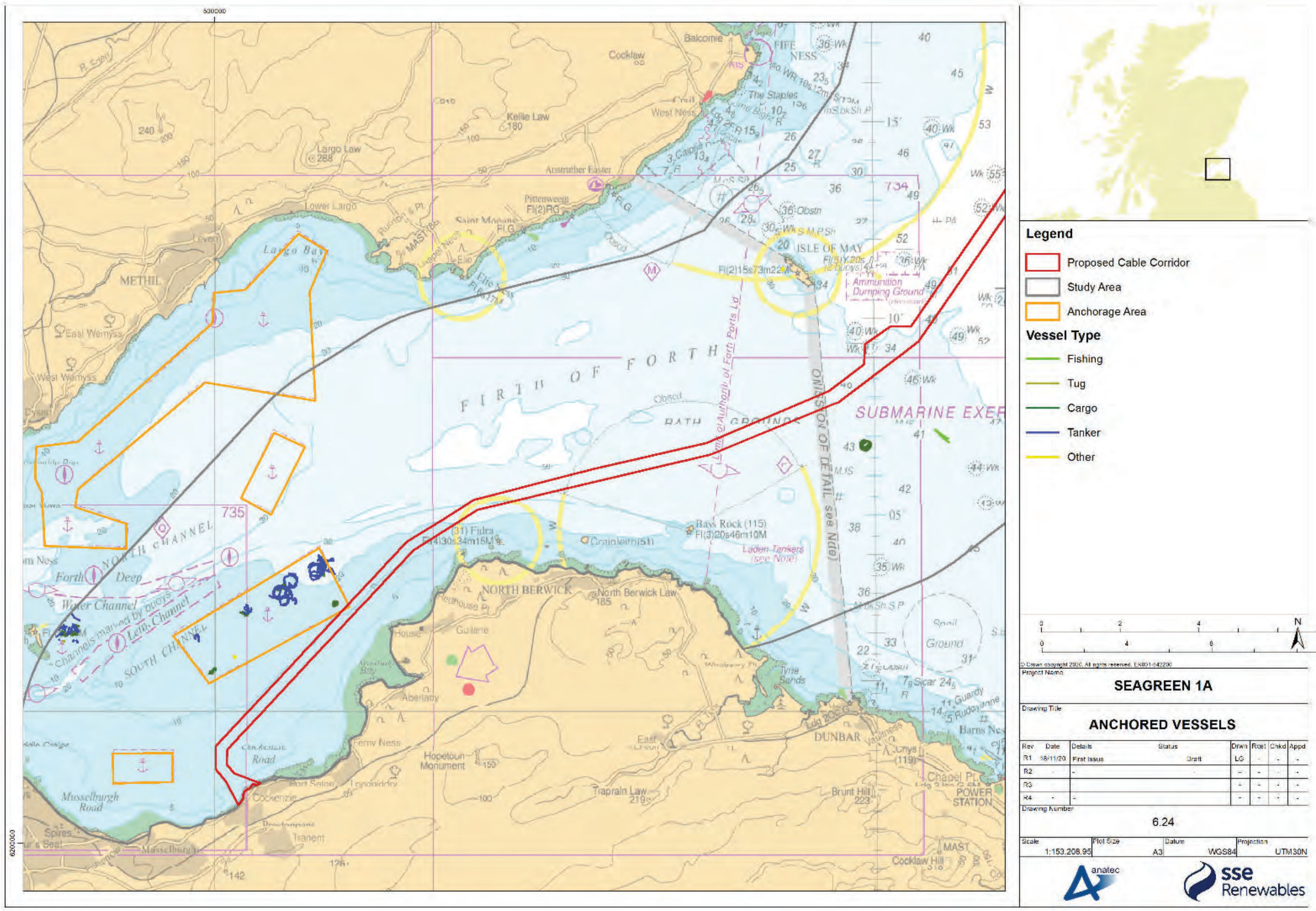

Figure 6.24 Anchored vessels

6.8.4 Mitigation and Management Measures

The SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts on shipping and navigation.

6.8.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for shipping and navigation and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence.

Following the results of the baseline review, and based on experience of other marine navigation assessments for wind farms and subsea cables, the following potential impacts have been identified for shipping and navigation receptors in relation to the SG1A Project. In line with guidance note MGN 543 (MCA, 2016) an NRA is expected to be carried out for a proposed subsea cable, and therefore SG1A will undertake a NRA to accompany the Environmental Appraisal, and to assess the potential impacts to shipping and navigation receptors.

6.8.5.1 Collision with Construction or Maintenance Vessel

An increased collision risk is created during the construction phase for all passing traffic due to the presence of the vessels associated with the construction of the cable. The nature of cable installation and other construction activities requires large, slow moving vessels which will be restricted in their ability to manoeuvre. The collision risk is likely to be greater in higher density shipping areas. The risk can be mitigated by promulgation of information about the works and minimum safe passing distances around vessels restricted in manoeuvrability. When considering the short term, temporary and localised nature of the SG1A works, any increased collision risk is anticipated to be low, however, in consideration of the need to carry out an NRA and the planned collection of additional AIS data this impact **will be considered** further within the Environmental Appraisal

A similar risk is created during the operational phase for vessels involved in maintenance works. However, this is expected to be a reduced risk than for construction vessels as maintenance works are likely to be shorter in duration. In consideration however of the need to carry out a NRA, and the planned collection of additional AIS data for use in the Environmental Appraisal, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.2 Disruption to Vessel Routeing/Timetables

During the construction phase, regular traffic will be required to alter their planned route due to the presence of construction vessels. These vessels have limited manoeuvrability and will request a minimum passing distance in which no other vessel can enter to reduce the likelihood of incidents. Since this will cause disruption to shipping activity, to mitigate this potential impact, notice to mariners should be issued on a frequent basis before and during the cable installation period. This will inform the nautical community of locations of proposed works which may require vessels to temporarily make slight diversions to avoid specific areas. Considering the temporary and localised nature of activities, any increased risk of disruption is anticipated to be low but noting the approach of obtaining additional AIS data and the need to carry out an NRA, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.3 Increase in Vessel-to-Vessel Collision Risk

The presence of construction vessels may increase the risk of a vessel-to-vessel collision, if vessels are required to deviate around the construction work. Standard mitigations including promulgation of information and compliance with COLREGS will be in place to mitigate this risk. Considering the temporary and localised nature of any increased in vessels, and the low number of construction vessels likely to be present at any one time, any increased collision risk is anticipated to be low, but noting the approach of obtaining additional AIS data and the need to carry out an NRA this impact **will be considered** further within the Environmental Appraisal.

6.8.5.4 Disruption to Fishing and Recreational Activities

Installation vessels may cause a disruption to local fishermen and recreational sailors along the ECR, particularly in coastal waters. The baseline description showed that fishing and recreational activity does occur within the study area, however, further data assessment will be undertaken as part of the NRA. It is expected that embedded mitigation such as presence of guard vessels and promulgation of information will notify sea users of construction works. Considering the temporary and localised nature of any disruption, and the low number of construction vessels likely to be present at any one time, any increased disruption is anticipated to be low, but noting the approach of obtaining additional AIS data and the need to carry out an NRA this impact **will be considered** further within the Environmental Appraisal.

6.8.5.5 Displacement of Third Party Marine Activities

The SG1A Project lies within close proximity to MoD PEXA areas (with two areas intersecting the corridors, see Figure 1.9) which have no current restrictions on the right to transit through them. Firing practice and exercises only take place when areas are considered to be clear of all shipping. However, potential impacts could include the disruption of installation activities if the timing coincides with firing practices. These potential impacts could be mitigated by on-going consultation with the MoD to determine the frequency and nature of activities so as to avoid unnecessary disruptions. Considering the temporary and localised nature of the anticipated low levels of potential displacement, and the low number of construction vessels likely to be present at any one time, but noting the approach of obtaining additional AIS data and the need to carry out an NRA this impact **will be considered** further within the Environmental Appraisal.

6.8.5.6 Vessel drags anchor over cable

There is a risk to the cable during the operational phase from vessels dragging anchor (due to poor holding ground or bad weather).Vessels were noted to anchor close to the cable and a wider anchoring assessment within the NRA will determine the extent and positions of anchoring activity near the cable. Mitigation measures include marking of the cable on Admiralty Charts and suitable protection of the cable, such as burial or rock dump.During the operational phase, interaction between anchors and cables will depend on the cable protection. Therefore, a CBRA study will need to be undertaken (at the appropriate stage), taking into account the seabed sediment characteristics and external risks to determine optimal burial depths and additional protection methods if deemed necessary. Considering the highly localised nature of the operational SG1A export cable, but noting the approach of obtaining additional AIS data and the need to carry out an NRA, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.7 Vessel anchors in an emergency over cable

Due to the high level of shipping which will cross over the cable route on a daily basis and the size of vessels that regularly transit the Firth of Forth, an anchor dropped accidentally, in an emergency or negligently, may pose a risk to the cable.

A wider anchoring assessment within the NRA will determine the volume of vessels passing over the cable that might present a risk of emergency anchoring.

Mitigation measures include marking of the cable on Admiralty Charts and suitable protection of the cable, such as burial or rock dump.

During the operational phase, interaction between anchors and cables will depend on the cable protection. Therefore, a CBRA study will need to be undertaken (at the appropriate stage), taking into account the seabed sediment characteristics and external risks to determine optimal burial depths and additional protection methods if deemed necessary. Considering the highly localised nature of the operational SG1A export cable, but noting the approach of obtaining additional AIS data and the need to carry out an NRA, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.8 Fishing gear snagging

The baseline assessment showed that fishing activity does occur within the study area, however further data assessment will be required as part of the NRA to identify fishing levels and gear types in operation near the cable.

The charted presence of the cable should dissuade fishing activity to some extent, however previous experience suggests some vessels may continue to fish over installed cables, and there is therefore still a snagging risk during the operation and maintenance phase. It is noted that penetration of fishing gear is limited, and that this will therefore not necessarily lead to interaction, assuming the cable is suitably monitored and maintained.

This risk of snagging will be mitigated by clear marking of the cable on Admiralty Charts and suitable protection of the cable. Considering the highly localised nature of the operational SG1A export cable, but noting the approach of obtaining additional AIS data, further information on commercial fishing gears and activity levels, and the need to carry out an NRA, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.9 Reduction in under keel clearance resulting from laid cable and associated protection

The cable, and associated protection, may lead to a reduction in under keel clearance. It should be ensured that the relevant policy guidance is followed. Considering the highly localised nature of the operational SG1A export cable, along with the expectation of maximising burial of the SG1A export cable where possible, but noting the relevant guidance, proposed approach of obtaining additional AIS data and the need to carry out an NRA, this impact **will be considered** further within the Environmental Appraisal.

6.8.5.10 Interference with Marine Navigational Equipment

The electromagnetic field created by buried direct current cables has the potential to create interference on a vessel's magnetic compass, in particular on smaller recreational vessels, as such vessels may lack more sophisticated navigational equipment on-board. As previously discussed, the installed single SG1A cable will be buried where possible and protected by a minimum of 1m of protection elsewhere, and so the expected EMFs emitted by the operational cable are expected to be minimal (as discussed in Section 6.4.3.5 and 6.6.5.3). In light of the proposed approach of obtaining further AIS data and consultation, this impact **will be considered** further within the Environmental Appraisal.

Table 6.15 summarises the impacts that will be considered further within the Environmental Appraisal that will accompany the SG1A Project Marine Licence application.

Table 6.15 Summary of the characteristics of potential impacts to shipping and navigation receptors associated with SG1A Project

Potential impact	Relevant phase of Project			To include in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Collision of a passing (third party) vessel with a vessel associated with cable installation, maintenance or decommissioning	✓	✓	✓	Yes
Cable installation / decommissioning causing disruption to passing vessel routeing/timetables.	✓	x	✓	Yes
Increase in the risk of a vessel-to-vessel collision due to construction / decommissioning vessel activity	✓	x	✓	Yes
Cable installation / decommissioning causing disruption to fishing and recreational activities.	✓	x	✓	Yes

Potential impact	Relevant phase of Project			To include in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Cable installation / decommissioning causing disruption to third party marine activities (military, dredging)	✓	x	✓	Yes
Vessel drags anchor over the cable	x	✓	x	Yes
Vessel anchors in an emergency over the cable	x	✓	x	Yes
A vessel engaged in fishing snags its gear on the cable	x	✓	x	Yes
Reduction in under keel clearance resulting from laid cable and associated protection	x	✓	x	Yes
Interference with Marine Navigational Equipment	x	✓	x	Yes

6.8.5.11 Cumulative Impacts

The nearby developments considered for cumulative impacts assessment have been outlined in Section 0, Table 6.15. Cumulative impacts will be considered within the Navigational Risk Assessment that will be undertaken as part of the Environmental Appraisal.

6.8.6 Conclusions and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to shipping and navigation is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

The potential impacts on shipping and navigation arising from SG1A Project are not expected to be significant. It is considered that the installation of an additional single offshore export cable, which will involve temporary and short-term construction activities and the associated low levels of vessel activity required for SG1A Project (Table 4.1) will not give rise to any potential impacts either project alone or cumulatively. As discussed in Section 6.8.5, although there are not anticipated to be any significant risks associated with shipping and navigation, in light of the potential safety risks associated with several of the potential impacts identified for shipping and navigation receptors, the need for additional collection of further AIS data to develop a fully comprehensive resource and in consideration of the guidance and legislation for this topic, all the identified impacts **will be considered** further within the Environmental Appraisal.

In addition, in line with guidance note MGN 543 (MCA, 2016) an NRA is expected to be carried out for a proposed subsea cable, and therefore SG1A will undertake a NRA to accompany the Environmental Appraisal, and to assess the potential impacts to shipping and navigation receptors. This will use additional AIS data (12 months) and other sources (defined below) to define the baseline and will include consultation to verify desk-based data sources and fill in any gaps in information. Consultation will also be required to verify that there are no conflicts in the cable corridors with other marine users. Hazards will be identified and ranked and quantified where appropriate to inform the level of impact during construction, operation / maintenance and decommissioning with appropriate mitigation measures identified.

The proposed approach for considering potential impacts to shipping and navigation within the Environmental Appraisal will be defined following receipt of the screening opinion, initial consultation responses and discussions with MS-LOT.

6.8.6.1 Environmental Appraisal Data Sources

The primary input to the NRA will be 12 months of up-to-date marine traffic survey data, taking into account seasonal variations.

Additional data and information sources that will be reviewed include:

- Up to date hydrographic charts for the area
- Maritime incident data in the area (20 years)
- RYA coastal atlas and reference materials such as sailing almanacs
- Environmental statement studies for developments in close proximity
- Fishing vessel activity data (AIS and VMS satellite data)

6.8.6.2 Consultees

During the NRA, consultation with key navigational stakeholders in UK waters will be undertaken in order to obtain supplementary information. Parties consulted will include:

- Maritime and Coastguard Agency (MCA)
- Northern Lighthouse Board
- Chamber of Shipping
- Cruising Association
- Royal Yachting Association Scotland
- Forth Ports
- Scottish Fishermen’s Federation (SFF)
- Ministry of Defence

6.9 Marine Archaeology

This section provides a description of the marine archaeology baseline and characterises any potential impacts which may affect marine archaeology receptors during construction, operation and maintenance and decommissioning phases of the SG1A Project.

6.9.1 Key Data Sources

The key sources used to inform the marine archaeology section include:

- The Historic Environment and Cultural Heritage section on the Marine Scotland Information website, http://marine.gov.scot/themes/historic-environment-and-cultural-heritage [accessed 16-17/11/2020].
- Statutory lists, registers and designated areas, including List of Designated Wrecks and Historic Marine Protected Areas;
- UKHO wreck register and relevant nautical charts;
- The EIAs for offshore windfarms and transmission infrastructure in the Forth – Tay area (Inch Cape, 2011; 2018; Neart na Goaithe, 2012; Seagreen, 2012); and
- Other readily available website databases and publications were consulted for information and, where used, are cited in the text.

6.9.2 Study Area

The study area for marine archaeology (see Figure 1.1) comprises the SG1A Project area split into three distinct areas:

- Between Inch Cape and Seagreen Project;
- South of Inch Cape and north of Neart na Gaoithe offshore wind farms; and
- Where the western boundary of the SG1A Project extends out with the Inch Cape export cable corridor.

The remaining SG1A ECR to landfall has been excluded from the marine archaeology study area because the route design overlays that of the consented Inch Cape export cable corridor, for which an assessment has already been undertaken, and no significant impacts were predicted after mitigation.

6.9.3 Baseline Description

6.9.3.1 Statutory Designations

No marine cultural heritage statutory designations are present within the study area. However, if the Phantom jet (Section 6.9.3.4) or any other military aircraft are discovered, they would automatically fall under the Protection of Military Remains Act 1986 (PoMRA).

6.9.3.2 Submerged Prehistoric Archaeology and Landscapes

No evidence of prehistoric remains or submerged palaeolandscapes is known from the study area, partly at least due to a lack of data. Current research indicates that there is potential for submerged Holocene sediments and prehistoric remains to survive in this part of the North Sea, but the chances of survival are low for remains of moderate or higher importance (Bicket and Tizzard 2015; Dawson *et al* 2017; Flemming 2004; Sturt 2013).

However, the archaeological analysis of the geotechnical (borehole, Cone Penetrometer Tests and vibrocore logs) and geophysical surveys (bathymetry and sub-bottom profiling) conducted for the Seagreen Project (Seagreen, 2012) identified no organic sediments of any palaeoenvironmental interest, no relict land surfaces and no prehistoric remains. There were similar results from the geotechnical and geophysical datasets for the Neart na Goaithe Offshore Wind Farm (Neart na Goaithe, 2012), and the Inch Cape export cable area immediately south of the OWF boundary (Inch Cape, 2018), which covers part of the same area as the SG1A Project. Only three cores from close to the Lothian coastline, where the Inch Cape route and the proposed SG1A ECR are the same, were of high interest, containing definite organic material.

Therefore, the potential for the discovery of palaeoenvironmental evidence in the study area appears negligible and there is limited potential for residual artefacts in marine sediments.

6.9.3.3 Shipwrecks

Coastal archaeological evidence suggests exploitation of the marine environment in the North Sea for fishing and transport purposes from prehistoric times. There are many trading and fishing ports along the east coast of Scotland, and shipping along this coast and across the North Sea is well documented from the medieval period onwards (Wessex 2012). Therefore, there is a high probability for unknown, unrecorded vessels to have sunk in the general area over the centuries, although the likelihood of encountering wrecks dating before the 18th century is low (op. cit.). There are a significant number of known maritime losses from the 19th and 20th centuries, aircraft as well as vessels, with unknown or arbitrary locations in the wider Forth and North Sea basin. Therefore, there is a moderate potential for the discovery of unrecorded assets.

Appendix C provides an overview of known marine cultural heritage losses that may be or are known to be in the study area from the data sources listed in Section 6.9.1. Those with verified locations are plotted on Figure 6.25, as are losses that have been assigned locations that are unverified and may be in the study area. Without further investigation, wrecks of unknown identity must be considered of unknown importance. Dead wrecks (a UKHO term for located wrecks that have not been found on later surveys) should be considered as still potentially present.

Whilst some vessels in the study area were sunk by torpedo during wartime, their crews were all saved except for the SS *Avondale Park*. None of the vessel types or cargoes are of significant importance.

The reviews of geophysical survey datasets (sidescan sonar, magnetometry, multibeam echo sounding and swath bathymetry) collected for the Seagreen Project, Neart na Goaithe and Inch Cape developments identified anomalies or targets on the seabed in all development areas. All identified targets of high or moderate potential, some of which could be related to known sites, others not, including sites of high importance such as submarines. Therefore, along with the assets identified by these surveys, there is known potential for the survival of heritage assets on the seabed of the SG1A Project that fall outwith the Inch Cape Export Cable geophysical survey area.

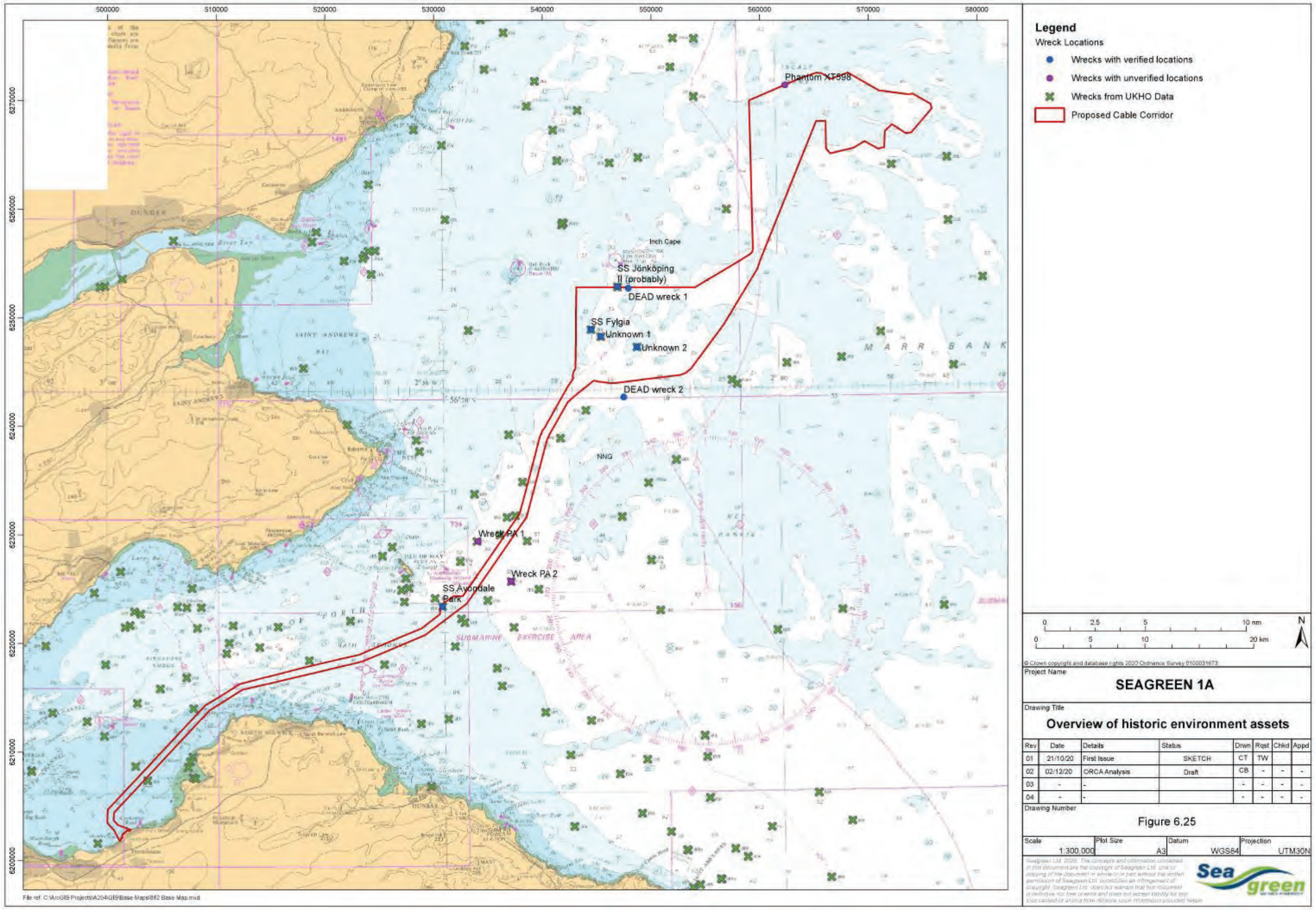

Figure 6.25 Marine Cultural Heritage Loss Locations

6.9.3.4 Aircraft

There is one aircraft potentially lost in the Study Area (Appendix C) – a Phantom FG1 from RAF Leuchars went missing in the area and was never located.

A number of aircraft did go missing without trace off eastern Scotland while on military service throughout the 20th century, though mostly during World War II (WWII). Although the likelihood of finding one within the Study Area is low, any such aircraft would automatically fall under the Protection of Military Remains Act 1986 (PoMRA).

The reviews of geophysical survey datasets (sidescan sonar, magnetometry, multibeam echo sounding and swath bathymetry) collected for the Seagreen Project, Neart na Goaithe and Inch Cape developments identified anomalies or targets on the seabed in all development areas. All identified targets of high or moderate potential, some of which could be related to known sites, others not, including a possible aircraft. Therefore, there along with the assets identified by these surveys, there is known potential for the survival of heritage assets on the seabed of the SG1A Project that fall outwith the Inch Cape Export Cable geophysical survey area.

6.9.3.5 Historic UXO

Although wartime losses have been identified, the study area is outside the main north-south shipping lanes up the east side of Scotland and east-west into the major ports, and so was not particularly prone to offensive mine activity in wartime.

During World War I, there was extensive mine laying off the Isle of May, the entrance to the Tay and Firth of Forth and in 1918 four large minefields with over 320 mines were laid offshore west of the study area (Bi Monthly mine sweeping report 1st Aug- 18th Aug 1918 (National Archives Kew: ADM 116-1518)). Between March 1917 and February 1918, the Granton minesweeping flotilla reported sinking several British mines off Bell Rock lighthouse.

In World War II there were several defensive minefields in the waters east of the Firth of Forth up to Rattray Head and in the Moray Firth, with the nearest being the British field SN 17 laid on 2 February 1942 (National Archives OCB M.6500A: British Islands and Adjacent Waters Minefield Index Chart 1945). The SS Einar Jarl, a charted wreck just south of the Study Area, struck what is thought to be a floating mine and not part of a German offensive mine field.

6.9.4 Mitigation and Management Measures

SG1A Project mitigation and management measures are presented in Section 4.7 and have been included when characterising the potential impacts to marine archaeology. Potential impacts for marine historic environment receptors have been identified, alongside additional mitigation measures, in Table 6.16. This extensive list has been used to ensure that all relevant development activities have been considered and to provide appropriate additional mitigation measures that will result in no significant impacts.

Table 6.16 - Potential environmental impacts and mitigations for marine historic environment receptors

Impact	Description of Impact	Mitigation Measures
Construction		
Surveys: Geotechnical coring	Seabed disturbance resulting in loss or damage to submerged deposits, wrecks, aircraft or anthropogenic geophysical anomalies	None required in relation to submerged deposits because other studies have shown that the potential for the discovery of palaeoenvironmental evidence in the study area appears negligible. Cores will be located to avoid any known seabed heritage assets.
Dredging / seabed clearance	Seabed disturbance resulting in loss or damage	Avoidance of any identified seabed heritage assets and geophysical anomalies
Trenching / Jetting	Seabed disturbance resulting in loss or damage	Avoidance of any identified seabed heritage assets and geophysical anomalies
Installation of cable protection / crossings	Seabed disturbance resulting in loss or damage	Avoidance of any identified seabed heritage assets and geophysical anomalies
Installation vessel anchoring	Seabed disturbance resulting in loss or damage	Use of Dynamic Positioning Systems, or if anchors necessary, avoidance of any identified seabed heritage assets and geophysical anomalies
Operation & Maintenance		
Use of cable protection, such as rock armour	Seabed compression / scouring resulting in loss or damage	Use of protection systems that do not result in seabed scouring. Avoidance of any identified seabed heritage assets and geophysical anomalies
Surface-laid cable dragging / scouring	Seabed disturbance resulting in loss or damage	Use of cable protection systems to weigh down cable to prevent movement
Anchoring of maintenance and inspection vessels	Seabed disturbance resulting in loss or damage	Use of Dynamic Positioning Systems, or if anchors necessary, avoidance of any identified seabed heritage assets and geophysical anomalies
Decommissioning		
Dragging / scouring	Seabed disturbance resulting in loss or damage	Ensure cable is lifted cleanly and not dragged across the seabed
Exposing trench	Seabed disturbance resulting in loss or damage	Ensure the trench created during installation is not widened on removal. Installation trench will have avoided any seabed assets

Impact	Description of Impact	Mitigation Measures
Anchoring of decommissioning vessels	Seabed disturbance resulting in loss or damage	Use of Dynamic Positioning Systems, or if anchors necessary, avoidance of any identified seabed heritage assets and geophysical anomalies

6.9.5 Characteristics of Potential Impacts

This section characterises the potential impacts which have been identified for marine archaeology receptors and provides recommendations on whether further consideration is required in the Environmental Appraisal to be submitted with the SG1A Project application for Marine Licence. A summary of the potential impacts and conclusions are included in Table 6.17.

6.9.5.1 Seabed disturbance

No evidence of prehistoric remains, deposits or submerged palaeolandscapes is known from the sub-bottom profile survey data or analysis of the geotechnical cores from any of the developments that surround the SG1A Study Area. Therefore, it is concluded that seabed disturbance will not result in loss or damage to paleoenvironmental deposits or prehistoric remains and **will not be included** within the Environmental Appraisal.

6.9.5.2 Seabed compression or scouring

The project design will have embedded engineering solutions to the potential impacts of scouring on the seabed, using appropriate cable protection. Therefore, no potential impacts are predicted on marine historic assets on the seabed from this pathway and therefore **will not be included** within the Environmental Appraisal.

6.9.5.3 Seabed disturbance to shipwrecks, aircraft or anthropogenic anomalies

Avoidance of known seabed assets will be embedded in the project design. Therefore, no potential significant impacts are predicted on shipwrecks, aircraft or anthropogenic geophysical anomalies. It is acknowledged however, that to allow for the identification of seabed assets that require avoidance and consultation with the statutory authorities to ensure avoidance of any direct disturbance, this impact **will be considered further** within the Environmental Appraisal.

Table 6.17 - Summary of the characteristics of potential impacts to marine archaeology receptors associated with SG1A Project

Potential impact (after management and mitigation)	Relevant phase of Project			To include in Environmental Appraisal
	Cable installation	Cable operation (maintenance and repair)	Decommissioning	
Seabed disturbance resulting in loss or damage of prehistoric remains or submerged palaeolandscape deposits	x	x	x	No
Seabed compression / scouring resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies	x	x	x	No
Seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies	✓	x	x	Yes

6.9.5.4 Cumulative Impacts

It is highly unlikely that the installation, operation or decommissioning of the SG1A Project presents any potential for significant cumulative impacts on historic marine assets on the seabed, since the named projects (see Section 6.1.1) have been, are, or will be designed to avoid any significant impacts on marine archaeology assets. Therefore, cumulative impact for the SG1A Project in relation to the marine historic environment **will not be included** within the Environmental Appraisal.

6.9.6 Conclusion and Proposed Methodology for the Environmental Appraisal

Taking account of selection criteria in Schedule 3 of the 2017 EIA Regulations the characterisation of potential impacts with respect to marine archaeology receptors is such that the proposed SG1A Project would not result in any significant adverse impacts to the environment. This finding supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

However, as presented above, one impact will be considered in further detail in the Environmental Appraisal in support of the Marine Licence application:

- Seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies.

The proposed approach for considering potential impacts to marine archaeology within the Environmental Appraisal will be defined following receipt of the screening opinion, initial consultation responses and discussions with MS-LOT. For any marine archaeology impacts, the appraisal will be conducted based on analysis of desk-based sources and geophysical data that already exists.

The appraisal would address the identification of any marine historic assets on the seabed, so that avoidance of impact can be embedded in the project design, and if avoidance is not possible, then an evidence-based approach will be used to design suitable mitigation strategies in consultation with MS-LOT and Historic Environment Scotland (HES).

The SG1A Project will prepare a marine heritage Written Scheme of Investigation and Protocol for Accidental Discoveries to avoid or mitigate accidental impacts and manage any accidental discoveries of archaeological interest. This would be based on standard professional guidelines, including The Crown Estate's 2010 *Model Clauses for Written Schemes of Investigation: Offshore Renewables Projects* (this is currently under revision, so the revised edition if issued in time will be utilised instead).

7. Proposed supporting information required for Marine Licence application

7.1.1 Environmental Appraisal

An Environmental Appraisal will be developed to support the SG1A Project Marine Licence application. This will build upon the information and conclusions provided within this Screening Report. Table 7.1 provides a summary of the potential impacts that will be considered further in the Environmental Appraisal.

Table 7.1 - Summary of impacts to be considered in the Environmental Appraisal

Potential Impacts	**Relevant phase of SG1A Project Installation**		
	Cable installation	**Cable operation**	**Cable decommissioning**
Commercial Fisheries			
Temporary loss or restricted access to fishing grounds	✓	✓	✓
Displacement of fishing activity into other areas	✓	x	✓
Safety issues for fishing vessels, including allision and collision and potential for snagging with project infrastructure	✓	✓	✓
Shipping and Navigation			
Collision of a passing (third party) vessel with a vessel associated with cable installation, maintenance or decommissioning	✓	✓	✓
Cable installation / decommissioning causing	✓	X	✓

disruption to passing vessel routeing/timetables.			
Increase in the risk of a vessel-to-vessel collision due to construction / decommissioning vessel activity	✓	x	✓
Cable installation / decommissioning causing disruption to fishing and recreational activities.	✓	x	✓
Cable installation / decommissioning causing disruption to third party marine activities (military, dredging)	✓	x	✓
Vessel drags anchor over the cable	x	✓	x
Vessel anchors in an emergency over the cable	x	✓	x
A vessel engaged in fishing snags its gear on the cable	x	✓	x
Reduction in under keel clearance resulting from laid cable and associated protection	x	✓	x
Interference with Marine Navigational Equipment	x	✓	x
Marine Archaeology			
Seabed disturbance resulting in loss or damage to shipwrecks, aircraft or anthropogenic geophysical anomalies	✓	x	x

Seagreen 1A will review the Screening Response received and will incorporate any comments from MS-LOT and other stakeholders provided in the Screening Response into the Environmental Appraisal, to ensure that the information provided in the Environmental Appraisal meets MS-LOT requirements with respect to the Marine Licence application.

7.1.2 Nature Conservation Appraisal (NCA)

In support of the Marine Licence Application, a Nature Conservation Appraisal (NCA) will also be produced and submitted as an appendix to the Environmental Appraisal. The NCA will consider the potential effects to key protected sites and species. This will provide Marine Scotland with the information they require in order to undertake a HRA and a NCMPA appraisal (as required). The NCA will incorporate the following:

- HRA as required under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended):
  - Screening to determine whether there is a potential for a LSE on designated Natura 2000 sites, and consideration of proposed SPAs.
  - If an LSE is identified, then the HRA will provide additional information in order to allow Marine Scotland to carry out an appropriate assessment.
- NCMPA Appraisal as required under the Marine (Scotland) Act 2010:
  - Initial screening to determine whether a project is reasonably capable of affecting a protected site; and
  - If it is concluded that a project is capable of affecting a protected site, the main assessment to determine whether the exercise of a function would or might significantly hinder, or there is or may be a significant risk of the act hindering the achievement of the conservation objectives.

As presented in this Screening Report, no adverse impacts are considered likely from any phase of the SG1A Project in relation to the physical environment, benthic ecology, ornithology, natural fish and shellfish and marine mammals. Therefore, no LSE on a designated Natura 2000 site and no effect on an NCMPA is expected and this will be clearly documented in the NCA submitted in support of the SG1A Marine Licence application.

7.1.3 Navigation Risk Assessment (NRA)

In order to assess potential risks associated with the SG1A Project in terms of shipping and navigation, it is proposed that a desk-based NRA is carried out. Further details of the proposed approach to the NRA are provided in Section 6.8.6.

8. Conclusions

On the basis of the information presented in this Screening Report, Seagreen 1A is requesting that Scottish Ministers make a determination that an EIA under the 2017 EIA Regulation is not required to support the SG1A Project Marine Licence application.

The proposed works for the SG1A project may be considered to represent a change or extension to an authorised project and therefore may be considered to fall under the description of projects provided at Paragraph 13 of Schedule 2 of the 2017 EIA Regulations (i.e. a change to an installation for the harnessing of wind power for energy production (wind farms) where those works are already authorised). The 2017

EIA Regulations specify that in making a determination as to whether or not a Schedule 2 project is an EIA project, the relevant criteria set out in Schedule 3 must be considered together with the results of any relevant assessment.

In summary, having considered the matters outlined within Schedule 3 of the 2017 EIA Regulations in terms of the characteristics and location of the project and the characteristics of the potential impacts, the content of this Screening Report has determined that the proposed SG1A Project is not likely to have significant adverse effects on the environment and supports a screening decision that the SG1A Project does not require an Environmental Impact Assessment.

Although it is expected that no significant impacts will occur to any offshore receptor due to the SG1A Project, in consideration of further studies which are required to provide a comprehensive set of desk based resources, consultation which is needed and in light of specific guidance and legislation some potential impacts will be considered further within the Environmental Appraisal, in support of the Marine Licence application. These are presented in Section 6 and summarised in Section 7.1.1 of this document.

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Appendix A. Spawning and nursery periods of fish and shellfish species in the vicinity of the SG1A Project

(S = spawning, S*=peak spawning, N = nursery, species= high spawning intensity as per Ellis et al., 2012, species = high nursery intensity as per Ellis et al., 2012

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N	N	N	N	N
Blue Whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Common Skate	N	N	N	N	N	N	N	N	N	N	N	N
European Hake	N	N	N	N	N	N	N	N	N	N	N	N
Herring	N	N	N	N	N	N	SN	S*N	S*N	N	N	N
Lemon Sole	N	N	N	SN	SN	SN	SN	SN	SN	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Nephrops	SN	SN	SN	S*N	S*N	S*N	SN	SN	SN	SN	SN	SN
Plaice	S*N	S*N	SN	N	N	N	N	N	N	N	N	SN
Saithe	N	N	N	N	N	N	N	N	N	N	N	N
Sandeel	SN	SN	N	N	N	N	N	N	N	N	SN	SN
Spotted Ray	N	N	N	N	N	N	N	N	N	N	N	N
Sprat	N	N	N	N	N	N	N	N	N	N	N	N
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Tope Shark	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	SN	SN	SN	SN	SN	N	N	N	N	N	N

Appendix B. The status of marine bird species in the Marine Ornithology Study Area, and their vulnerability to vessel disturbance and potential for connectivity to SPAs

Species	Seasonality			Status in offshore marine areas	Status in inshore marine areas	SPAs with potential for connectivity
	Breeding locally	Passage migrant	Wintering			
Eider	Yes		Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding Montrose Basin SPA, non-breeding
Long-tailed duck			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding
Common scoter			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding
Velvet scoter			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding
Goldeneye			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding

Species	Seasonality			Status in offshore marine areas	Status in inshore marine areas	SPAs with potential for connectivity
	Breeding locally	Passage migrant	Wintering			
Red-breasted merganser			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding Firth of Tay & Eden Estuary SPA, non-breeding
Red-throated diver			Yes		Regular	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding
Black-throated diver			Yes		Scarce	None likely
Fulmar	Yes	Yes	Yes	Regular	Scarce	Fowlsheugh SPA, breeding
Manx shearwater	Recent breeding on Isle of May	Yes		Scarce		Outer Firth of Forth and St Andrews Bay pSPA, breeding
Gannet	Yes		Yes	Regular	Regular	Forth Islands SPA, breeding
Cormorant	Yes		Yes		Regular	Forth Islands SPA, breeding Firth of Forth SPA, non-breeding
European shag	Yes		Yes	Scarce	Regular	Forth Islands SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding & non-breeding
Little grebe			Yes		Scarce	None likely
Great-crested grebe			Yes		Scarce	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding

Species	Seasonality			Status in offshore marine areas	Status in inshore marine areas	SPAs with potential for connectivity
	Breeding locally	Passage migrant	Wintering			
Red-necked grebe			Yes		Scarce	Firth of Forth SPA, non-breeding
Slavonian grebe			Yes		Scarce	Firth of Forth SPA, non-breeding Outer Firth of Forth and St Andrews Bay pSPA, non-breeding
Puffin	Yes		Yes	Regular	Scarce	Forth Islands SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding
Razorbill	Yes		Yes	Regular	Regular	Forth Islands SPA, breeding Fowlsheugh SPA, breeding St Abb's Head to Fast Castle SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding & non-breeding
Guillemot	Yes		Yes	Regular	Regular	Forth Islands SPA, breeding Fowlsheugh SPA, breeding St Abb's Head to Fast Castle SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding & non-breeding
Little auk			Yes	Regular		None likely
Pomarine skua		Yes		Scarce	Scarce	None likely
Arctic skua		Yes		Scarce	Scarce	None likely
Great skua		Yes		Scarce	Scarce	None likely
Sandwich tern	Yes	Yes	Yes	Scarce	Regular	Forth Islands SPA, breeding Firth of Forth SPA, passage

Species	Seasonality			Status in offshore marine areas	Status in inshore marine areas	SPAs with potential for connectivity
	Breeding locally	Passage migrant	Wintering			
Common tern	Yes	Yes	Yes	Scarce	Regular	Forth Islands SPA, breeding Imperial Dock Leith SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding
Arctic tern	Yes	Yes	Yes	Scarce	Scarce	Forth Islands SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding
Roseate tern	Yes			Scarce	Scarce	Forth Islands SPA, breeding
Kittiwake	Yes		Yes	Regular	Scarce	Forth Islands SPA, breeding Fowlsheugh SPA, breeding St Abb's Head to Fast Castle SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding & non-breeding
Black-headed gull	Yes		Yes	Scarce	Regular	Outer Firth of Forth and St Andrews Bay pSPA, non-breeding
Common gull	Yes		Yes	Scarce	Regular	Outer Firth of Forth and St Andrews Bay pSPA, non-breeding
Lesser black-backed gull	Yes		Yes	Regular	Regular	Forth Islands SPA, breeding
Herring gull	Yes		Yes	Regular	Regular	Forth Islands SPA, breeding St Abb's Head to Fast Castle SPA, breeding Outer Firth of Forth and St Andrews Bay pSPA, breeding & non-breeding
Great black-backed gull	Yes		Yes	Regular	Regular	None likely
Little gull		Yes		Scarce	Scarce	Outer Firth of Forth and St Andrews Bay pSPA, non-breeding

Appendix C. Overview of identified marine historic environment assets

Name	UKHO Wreck Number	Canmore ID	Description	Circumstance of loss	Date Lost	Lat (WGS84)	Long (WGS84)	Source	Importance
SS Jönköping II (probably)	3003	121116, 201634, 325983	Swedish Steamship. Built 1888. Gourlay Brothers & Co. (Dundee) Ltd., Dundee. 1274 tons. Steel. 74.8m x 10.4m x 4.9m. Cargo: Göteborg to Hull with general cargo. Ex-SS Ardle	Sunk by torpedo from UC49 (Hans Kükenthal) Crew survived.	24/01/1918	56 25.073N	02 14.348W	1,2,3,5,6	Low
DEAD wreck 1	3002		Located in 1955 by HMS Welcome. Not located by Guardline survey in 2008. Amended to "DEAD"			56 24.994N	02 13.395W	4	
SS Fylgia	2997	201631, 322309	Swedish Steamship, Built 1889. William Dobson & Co., Newcastle-Upon-Tyne. 1741 tons. 81.1m x 11.3m x 4.9m. Göteborg to Rouen with a general cargo including wood pulp & steel ingots	Sunk by torpedo from UC49 (Hans Kükenthal) Crew survived.	24/01/1918	56 22.966N	02 16.763W	1,2,3	Low
Unknown 1	2995		Unknown wreck 19m long lying 048/228			56 22.61N	02 15.894W	3	Unknown

Name	UKHO Wreck Number	Canmore ID	Description	Circumstance of loss	Date Lost	Lat (WGS84)	Long (WGS84)	Source	Importance
Unknown 2	2994		Unknown wreck 26m x 8m x 4.1m lying 140/220			56 22.077N	02 12 .676W	3	Unknown
DEAD wreck 2	2990		Located in 1975 but not located by Guardline survey in 2008. Amended to ''DEAD''. Location from 1975 may not have been accurate and so missed by the 2008 survey.			56 19.594N	02 13.894W	3	Unknown
Phantom XT598	3179	315446	Aircraft. McDonnell Douglas] Phantom FG1. 111 Sgn RAF Leuchars	Crashed 056 deg, 16.1 miles Bell Rock. Two crew lost. Not located.	23/11/1978	56 34.99N	01 59.097W	1,3,4,7	High
SS Avondale Park	2934	102069	British Steamship. Built 1944. Foundation Maritime Ltd., Pictou, Pictou Canada. 2878 tons. Hull for Belfast	Torpedoed by U-2336. Part of Convoy EN-91. Last U boat action on WW2. Two crew lost	07/05/1945	56 09.279N	02 30.215W	1,2,3,5,6,8	Medium
Ulundi DE 107		315245	Dundee Steam Trawler, iron. Built 1894 by Cook, Welton & Gemmell Ltd., Beverley (Hull) 131 tons.28.5 x 6.2 x 3.4.	Sunk following a collision off Bell Rock. Crew survived	02/10/1911			1,4,7	Low

Name	UKHO Wreck Number	Canmore ID	Description	Circumstance of loss	Date Lost	Lat (WGS84)	Long (WGS84)	Source	Importance
Wreck PA 1	2960		Unknown wreck located by sonar in 1960.			56 12,500N	02 27.000W	3	Unknown
Wreck PA 2	2948		Wreck located in 1919. Listed as a bad obstruction in the Kingfisher Book of Tows Vol 1 (1979)			56 10,495N	02 24,092W	3	Unknown

1 = Whittaker (1998); 2 = Larn & Larn (1998); 3 = UKHO; 4 = Wrecksite.eu; 5 = Baird B (1993); 6 = Baird B (2016); 7 = Britishnewspaperarchive.com; 8 = Ridley, G. (1992).

E: ms.marinerenewables@gov.scot

Ms Kirstine Wood
Seagreen 1A Limited
c/o SSE plc
1 Waterloo Street
Glasgow
G2 6AY

Date: 19 February 2021

Dear Ms Wood,

Screening Opinion under The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) and The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended)

Thank you for your screening opinion request dated 02 December 2020 in regards to the proposed construction of an offshore export cable and cable protection in the Firth of Forth and Firth of Tay to connect the Seagreen Alpha and Seagreen Bravo offshore wind farms to a landfall in East Lothian ("the Proposed Works").

The Proposed Works are required as part of the installation of the Seagreen Alpha and Bravo offshore wind farms ("the Seagreen Project") for which marine licences were granted in October 2014. The Seagreen Project included up to six export cables to connect to a landfall at Tealing, Carnoustie. The installation of an additional export cable at an alternative landfall location was not included in the Seagreen Project that was previously assessed.

The construction of the Seagreen Project is an Environmental Impact Assessment ("EIA") project therefore the Scottish Ministers consider the Proposed Works to fall under paragraph 13 of schedule 2 of The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) ("the 2017 MW Regulations") and paragraph 89, of schedule A2 of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) ("the 2007 MW Regulations"), on the basis that they constitute an extension of schedule 2/schedule A2 works already authorised with the Proposed Works being carried out in a sensitive area as defined by the 2017 MW Regulations. Consequently, the Scottish Ministers are obliged to adopt a screening opinion as to whether the Proposed Works are or are not, an EIA project under the 2017 MW Regulations and the 2007 MW Regulations.

Under regulation 10(5) of the 2017 MW Regulations and paragraph 4(1) of schedule 2 of the 2007 MW Regulations, the Scottish Ministers have consulted with the relevant local planning authorities (Angus Council, Dundee City Council, East Lothian Council, Fife

Council and the Scottish Borders Council), NatureScot (operating name of Scottish Natural Heritage), Historic Environment Scotland (“HES”) and the Scottish Environment Protection Agency (“SEPA”) for their view on whether the Proposed Works are an EIA project. Copies of the consultation responses and the advice received are attached for your review (see Appendix 1). Due to circumstances outwith its control, SEPA has not been able to provide a consultation response.

When making a determination as to whether schedule 2 projects under the 2017 MW Regulations and schedule A2 projects under the 2007 MW Regulations are an EIA project, the Scottish Ministers must take into account the selection criteria set out in schedule 3 of the 2017 MW Regulations and schedule 1 of the 2007 MW Regulations as are relevant to the Proposed Works. In this regard, the Scottish Ministers have considered the following:

Characteristics of the works

The Seagreen Project was awarded Section 36 consents and marine licences for the construction and operation of 150 Wind Turbine Generators (“WTGs”), associated inter array cabling and offshore transmission asset infrastructure. The Seagreen Project will comprise of 114 WTGs to be installed on three-legged steel jackets, each installed on suction bucket caissons and 36 WTGs installed on up to four-legged steel jackets, each installed on pin pile foundations. The existing marine licences allow up to six export cables to be installed to connect the wind farm to a landfall at Carnoustie, Fife.

The Proposed Works involve the construction of an additional high voltage export cable (approximately 108 kilometres long) from the Seagreen Project to an identified landfall location on the East Lothian coastline at either Cockenzie or Seton Sands. The cable will transmit electricity from up to 36 of the 150 consented WTGs within the Seagreen Project area via an Offshore Substation Platform. The Proposed Works will follow a similar alignment to the consented Inch Cape export cable corridor and will overlap across approximately 400 to 500 meters of the Inch Cape cable route.

The cable will be buried along the majority of the export cable route and, where this is not possible, additional cable protection measures will be applied (including concrete mattresses, grout bags and/or rock placement). The exact details of the cable installation technique to be employed are yet to be confirmed; however, it is envisaged that a variety of installation and burial techniques (such as post lay burial using a jet trenching remotely operated vehicle and cable lay and burial using a cable plough or a mechanical trencher) will be used due to the variable nature of the seabed along the proposed export cable corridor. At the landfall location, a trenchless installation technique (horizontal directional drilling or direct pipe) will be used to install a cable duct from onshore to below mean high water springs.

There remains uncertainty as to the extent of the onshore works associated with the Proposed Works. East Lothian Council highlighted that further onshore transmission works including a substation within East Lothian will be required however details of this have not been provided. The screening opinion request also refers to the construction of an onshore operations and maintenance facility for the Proposed Works however does not provide any further details. The Proposed Works and onshore transmission works are integral to each other, as the electricity cannot be exported to the grid without both. The Scottish Ministers are required to consider the whole project when considering EIA.

Location of the works

The Proposed Works are to be located within the Firth of Forth and Firth of Tay running south and east of the Inch Cape Offshore Wind Farm, north of the consented Neart na Gaoithe Offshore Wind Farm and northwest of the proposed Berwick Bank and Marr Bank Offshore Wind Farms.

The Proposed Works are located within or in close proximity to the Outer Firth of Forth and St Andrews Bay Complex Special Protected Area ("SPA"), the Firth of Forth SPA, the Firth of Forth Banks Complex Nature Conservation Marine Protected Area ("ncMPA"), the Firth of Forth Site of Special Scientific Interest ("SSSI"), the Forth Islands SPA and the Isle of May Special Area of Conservation ("SAC"). NatureScot advised that there are a number of impact pathways which may lead to significant effects on one or more of these protected sites.

NatureScot advised that quantification of any habitat loss during the construction and decommissioning phases is needed to assess the impact on habitat and benthic features as well as habitats used by seabirds or migratory birds. NatureScot advised that this needs to be considered for all qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA which overlaps with the cable corridor, as well as the Firth of Forth SPA which overlaps with the landfall locations. NatureScot also advised that the features of the Firth of Forth Banks Complex ncMPA should be assessed for any potential impact pathways.

NatureScot also advised, that disturbance and displacement effects during the construction phase are possible for all the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA, the Firth of Forth SPA, the Firth of Forth SSSI as well as seabird qualifying features (guillemot, kittiwake, puffin, razorbill (and seabird assemblage)) of the Forth Islands SPA. NatureScot advised that a qualitative assessment based on vessel movements and areas occupied by activity should be undertaken and that depending on the construction schedule, consideration may also be required for the Isle of May SAC designated for grey seals.

In relation to the operation and maintenance phase, NatureScot advised that it is not yet known to what extent introducing hard structures to a soft sediment environment will impact benthic and fish communities. There is the potential for impacts across multiple trophic levels due to changes in prey availability and this will need to be considered for all the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA and also the seabird qualifying features of the Forth Islands SPA.

East Lothian Council highlighted that construction works at the landfall locations may be in close proximity to sensitive residential receptors. These may be impacted by noise, vibration and dust caused by the Proposed Works. East Lothian Council advised that this could be controlled through the submission of a Construction Environmental Management Plan which should include practicable control measures for reducing visible dust emissions, details of daytime and night time construction noise mitigation measures and assessment of vibration impacts from tunnelling and trenching during construction. However, the Scottish Ministers note that details of these mitigation measures have not been provided so there remains a potential for significant effects on sensitive receptors.

HES advised that sufficient information has been provided to demonstrate that any potentially significant effects on historic environment interests can be effectively mitigated. The Scottish Ministers note however, that details of this mitigation have not been provided and HES have also requested sight of the Written Scheme of Investigation and Protocol for Accidental Discoveries which it requires to be submitted to show how accidental impacts on marine heritage will be avoided or mitigated and to manage any accidental discoveries of archaeological interest.

Characteristics of the potential impact

In addition to the impacts on designated sites, NatureScot also advised on the need to consider pre-construction activities such as unexploded ordnance clearance and geophysical activities that may create significant underwater noise. NatureScot confirmed that these impacts will require assessment under European Protected Species licensing as well as an assessment of the effects on designated sites with marine mammal and potentially diadromous fish qualifying features. East Lothian Council supported this view about impacts on marine mammals and referred to the Isle of May SAC and Moray Firth SAC as being potentially impacted. NatureScot also advised that greater consideration of electromagnetic field effects for diadromous fish and in particular Atlantic salmon, is required.

Concerns were raised by East Lothian Council regarding the lack of detail about the mitigation measures which have been proposed. East Lothian Council noted that this is particularly relevant for potential effects with regard to noise, accidental spillage of pollutants, invasive non-native species, possible risks to the health of the general public and fisheries. East Lothian Council also noted with respect to landscape, that the visual disturbance from the intertidal works requires further consideration as part of the Proposed Works.

The Proposed Works will overlap considerably with the Inch Cape Offshore Wind Farm export cable corridor which underwent an EIA. The screening opinion request proposes that assessments carried out in support of the Inch Cape project can be used to show that the Proposed Works will not have significant effects on the environment. However, NatureScot noted that while much can be drawn across from the previous assessments, all key environmental receptors and impact pathways have been screened out across all development phases in the screening opinion request without any project-specific quantification or justification of these impacts. NatureScot disagrees with the proposed approach due to a lack of knowledge on the Inch Cape build out and advised that insufficient consideration has been given to impacts on protected sites and features, including the potential for in-combination effects. NatureScot also advised that other works that may be sequential or operating at the same time as the Proposed Works require further consideration and may need to be assessed further.

The Scottish Ministers note the proposal in the screening opinion request to include some of this information as part of an environmental appraisal to be submitted along with the marine licence application. However, the Scottish Ministers are of the view that due to the number of uncertainties, insufficient detail on mitigation and the potential for the Proposed Works to have a significant effect on the environment, an environmental appraisal is not appropriate and the Proposed Works are an EIA project.

Conclusion

In view of the findings above, the Scottish Ministers are of the opinion that the Proposed Works are an EIA project under the 2017 MW Regulations and the 2007 MW Regulations and, therefore, an EIA is required to be carried out in respect of the Proposed Works.

If you increase, alter or extend the Proposed Works, you are advised to contact Marine Scotland - Licensing Operations Team again to confirm if the screening opinion is still valid.

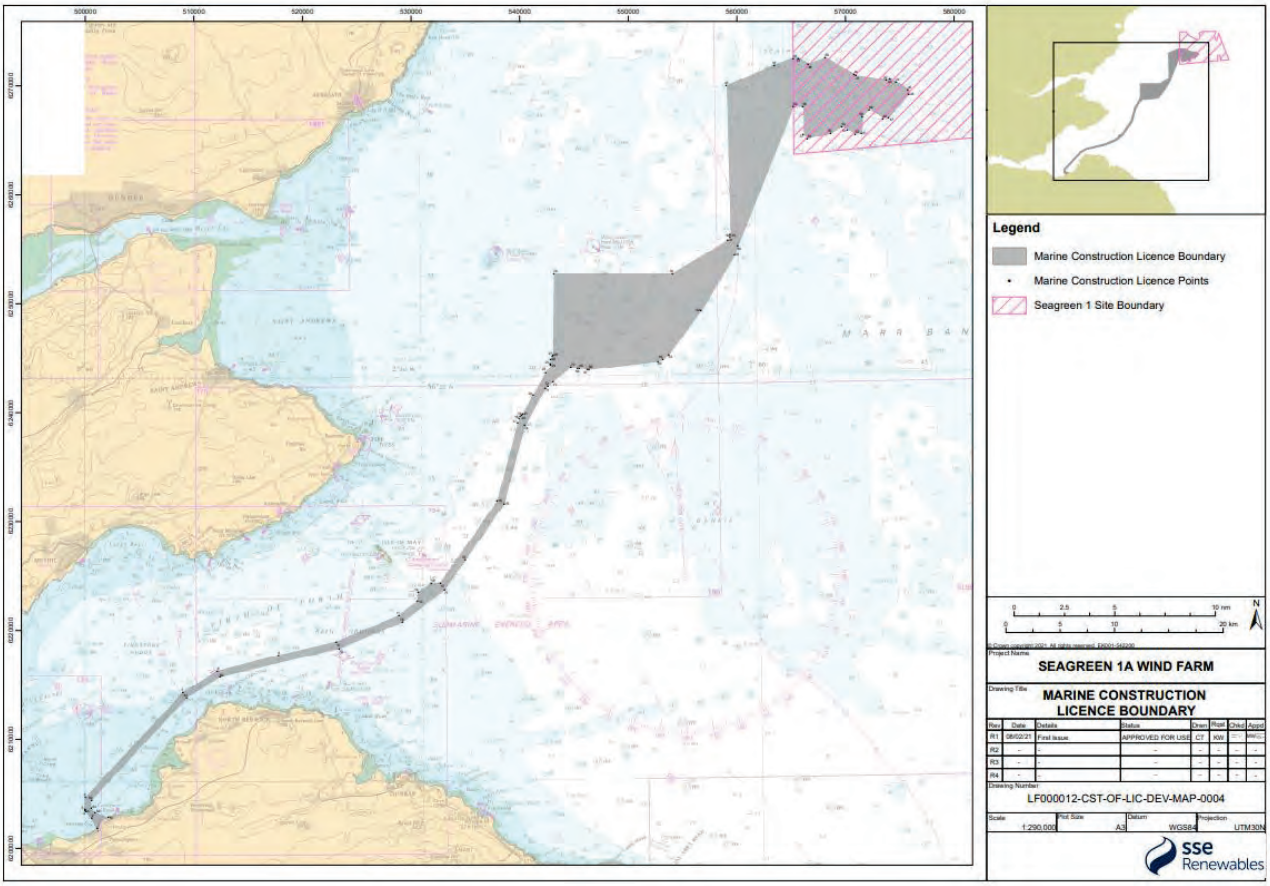
A copy of the screening opinion has been forwarded to Angus Council, Dundee City Council, East Lothian Council, Fife Council and Scottish Borders Council Planning Departments, NatureScot, HES and SEPA. The screening opinion has also been made publicly available through the Marine Scotland Information website.

If you require any further assistance or advice on this matter, please do not hesitate to contact me.

Yours sincerely,

Emma Lees
Marine Scotland - Licensing Operations Team

Appendix B: Chart and WGS84 Co-ordinates of the Offshore SG1A Marine Construction Licence Boundary



Ref	Easting (WGS84 30N)	Northing (WGS84 30N)	Latitude (WGS84 DDM)	Longitude (WGS84 DDM)
1	501120.42	6201810.01	55° 57.698' N	2° 58.923' W
2	500597.82	6202788.25	55° 58.226' N	2° 59.425' W
3	500079.33	6203362.58	55° 58.535' N	2° 59.924' W
4	499983.5	6203482.95	55° 58.600' N	3° 0.016' W
5	499980.46	6203614.44	55° 58.671' N	3° 0.019' W

6	500018.43	6204679.93	55° 59.245' N	2° 59.982' W
7	509011.63	6214302.54	56° 4.428' N	2° 51.314' W
8	512171.36	6216266.66	56° 5.482' N	2° 48.263' W
9	517792.38	6217719.97	56° 6.255' N	2° 42.837' W
10	523148.53	6218954.05	56° 6.907' N	2° 37.664' W
11	528891.24	6221385.99	56° 8.199' N	2° 32.107' W
12	530599.47	6222686.28	56° 8.894' N	2° 30.449' W
13	530652.72	6223508.59	56° 9.337' N	2° 30.392' W
14	531857.85	6224355.95	56° 9.789' N	2° 29.222' W
15	532694.84	6224355	56° 9.785' N	2° 28.413' W
16	537928.89	6231925.12	56° 13.842' N	2° 23.292' W
17	539807.85	6239077.17	56° 17.688' N	2° 21.409' W
18	539963.95	6239480.66	56° 17.905' N	2° 21.254' W
19	540059.2	6239670.5	56° 18.007' N	2° 21.160' W
20	540161.07	6239772.89	56° 18.061' N	2° 21.060' W
21	540273.86	6239948.75	56° 18.156' N	2° 20.949' W
22	541242.14	6241669.95	56° 19.078' N	2° 19.994' W
23	542402.66	6243732.87	56° 20.184' N	2° 18.849' W
24	542854.45	6244382.25	56° 20.532' N	2° 18.404' W
25	542811.53	6244523.99	56° 20.609' N	2° 18.444' W
26	542835.82	6244923.62	56° 20.824' N	2° 18.417' W
27	543009.91	6245228.95	56° 20.987' N	2° 18.245' W
28	543072.73	6245293.62	56° 21.022' N	2° 18.183' W

29	543140.64	6252797.35	56° 25.066' N	2° 18.043' W
30	554067.45	6252794.9	56° 24.998' N	2° 7.417' W
31	559167.4	6255871.59	56° 26.619' N	2° 2.416' W
32	559345.2	6256105.78	56° 26.744' N	2° 2.240' W
33	559400.42	6256325.95	56° 26.862' N	2° 2.184' W
34	559035.2	6270021.44	56° 34.247' N	2° 2.353' W
35	563449.12	6271930.49	56° 35.241' N	1° 58.015' W
36	565190.55	6272551.36	56° 35.561' N	1° 56.305' W
37	565675.11	6272533.41	56° 35.547' N	1° 55.832' W
38	566577.58	6272012.37	56° 35.259' N	1° 54.958' W
39	568133.02	6272575.37	56° 35.549' N	1° 53.430' W
40	570792.89	6271047.54	56° 34.702' N	1° 50.857' W
41	570979.25	6270940.49	56° 34.643' N	1° 50.677' W
42	573780.33	6270581.46	56° 34.423' N	1° 47.948' W
43	574077.17	6270653.73	56° 34.459' N	1° 47.657' W
44	574632.71	6270336.72	56° 34.283' N	1° 47.120' W
45	575760.27	6269693.29	56° 33.926' N	1° 46.030' W
46	575855.65	6269280.11	56° 33.702' N	1° 45.944' W
47	573959.39	6267064.34	56° 32.526' N	1° 47.833' W
48	573453.5	6267011.43	56° 32.502' N	1° 48.327' W
49	572190.27	6267832.29	56° 32.956' N	1° 49.546' W
50	571538.79	6267204.52	56° 32.624' N	1° 50.192' W
51	571475	6265718.2	56° 31.824' N	1° 50.279' W

52	570908.84	6265574.63	56° 31.751' N	1° 50.833' W
53	570183.39	6265977.36	56° 31.975' N	1° 51.534' W
54	569667.83	6266263.58	56° 32.134' N	1° 52.033' W
55	568664.43	6265660.35	56° 31.818' N	1° 53.021' W
56	566503.36	6265146.07	56° 31.559' N	1° 55.136' W
57	566123.88	6265588.25	56° 31.801' N	1° 55.500' W
58	566091.09	6268114.03	56° 33.162' N	1° 55.493' W
59	565210.7	6268103.81	56° 33.164' N	1° 56.352' W
60	560058.06	6255283.54	56° 26.295' N	2° 1.558' W
61	559804.83	6254519.14	56° 25.885' N	2° 1.815' W
62	556704.15	6249366.51	56° 23.131' N	2° 4.898' W
63	553726.27	6245353.97	56° 20.989' N	2° 7.841' W
64	553190.62	6244903.55	56° 20.750' N	2° 8.366' W
65	552732.72	6244737.87	56° 20.664' N	2° 8.812' W
66	546390.8	6243963.07	56° 20.286' N	2° 14.976' W
67	546244.4	6243984.48	56° 20.298' N	2° 15.118' W
68	545492.66	6244094.43	56° 20.362' N	2° 15.846' W
69	545332.35	6244098.56	56° 20.365' N	2° 16.002' W
70	544744.94	6244203.79	56° 20.425' N	2° 16.571' W
71	543085.7	6242878.57	56° 19.720' N	2° 18.194' W
72	542581.45	6242419.04	56° 19.475' N	2° 18.688' W
73	542383.58	6242271.26	56° 19.397' N	2° 18.881' W
74	540463.46	6238817.44	56° 17.545' N	2° 20.776' W

75	538576.61	6231633.66	56° 13.682' N	2° 22.668' W
76	535009.49	6226471.86	56° 10.916' N	2° 26.160' W
77	533098.84	6223709.92	56° 9.435' N	2° 28.028' W
78	529248.61	6220771.09	56° 7.866' N	2° 31.766' W
79	523396.01	6218313.64	56° 6.561' N	2° 37.428' W
80	512402.54	6215721.21	56° 5.188' N	2° 48.042' W
81	509358.82	6213794.41	56° 4.154' N	2° 50.980' W
82	500591.84	6204401.68	55° 59.095' N	2° 59.431' W
83	500565.38	6203719.06	55° 58.727' N	2° 59.456' W
84	500930.5	6203290.43	55° 58.496' N	2° 59.105' W
85	502145.61	6202842.58	55° 58.255' N	2° 57.937' W

Appendix C: Offshore SG1A Nature Conservation Appraisal (NCA) Report

Project Title	Seagreen 1A
Document Reference Number	LF000012- CST-OF-LIC-DEV-REP-0002

Seagreen 1A Export Cable Corridor Marine Nature Conservation Appraisal

Rev	Date	Reason for Issue	Originator	Checker	Approver
01	05/03/21	Approved for use			

Table of Contents

Table of Figures

Table of Acronyms

AIS	Automatic Identification System
B	Magnetic Components
BGS	British Geological Survey
CaP	Cable Plan
CBRA	Cable Burial Risk Assessment
CDM	Construction Design and Management
CEH	Centre for Ecology & Hydrology
CEMP	Construction Environmental Management Plan
CITES	Convention on International Trade in Endangered Species
CMS	Convention of Migratory Species
COSHH	Control of Substances Hazardous to Health Regulation
cSAC	Candidate Special Area of Conservation
DP2	Dynamic Positioning
E	Electric
ECR	Offshore Export Cable Corridor
EIA	Environmental Impact Assessment
ELC	East Lothian Council
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
EPS	European Protected Species
EU	European Union
FLO	Fisheries Liaison Officer
FMMS	Fisheries Management and Mitigation Strategy
GT	Gross Tonnage
HDD	Horizontal Directional Drilling
HES	Historic Environment Scotland
HRA	Habitat Regulations Appraisal
HSE	Health, Safety and Environment

iE	Induced Electric
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effect
m	Meters
MBES	Multibeam Echosounders
MCA	Marine Coastguard Agency
MLWS	Mean Low Water Springs
MNNS	Marine Non-Native Species
MoD	Ministry of Defence
MPCP	Marine Pollution Contingency Plan
µT	Micro Tesla
NCA	Nature Conservation Appraisal
NCMPA	Nature Conservation Marine Protected Area
nm	Nautical Miles
NMPi	National Marine Interactive Plan
NRA	Navigational Risk Assessment
O&M	Operation and Maintenance
OFTO	Offshore Transmission Owner
OTA	Offshore Transmission Asset
OWF	Offshore Wind Farm
PAC	Pre-Application Consultation
PAH	Poly-Aromatic Hydrocarbons
PCB	Poly-Chlorinated Biphenyls
PMF	Priority Marine Features
pNCMPA	Possible Nature Conservation Marine Protected Area
pSPA	Proposed Special Protection Area
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub-Bottom Profilers

SCANS	Small Cetaceans in the European Atlantic and North Sea
SEL	Sound Exposure Levels
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SG1A	Seagreen 1A
SOLAS	Safety of Life at Sea
SPA	Special Protection Area
SPM	Suspended Particulate Matter
SMU	Seal Management Units
SSC	Suspended Sediment Concentration
SSS	Side Scan Sonar
SWEL	Seagreen Wind Energy Limited
SG1A Ltd	Seagreen 1A Limited
TEC	Transmission Entry Capacity
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
USBL	Ultra-Short Baseline
UXO	Unexploded Ordinances
V m-1	Volts Per Metre
VMP	Vessel Management Plan
VTS	Vessel Traffic Service
WTG	Wind Turbine Generators

1. Introduction

In line with Part 4 of the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, Seagreen Seagreen 1A Ltd is planning to submit an application for a Marine Licence for the installation of a single offshore export cable between the consented Seagreen Project and the anticipated landfall location at Cockenzie. This single offshore export cable infrastructure comprises the Seagreen 1A Project, hereafter referred to as the offshore SG1A Project. The proposed 108 km offshore SG1A Project export cable corridor is shown in Figure 1-1.

1.1 Purpose of this document

This Nature Conservation Appraisal (NCA) Report is Appendix C of the Environmental Impact Assessment Report (EIAR) submitted in support of the offshore SG1A Project Marine Licence application. This NCA Report should be read in conjunction with the following offshore SG1A Project documents:

- Marine Licence Application Form;
- Pre-application Consultation (PAC) Report; and
- Environmental Impact Assessment Report (EIAR).

This NCA identifies protected sites designated for their nature conservation interests (referred to collectively as designated sites) and their qualifying features with potential connectivity to the offshore SG1A Project, and considers the potential impacts of the offshore SG1A Project to the relevant ecologically designated sites and features which have been identified. A list of the designated sites which are considered in this report is provided in Section 6.

The designated sites which have been considered are those with spatial connectivity or marine features with assumed connectivity to the offshore SG1A Project and associated works (in line with the criteria outlined in Section 4.2). The potential for a LSE on the designated sites which could result from the proposed offshore SG1A Project activities have been assessed. Where no LSE is predicted on designated sites or the offshore SG1A Project is not considered Capable of Affect (CoA) in the case of Nature Conservation Marine Protected Areas (NCMPAs), the designated sites have been screened out of further assessment in this report. Where LSE or CoA cannot be ruled out, a more detailed impact assessment has been carried out.

A separate Environmental Impact Assessment Report (EIAR) has been produced to accompany the Marine Licence application for the offshore SG1A Project, along with this NCA Report. The potential impacts which may be caused by the offshore SG1A Project to specific environmental receptors in line with the Screening Report and Screening Opinion are assessed within the EIAR, and where not relevant to Conservation Objectives of designated sites, are not considered further in this report.

This report is focused on the marine aspects of the offshore SG1A Project and only considers the potential effects from the SG1A Project offshore export cable corridor during construction, operation and decommissioning. Where a designated site has potential connectivity with the onshore infrastructure of the SG1A Project, this has been considered in the Seagreen 1A EIAR Volume 4: Technical Appendices (LF000012-CST-ON-LIC-DEV-REP-0004) work submitted with the onshore planning application.

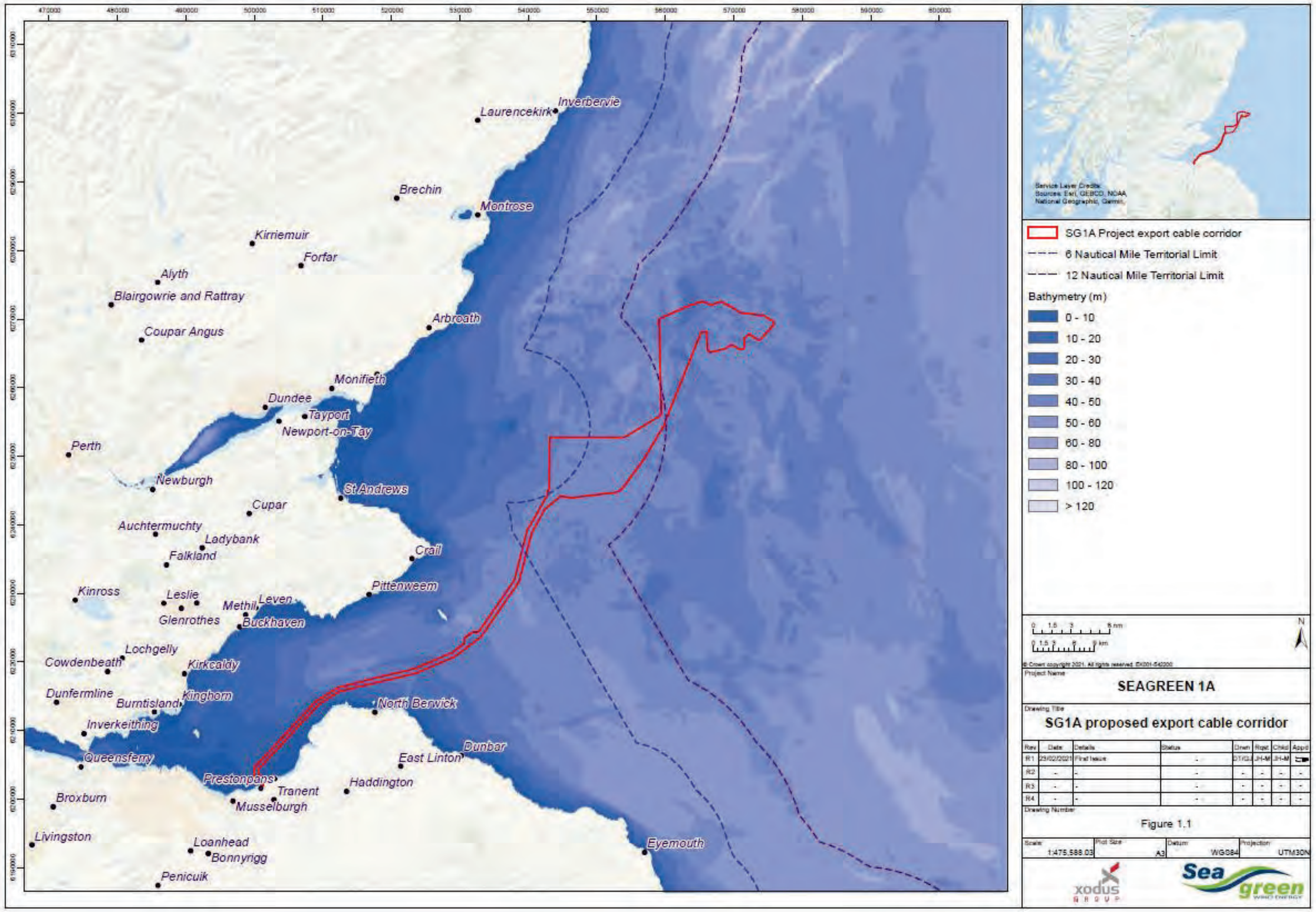


Figure 1-1 Offshore SG1A Project proposed offshore export cable corridor

2. NCA Assessment Process

2.1 Summary of key legislation

Table 2-1 outlines the key legislation in relation to the potential impacts on ecologically designated sites associated with the offshore SG1A Project.

Special Area of Conservation (SACs) and Special Protection Area (SPAs) within the UK and the Conservation of Offshore Marine Habitats and Species Regulations 2017 no longer form part of the EU's Natura 2000 Network. Alternatively, they form the UK National Site Network [1] (as defined in Regulation 1994) that existing SACs and SPAs and new SACs and SPAs designated under the Habitats Regulations now contribute to. This includes both the inshore and offshore marine areas in the UK.

Table 2-1 Legislation and policy relevant to nature conservation designated sites

Designated site	Legislation
SPA/SAC (UK National Site Network)	• The EU Habitats Directive implemented through the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland) (the Habitats Regulations). • Conservation of Offshore Marine Habitats and Species Regulations 2017 (the Offshore Habitats Regulations).
Ramsar	• The Convention on Wetlands of International Importance especially as Waterfowl Habitat (the 'Ramsar Convention') (implemented through the Habitats Regulations).
NCMPA	• Marine (Scotland) Act 2010 • Marine and Coastal Access Act 2009
SSSI	• Nature Conservation (Scotland) Act 2004 • Wildlife and Natural Environment (Scotland) Act 2010 • Wildlife and Countryside Act 1981 (as amended)
Seal haul out	• Marine (Scotland) Act 2010 • The Protection of Seals (Designation of Haul out Sites) (Scotland) Order 2014

2.2 Habitats Regulations Appraisal Process

In the UK, the requirements of the Habitats Regulations are also extended to consider the effect on Ramsar sites (listed under the Ramsar Convention on Wetland of International Importance). Despite the recent changes to the Habitats Regulations, following the UK's exit from the European Union, the Habitat

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[1] https://www.gov.scot/binaries/content/documents/govscot/publications/advice-and-guidance/2020/12/eu-exit-habitats-regulations-scotland-2/documents/eu-exit-habitats-regulations-scotland/eu-exit-habitats-regulations-scotland/govscot%3Adocument/eu-exit-habitats-regulations-scotland.pdf?forceDownload=true

Regulation Appraisal (HRA) process remains unchanged (Scottish Government, 2020). Therefore, the European Commission's (2001) guidance identifying a staged process for the assessment of the effect of plans or projects is relevant for this assessment. In the UK the four stages are commonly categorised as the following:

- Stage One: Screening;
- Stage Two: Report to Inform Appropriate Assessment (AA) to be carried out by the Competent Authority;
- Stage Three: Assessment of Alternative Solutions; and
- Stage Four: Assessment of 'Imperative Reasons of Overriding Public Interest' (IROPI).

This NCA report has been prepared to address Stages One and Two of the HRA process.

HRA in Scotland is undertaken in line with the NatureScot guidance document 'Habitats Regulations Appraisal: Guidance for Plan-making Bodies in Scotland' (Tyldesley *et al.*, 2015).

The purpose of HRA Screening is for the Competent Authority (CA; in this case, Marine Scotland) to identify aspects of the project/plan for which it is not possible to rule out the risk of significant effects on a designated site (referred to as LSE), either alone or in-combination with other projects. A LSE is one that cannot be ruled out on the basis of objective information.

Designated sites and features which will be subject to an AA are those for which LSEs could not be ruled out during the screening exercise. A designated site is progressed to the AA Stage (Stage 2 of the HRA) where it is not possible to exclude a LSE to one or more qualifying features of that site in view of the Conservation Objectives. A project is required to provide a report to inform the AA which considers the impacts of a project, alone and in-combination with other plans and projects, on the integrity of a designated site, with regard to the designated site's structure and function and its Conservation Objectives. The CA is then required to carry out an AA on the implications for a designated site in respect of that site's Conservation Objectives, before deciding to undertake or give any consent, permission or other authorisation for, a plan or project.

The need for AA extends to plans or projects outwith the boundary of a designated site in order to determine the implications for the features for which the site is designated. CAs (in this case Marine Scotland) need to identify the qualifying interests and the Conservation Objectives for each designated site involved in an AA.

2.3 NCMPA Process

It is an offence to intentionally or recklessly kill, remove, damage, or destroy any protected feature of a NCMPA. Marine Scotland are tasked with ensuring that consenting/licensing decisions do not constitute a significant risk to the Conservation Objectives of any NCMPA. To ensure that Marine Scotland has sufficient information available to make such a decision, this document presents information on the potential interaction of the offshore SG1A Project with NCMPAs.

Under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, Marine Scotland is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature of an NCMPA or any protected ecological or geomorphological process on which the conservation of any protected feature of an NCMPA is dependant. If Marine Scotland-Licencing Operations Team (MS-LOT; on behalf of the Scottish Ministers) believe there is or may be a significant risk of a project hindering the achievement of the Conservation Objectives then they must notify the relevant conservation bodies, NatureScot in the case of the offshore SG1A Project (where NCMPAs are within 12 nm of the coast).

The NCMPA assessment process follows the following broad steps:

- Initial screening: The assessment stage focuses on what can reasonably be predicted as a consequence of the proposal and whether it is 'capable of affecting (other than insignificantly)' a protected feature of a NCMPA. A capability that is both remote (in terms of likelihood of occurrence) and hypothetical should not be the basis of a conclusion that further assessment is required. If a project is 'capable of affecting' a designated site then consideration is also given to whether the proposed development or activity will affect the protected features of a NCMPA, other than insignificantly. Consideration of the degree of pressure that could be exerted by the activity on a spatial basis should help to establish what level of effect might occur.
- Main assessment: Focuses on determining whether the exercise of a function would or might significantly hinder, or there is or may be a significant risk of the act hindering (referred to as a significant risk of hindering), the achievement of the Conservation Objectives. Aspects such as scale, timing and duration of the proposed activities or developments should all be considered. However, whilst the initial screening focuses on the protected features, this main assessment focuses on the potential impact on the achievement of the Conservation Objectives of the protected features.

2.4 Sites of Special Scientific Interest

Scottish planning policy states that developments affecting Sites of Special Scientific Interest (SSSIs, should only be permitted where the objectives of designation and the overall integrity of the area will not be compromised; or any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social, environmental or economic benefits of national importance.

2.5 Seal Haul out Sites

Under Section 117 of the Marine (Scotland) Act 2010, Scottish Ministers are permitted to designate specific seal haul out sites to provide additional protection for seals from intentional or reckless harassment. Seal haul outs are locations on land where seals come ashore to rest, moult or breed.

3. Offshore SG1A Project Key Parameters

3.1 Overview

Key Parameters of the offshore SG1A Project export cable are outlined in Table 3-1. Full details of the project description can be found in Section 3 of the EIAR.

Table 3-1 – Key Project Parameters

Export Cable Parameters	Value
Maximum number of export cables	1
Maximum number of export cable trenches	1
Anticipated cable corridor width maximum (km)	1
Anticipated working width maximum (m)	100
Anticipated buried export cable length*	Approximately 80%
Maximum rock or mattress protected length*	Approximately 20%
Temporary zone of influence during cable installation (due to plough or ROV tracks)	6-10 m
If trenched, estimated width per trench (maximum) (m)	3 m
If trenched, cable burial depth (min – max) (m)	1-3 m
If protected, maximum height (m)	1 m
If protected, maximum width (m)	6 m
Number of construction vessels for export cable installation	2

*The offshore SG1A Project will aim to maximise achievable protection by burial, but allowance is made for cable protection where burial is not possible

3.2 Embedded Mitigation Measures

The EU Court of Justice ruled in 2018 (case C-3232/17) that it is not appropriate, at the HRA screening stage, for a proposal to take account of measures intended to avoid or reduce or mitigate the harmful effect of a plan or project. On this basis, mitigation measures which will be implemented and finalised post-consent have not been considered as part of the assessment of LSE, while acknowledging that such measures are likely to reduce the environmental impact of the offshore SG1A Project. An overview of the offshore SG1A Project embedded mitigation measures that will be implemented is provided in Table 3-2. This is consistent with the mitigation provided in the EIAR.

Table 3-2 - offshore SG1A Project embedded mitigation

Measure	Details
General	
Pre-construction surveys will be conducted to inform detailed route engineering.	Appropriate pre-construction validation surveys including geophysical, geotechnical, terrestrial and benthic scopes will be conducted to confirm the locations of potentially sensitive features. Detailed route design will be informed by the survey results, and sensitive features avoided where possible.
Environmental planning.	Development and implementation of a Marine Pollution Contingency Plan (MPCP) Development and implementation of a CEMP. The CEMP will set out those responsible for overseeing work and the implementation of mitigation and good practice working methods during construction to minimise environmental effects.
Offshore	
Marine mammal mitigation.	• All vessels will be compliant with the Scottish Marine Wildlife Watching Code (NatureScot, 2017) • A marine mammal observer (MMO) will be on the geophysical survey vessel to carry out the proposed mitigation. • The MMO will conduct a pre-shooting search of a 500 m radius mitigation zone. If a marine mammal is observed survey commencement will be delayed until 20 minutes after the marine mammal has left the mitigation zone or was last observed. • Soft start procedures will be implemented by seismic survey equipment, where practical, through the uniform ramping up of power. It is acknowledged that this is not possible for some SBP equipment (i.e. it is either on or off) and such instances will be ascertained by the appointed survey contractor; and • For SBP, in relation to line change procedures, it is interpreted here that equipment should be turned off if line changes (or other pauses) are expected to be longer than 40 minutes, and also where practical if line changes/pauses are less than 40 minutes, with the above pre-shooting search and soft start procedures applying in both cases.

Measure	Details
Control measures and shipboard oil pollution emergency plans (SOPEP) will be in place and adhered to under MARPOL Annex I requirements for all vessels. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly.	As per the MARPOL 73/78 requirement under Annex I, all ships with 400 GT and above must carry an oil prevention plan as per the norms and guidelines laid down by International Maritime Organization under MEPC (Marine Environmental Protection Committee) act. Production of this plan will help to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to IMO MARPOL Annex IV Prevention of Pollution from Ships standards.	Measures will be adopted to ensure that the potential for release of pollutants from construction, operation and decommissioning is minimised.
Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (BWM Convention).	The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Marine Non-Native Species (MNNS) introduction during construction, operation and decommissioning is minimised.
Vessels will adhere to the IMO guidelines for the control and management of ships' biofouling to minimise the transfer of invasive aquatic species (Biofouling Guidelines) (resolution MEPC.207(62).	The Biofouling Guidelines provide a consistent approach to minimising the risk of MNNS introduction via biofouling on ship's hulls.
The use of external cable protection including rock berms and/or mattresses will be minimised, and only be deployed where adequate protection of the cables cannot be achieved through burial.	Cable burial is the first choice for protection, as this minimises impacts on the environment and other sea users. However, when this is not possible due to existing subsea assets, or seabed conditions, other cable protection measures may be utilised to ensure the cable is adequately protected. The preferred option for this will be rock placement.
All rock berms and external cable protection will be designed with slopes less than 1:2.5, and of suitable construction to minimise snagging risk.	Minimising disruption to commercial fisheries resulting from the installation and operation of the cables.

Measure	Details
A Fisheries Liaison Officer (FLO) will be employed to manage interactions between cable installation vessels, personnel, equipment and fishing activity. This will be managed through a Fisheries Management and Mitigation Strategy (FMMS).	Employment of a FLO will ensure all commercial fisheries operators in the vicinity of the Project will be proactively and appropriately communicated with in terms of proposed Project operations including exclusions, dates and durations.
Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, NAVTEX, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures.	Ensure navigational safety and minimise the risk and equipment snagging.
Compliance with International Regulations for the Prevention of Collision at Sea (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS).	SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the Project, compliance will ensure navigational safety and minimise the risk of equipment snagging.
As built survey data will be provided to the UKHO and Kingfisher for inclusion on Admiralty Charts and KIS-ORCA Awareness Charts.	Ensure navigational safety and minimise the risk of equipment snagging.
Crossing and Proximity agreements will be established with relevant cable and pipeline owners or operators of other assets.	These agreements will include the ability of a cable or pipeline operator to access their asset during construction if required. If such works are required to occur simultaneously, consultation with the cable or pipeline operator will be undertaken.
Protocol for Accidental Discoveries of Marine Historical Assets.	The Protocol will define procedures to be taken in the event of a discovery in order to avoid impact to any marine historic assets. Marine archaeology exclusion zones will be established where relevant, where access will be restricted.
Avoidance of any identified seabed heritage assets and geophysical anomalies.	Geophysical surveys and archaeological review of data, will allow for the avoidance of known assets and identified geophysical anomalies that are likely to be anthropogenic as the primary strategy. This will be

Measure	Details
Conduct and review marine geophysical surveys to support avoidance.	supported by a marine Protocol for accidental archaeological discoveries (mPAD), and a marine archaeological written scheme of investigation (WSI).
Protocol for Dropped Objects at Sea	Seagreen 1A will implement prevention, notification and recovery processes for Dropped Objects
Navigational safety	Appropriate lighting and marking of vessels will be implemented to minimise risk to other marine users.

3.2.1 Implementation of mitigation

To ensure implementation of the embedded mitigation in this NCA and the EIAR, the schedule of mitigation (see Section 12 of the EIAR) will be included in the offshore SG1A Project Construction Environmental Management Plan (CEMP) which will be produced prior to construction.

Any Contractor appointed to work on the offshore SG1A Project is expected to work to the offshore SG1A Project CEMP and will be required to produce a Contractor specific EMP in line with the project CEMP.

The CEMP will provide the policy and plans of how the construction and cable installation works are to be managed from an environmental perspective. The CEMP will clearly set out the lines of communication between offshore SG1A Project Management Team and Environmental Lead, and the Contractor's Management Team and their Environmental Representative. It will set out the roles and responsibilities of the various parties to with regard to ensuring that all environmental mitigation is appropriately implemented.

In addition to the CEMP, the Fisheries Liaison and Mitigation Action Plan (FLMAP) will be implemented.

4. Approach to Screening of LSE

4.1 Designated Sites

There are several of designated sites with marine components which are located along, and in the vicinity of the offshore SG1A Project export cable corridor and landfall. In addition, within the Firth of Forth there are a number of designated sites which are protected for their coastal and marine features of nature conservation importance. For the purpose of this report, only features and designated sites in the marine environment have been considered, and no onshore or intertidal features (inshore of MHWS level) are included. The types of designated site which are relevant to the offshore SG1A Project include the following:

- SPAs;
- SACs;
- pSACs;
- pSPAs;
- NCMPAs
- pNCMPAs;
- SSSIs; and
- Seal haul out sites.

4.2 Designated Site Identification

The identification of the designated sites which require assessment has been undertaken in consultation with NatureScot and MS-LOT, via the SG1A Screening Report, the Screening Opinion and on-going consultation (see Section 5 of the EIAR). The identification of designated sites was undertaken with reference to the qualifying interests/ features and associated designated sites in line with the following process:

- Identifying the range of impacts that the offshore SG1A Project could have on qualifying feature(s) of a site (impact pathways).
- Determining connectivity with the sites.

The following criteria, based on the above, was used to identify the designated sites that would require further consideration:

- SPAs and NCMPAs (including proposed and candidate sites) with breeding seabird qualifying features with Mean Maximum foraging ranges (as identified by Woodward *et al*., (2019)), that overlap with the offshore SG1A Project export cable corridor;
- SACs (including proposed and candidate sites) with harbour seal interests within 50 km of the offshore SG1A Project export cable corridor and breeding grey seal within 20 km of the offshore SG1A Project export cable corridor;

- Designated seal haul outs that overlap with or are located within 500 m of the offshore SG1A Project export cable corridor;
- SACs (including proposed and candidate sites) with otter interests that overlap with or are located within 500 m of the offshore SG1A Project export cable corridor;
- SACs and NCMPAs (including proposed and candidate sites) with cetaceans as qualifying features within 50 km of the offshore SG1A Project export cable corridor, or where the qualifying features of a designated site are known to be present within the vicinity of the works;
- SACs with Atlantic salmon and freshwater pearl mussel (which prey on salmonids) who's migrating smolts or adult salmon are likely to cross the offshore SG1A Project export cable corridor);
- SACs and NCMPAs (including proposed and candidate sites) with seabed/benthic protected features that overlap with or are located within 2 km of the offshore SG1A Project export cable corridor; and
- SSSIs within the marine environment (to MLWS) that overlap with or are located within 2 km of the offshore SG1A Project export cable corridor.

4.3 Approach to Assessment

The first stage of both the HRA and the NCMPA assessment is for the Competent Authority to conduct a screening exercise. The screening process comprises a relatively coarse filter to identify designated sites and qualifying features with potential connectivity and pathway for effect to the offshore SG1A Project for which a LSE or CoA cannot be discounted.

Once a site and its qualifying features are identified, the screening exercise considers whether or not a LSE can be foreseen, both directly and indirectly. A precautionary approach is applied during screening, and therefore unless it is possible to confidently exclude LSE, then the designated site and its features are screened into further consideration as part of the next stage (Stage 2 of the HRA and the main assessment for the NCMPA). The potential conclusions which will be drawn for each type of designated site are outlined in Table 4-1. The potential for LSE are also considered in-combination with other relevant developments.

The information in this NCA report is provided to ensure that the Competent Authority has the necessary information available to undertake the AA in line with the requirements of the HRA, but does not delineate the steps that the Competent Authority will execute.

Table 4-1 Possible conclusions drawn based on the designated site and the underlying assessment process

Designated site	Screening conclusion	
	No further assessment required	Assessment required at the next stage
SPA, pSPA, SAC, cSAC, Ramsar	No Likely Significant Effect (LSE) - There are no LSEs on the designated site(s) and their	Potential for LSE - LSEs on the designated site(s) and their qualifying features cannot be discounted

	qualifying features, therefore no further assessment is required.	and therefore an AA requires completion by the Competent Authority (CA).
NCMPA	Not Capable of Affect (CoA) - As a consequence of the offshore SG1A Project, there are no reasonably predicted effects, and/or the project is not capable of affect any protected features.	Potential CoA – Potential that the project is capable of affecting (other than insignificantly) an NCMPA protected features and therefore a main assessment is required

5. Potential Impacts

The potential effects arising from installation, maintenance and repair, operation and decommissioning phases of the offshore SG1A Project are summarised in Table 5-1. For the purposes of this report and given the information currently available with respect to decommissioning, potential impacts during this phase have been assumed to be similar or less than those predicted during the installation phase, for all qualifying features.

Table 5-1 Potential impacts from the offshore SG1A Project on designated sites and features

Receptor	Effect	Relevant Phase of offshore SG1A Project		
		Cable installation	Cable operation (Maintenance and Repair)	Cable Decommissioning
Benthic ecology	Direct habitat loss / disturbance loss of habitat	✓	✓	✓
	Temporary increase in suspended sediment concentrations and associated deposition	✓	✓	✓
	Introduction of new substrate	X	✓	X
	Increased risk of introducing or spread of invasive non-native species (INNS)	✓	X	✓
	Accidental release of pollution	✓	X	✓
Ornithology	Disturbance / displacement due to vessel presence (including noise and lighting)	✓	✓	✓
	Displacement of to increased turbidity in the water column	✓	✓	✓
	Indirect effects due to changes in distribution of prey items	✓	✓	✓
	Accidental pollution events	✓	✓	✓

Marine megafauna	Injury and/or temporary disturbance from underwater noise	✓	✓	✓
	Collision risk from vessel activities	✓	✓	✓
	Increased turbidity affecting habitat use	✓	✓	✓
	Accidental pollution events	✓	✓	✓

6. Initial Identification of Site and Features

6.1 Initial site identification

This section outlines the designated sites and their qualifying features for which there is potential connectivity with the offshore SG1A Project offshore export cable corridor, using the criteria outlined in Section 4.2. An assessment of whether each designated site requires further investigation of potential LSE/CoA is also provided, in Table 6-1.

Table 6-1 Designated sites with potential connectivity to the offshore SG1A Project

Designated site name	Designation	Qualifying feature[2]	Distance from the Project (km – at nearest point)	Requirement for further assessment
Firth of Forth Banks Complex	NCMPA	• Offshore subtidal sands and gravels; • Ocean quahog aggregations; and • Shelf banks and mounds.	0.0	The offshore SG1A Project overlaps with the NCMPA therefore **further assessment required.**
Southern Trench	pNCMPA	• Minke whale • Burrowed mud • Fronts • Shelf deeps	91.7	The offshore SG1A Project is located over 50 km (91.7km) from the pNCMPA, which protects spatially constrained habitats, hydrographic and geophysical features, as well as minke whales which capitalise on them, therefore no connectivity has been identified and **no further assessment is required.**
Isle of May	SAC	• Grey seal • Reefs	3.9	The offshore SG1A Project is located within 20 km from the SAC therefore **further assessment is required.**
Berwickshire and North Northumberland Coast	SAC	• Grey seal • Reefs	26.7	The offshore SG1A Project is not located within 20 km from the SAC and therefore is located further than 20 km away from the grey seal breeding colonies this SAC is designated for. No connectivity

[2]Qualifying features are based on the EC's criteria of using A, B, or C gradings for population size / density, and representivity of a habitat type (see page 4 of https://ec.europa.eu/environment/nature/natura2000/management/docs/commission_note/commission_note_EN.pdf)

				has been identified and **no further assessment is required.**
Firth of Tay and Eden Estuary	SAC	• Estuaries • Harbour Seal (*Phoca vitulina*) • Intertidal mudflats and sandflats • Subtidal sandbanks	30	No connectivity has been identified with regards to the habitats included as qualifying features of this site; however, the location of this site within 50 km of the offshore SG1A Project **requires further assessment** of impacts to harbour seals as a qualifying feature.
River Teith	SAC	• River lamprey • Brook lamprey • Sea lamprey • Atlantic salmon	55.0	The offshore SG1A Project is located over 50 km from the SAC, and on the basis of the typical migration route extent and pathway for the designated features, the localised and short-term duration of the offshore SG1A Project installation, and the low likelihood of direct use of the SG1A export cable corridor for this life stage of salmonids, no connectivity has been identified and **no further assessment is required.**
Moray Firth	SAC	• Subtidal sandbanks (Sandbanks which are slightly covered by sea water all the time) • Bottlenose dolphin	147.7	The bottlenose dolphin population which is protected by this site comprises the Coastal East Scotland Management Unit (IAMMWG, 2015). The site has been designated to protect the approximately 195 individuals in this Management Unit which remain resident to the coastal waters of the Moray Firth. Although individuals from the site may intermittently form smaller pods which transit along the coastline of northeast Scotland, particularly to the Tay Estuary (JNCC, 2021; Hague *et*

				al., 2020), it is highly unlikely that this protected population will utilise the offshore waters of the offshore SG1A Project given its distance from shore (i.e. > 10 km) and their largely coastally-constrained habitat use (e.g. approximately 2 km from shore; water depths ≤ 20 m; Hague *et al.*, 2020). Moreover, bottlenose dolphin occurrence within the project area in the southern Firth of Forth is even less likely, as this is considered the southernmost extent of the management unit and dedicated visual survey and acoustic monitoring data indicates very low bottlenose dolphin habitat use within this area. The Firth of Forth has not been recommended as an area of consideration for cable landfall use as has the Tay Estuary and St Andrews Bay area to the north of the Project area's proposed landfall (Hague *et al.*, 2020). Given the distance of the offshore SG1A Project from the SAC and the primary habitat identified for the species it protects, no connectivity has been identified for any qualifying feature and **no further assessment is required.**
Forth Islands	SPA	Qualifying Species: Breeding: • Arctic tern (*Sterna paradisaea*) • Common tern (*Sterna hirundo*) • Cormorant (*Phalacrocorax carbo*) • Gannet (*Morus bassanus*) • Common guillemot (*Uria aalge*)	0.0	The offshore SG1A Project overlaps with the SPA therefore **further assessment required on seabird qualifying interests.**

		• Herring gull (*Larus argentatus*) • Kittiwake (*Rissa tridactyla*) • Lesser black-backed gull (*Larus fuscus*) • Atlantic Puffin (*Fratercula arctica*) • Razorbill (*Alca torda*) [redacted] • Sandwich tern (*Sterna sandvicensis*) • European shag (*Phalacrocorax aristotelis*)		
Outer Firth of Forth and St Andrews Bay	SPA	Qualifying interests: Breeding: • Arctic tern • Atlantic puffin (*Fratercula arctica*) • Common guillemot (*Uria aalge*) • Common tern • European shag • Herring gull • Kittiwake • Manx shearwater (*Puffinus puffinus*) • Northern gannet Non-breeding: • Black-headed gull (*Chroicocephalus ridibundus*) • Common eider (*Somateria mollissima*) • Common goldeneye (*Bucephala clangula*)	0.0	The offshore SG1A Project overlaps with the SPA therefore **further assessment required on seabird and waterfowl qualifying interests.** However, it is considered that works in relation to the offshore SG1A export cable do not have potential to effect waders therefore these are not considered further in this report (covered in Seagreen 1A EIAR Volume 4: Technical Appendices (LF000012-CST-ON-LIC-DEV-REP-0004)).

		• Common guillemot • Common gull (*Larus canus*) • Common scoter (*Melanitta nigra*) • European shag • Herring gull • Kittiwake • Little gull (*Hydrocoloeus minutus*) • Long-tailed duck (*Clangula hyemalis*) • Razorbill • Red-breasted merganser (*Mergus serrator*) • Red-throated diver (*Gavia stellata*) • Slavonian grebe (*Podiceps auratus*) • Velvet scoter (*Melanitta fusca*) • Waterfowl assemblage		
Firth of Forth	SPA	Non-breeding: • Bar-tailed godwit (*Limosa lapponica*) • Common scoter • Cormorant • Curlew (*Numenius arquata*) • Dunlin (*Calidris alpina alpina*) • Common eider • Golden plover (*Pluvialis apricaria*) • Common goldeneye (• Great-crested grebe (*Podiceps cristatus*) • Grey plover (*Pluvialis squatarola*) • Knot (*Calidris canutus*) • Lapwing (*Vanellus vanellus*)	0.0	The offshore SG1A Project overlaps with the SPA therefore **further assessment required waterfowl qualifying interests.** However, it is considered that works in relation to the offshore SG1A export cable do not have potential to effect waders therefore these are not considered further in this report (covered in Seagreen 1A EIAR Volume 4: Technical Appendices (LF000012-CST-ON-LIC-DEV-REP-0004)).

		• Long-tailed duck • Mallard (*Anas platyrhnchos*) • Oystercatcher (*Haematopus ostralegus*) • Pink-footed goose (*Anser brachyrhynchus*) • Red-breasted merganser • Common redshank (*Tringa totanus*) • Red-throated diver • Ringed plover (*Charadrius hiaticula*) • Sandwich tern • Scaup (*Aythya marila*) • Shelduck (*Tadorna tadorna*) • Slavonian grebe • Turnstone (*Arenaria interpres*) • Velvet scoter • Wigeon (*Anas penelope*) • Waterfowl assemblage		
Imperial Dock Lock, Leith	SPA	Breeding: • Common tern	11	Potential moderate connectivity has been identified with regard to breeding common tern qualifying feature. However, this species has low vulnerability to the potential effects of the offshore SG1A Project disturbance effects and so **no further assessment is required**.
St. Abb's Head to Fast Castle	SPA	Qualifying features: Breeding: • Common guillemot	27	Potential moderate connectivity has been identified with regard to breeding qualifying features. However, species have low vulnerability to the potential effects of the offshore SG1A Project

		• Herring gull • Kittiwake • Razorbill • Seabird assemblage • European shag		disturbance effects and so **no further assessment is required**.
Firth of Tay and Eden Estuary	SPA	Qualifying features: Breeding: • [redacted] Non-breeding: • Bar-tailed godwit • Common redshank • Greylag goose • Pink-footed goose • Velvet scoter • Cormorant • Shelduck • Common eider • Common scoter • Black-tailed godwit • Common goldeneye • Red-breasted merganser • Goosander • Oystercatcher • Grey plover • Sanderling • Dunlin	30	The offshore SG1A Project lies 30 km outside Firth of Tay and Eden Estuary. Low level exchange of individuals of some species between regional sites is to be expected but no effect considered likely due to the small scale works of the offshore SG1A project. Therefore, **no further assessment is required.**

		• Long-tailed duck		
Montrose Basin	SPA	Qualifying features: Non-breeding: • Dunlin • Common eider • Greylag goose • Knot • Oystercatcher • Pink-footed goose • Common redshank • Shelduck • Waterfowl assemblage • Wigeon	38	The offshore SG1A Project lies more than 30 km outside Montrose Basin. Low level exchange of individuals of some species between regional sites is to be expected but no effect considered likely due to the small scale works of the offshore SG1A project. Therefore, **no further assessment is required.**
Craigleith	Seal haul out	Breeding Colony Seal Haul Out	2.0	The offshore SG1A Project is located over 500 m from the seal haul out therefore no connectivity, in line with standard guidance and regulations on seal haul out protection has been identified and **no further assessment is required.**
Inchkeith	Seal haul out	Breeding Colony Seal Haul Out	12.3	The offshore SG1A Project is located over 500 m from the seal haul out therefore no connectivity, in line with standard guidance and regulations on seal haul out protection has been identified and **no further assessment is required.**
Kinghorn Rocks	Seal haul out	Seal Haul Out	15.1	The offshore SG1A Project is located over 500 m from the seal haul out therefore no connectivity, in

				line with standard guidance and regulations on seal haul out protection has been identified and **no further assessment is required.**
Inchmickery and Cow & Calves	Seal haul out	Seal Haul Out	17.4	The offshore SG1A Project is located over 500 m from the seal haul out therefore no connectivity, in line with standard guidance and regulations on seal haul out protection has been identified and **no further assessment is required.**
Firth of Forth	SSSI	Notified Natural Features: • Coastal geomorphology of Scotland; • Carboniferous – Permian Igneous; • Maritime cliff; • Mineralogy of Scotland; • Mudflats; • Lower Carboniferous (Dinantian - Namurian (part)) • Quaternary of Scotland; • Saltmarsh; • Sand dunes; and • Upper Carboniferous (Namurian (part) – Westphalian) Additionally, all bird species named under the Firth of Forth SPA are also protected under the SSSI.	0.0	The offshore SG1A Project export cable corridor offshore of MHWS has no connectivity to intertidal or terrestrial features for which the SSSI is designated. All bird species which are protected have been considered as part of the SPA assessment of LSE, and therefore **no further assessment is required.**

6.2 Sites and features taken forward for further assessment

The consultation feedback which was provided from NatureScot and MS-LOT, to the SG1A Screening Report (see Section 5 of the EIAR), for the offshore SG1A Project has informed the identified of designated sites which the competent authority and its statutory advisors consider should be assessed in the NCA Report. A review of all designated sites which have the potential to have connectivity with the offshore SG1A Project (Table 6-1) has been undertaken. The designated sites that have taken forward for further assessment of LSE and CoA are presented within Table 6-2. Figure 6-1 presents all designated sites which have been considered in the NCA Report.

In relation to potential CoA or LSE which could result from activities required to decommissioning of the cable, a decommissioning programme will be prepared at the appropriate time. The programme will be developed based on technological, legislative and environmental requirements at the time. The impacts which could occur as a result of offshore SG1A Project decommissioning activities are expected to be similar, and less significant, than those predicted during installation for all designated sites and features.

Table 6-2 Designated sites where further assessment is required in relation to the offshore SG1A Project

Name	Designations	Features requiring further assessment	Relevant section of this report
Firth of Forth Banks Complex	NCMPA	Ocean quahog aggregations.	Section 6.2
Forth Island	SPA	All qualifying features (see list in Table 6-1).	Section 8.1
Outer Firth of Forth and St Andrews Bay	SPA	All seabird and waterfowl qualifying features (see list in Table 6-1).	Section 8.1.2
Firth of Forth	SPA	All waterfowl qualifying features (see list in Table 6-1).	Section 8.3
Isle of May	SAC	Grey seals	Section 9.1
Firth of Tay and Eden Estuary	SAC	Harbour seals	Section 9.2

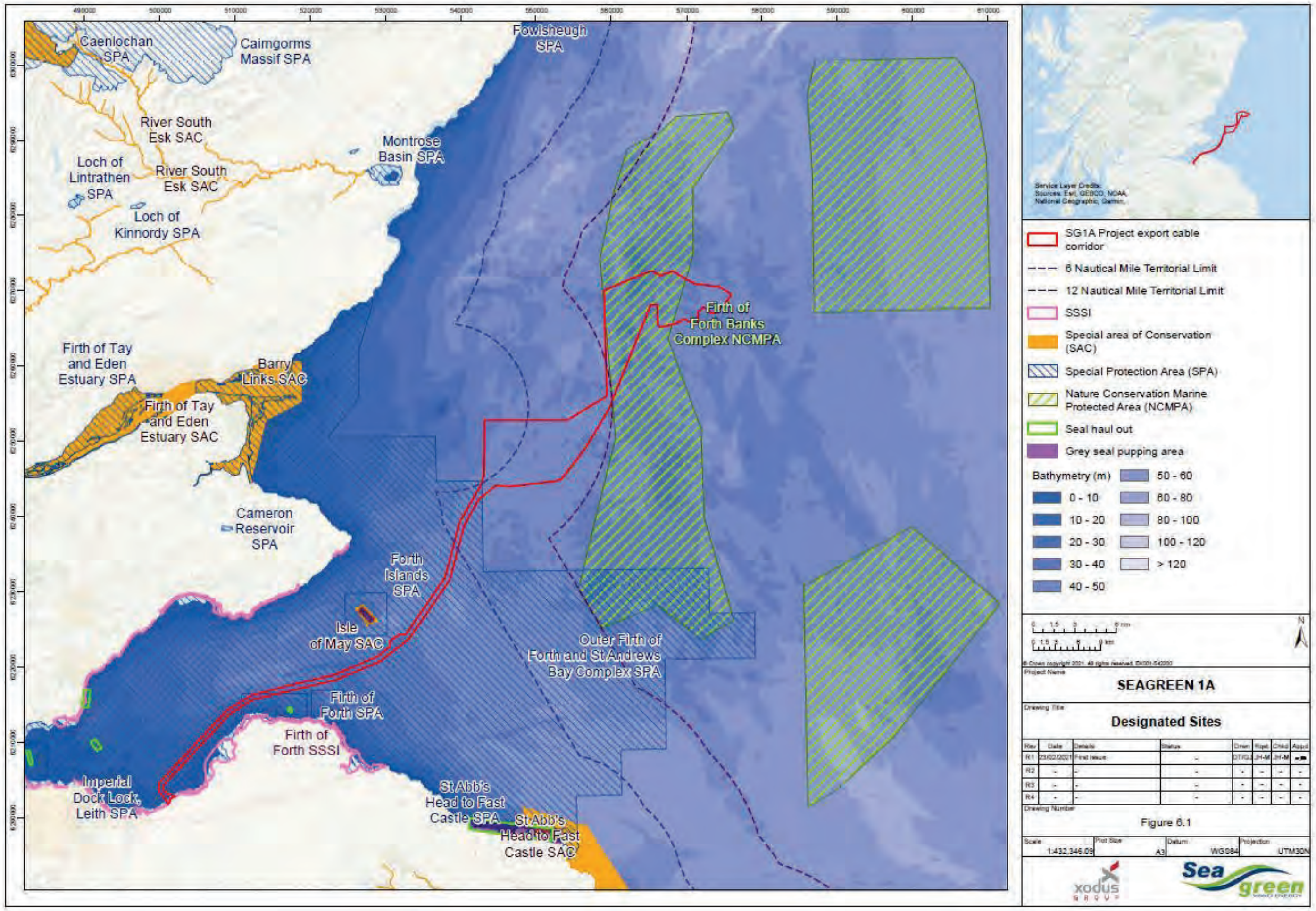

Figure 6-1 Designated sites located in the vicinity of the offshore SG1A export cable corridor

7. Benthic Ecology

7.1 Firth of Forth Banks Complex NCMPA – CoA Assessment

The northeastern part of the offshore SG1A Project lies within the Firth of Forth Banks Complex NCMPA (Figure 6-1) which is designated for the following biodiversity features; Offshore subtidal sands and gravels, Ocean quahog (*Arctica islandica*) aggregations and Shelf banks and mounds (JNCC, 2020).

As part of the evidence base for the Firth of Forth Banks Complex NCMPA, JNCC commissioned an analysis of benthic grab data collected at the site location in 2011 (Pearce *et al.*, 2014). The report provides information on sediment physical characteristics, faunal assemblages, and the assignment of a biotope to each of the faunal samples, including the proposal of new biotopes based on the information gathered during the survey. The study also identified the occurrence within the survey area of features of conservation interest including Annex I habitats, NCMPA search features and rare or alien species. The data which was gathered and analysed provides important information that has been used to inform the baseline for impact assessments in this area.

Conservation objective:

- *The aim is to conserve the protected features that are present within the NCMPA.*

7.1.1 Construction, installation and decommissioning

7.1.1.1 Direct habitat loss / disturbance loss of habitat

The various seabed preparation, cable installation, cable protection and decommissioning methods in direct contact with the seabed have the potential to impact on the benthic species and habitats directly within the offshore SG1A Project footprint.

As detailed in Section 3 of the EIAR several installation and cable protection methods are being considered, and will be defined once the installation contractor is in place and the full geophysical survey results are analysed. The indicative programme for the offshore SG1A Project installation period is Q2/Q3 2023, and is estimated to be a total of 105 days including pre-installation seabed preparation and installation of any protection which is required (excluding weather downtime).

A combination of jetting, ploughing or mechanical trenching techniques are likely to be used. The anticipated offshore SG1A export cable burial depth will be between 1 m and 3 m depending on ground conditions. If buried, the estimated maximum trench width of any trench in place during installation of the cable is 3 m and depending on the installation methods used, temporary direct impacts may occur within an anticipated maximum working width of 100m around the installation works. The offshore SG1A export cable corridor comprises a maximum overlap of 3.8% of the NCMPA, however the maximum width of the temporary zone of influence, due to plough or Remotely Operated Vehicle (ROV) tracks, will be approximately 10m. Further direct impacts may occur during the placement of mechanical protection (estimated to be required for up to 20% of the cable length) over a maximum width of 6 m in localised small sections of the cable, and from the use of anchors by the cable installation vessels. The post-installation inspection surveys will inform the identification of areas of cable which require additional protection. Further information is provided in the project description within the Screening Report (SG1A, 2020) and the EIAR (LF000012-CST-OF-LIC-DEV-REP-0003).

The benthos of the offshore SG1A Project area is well understood from comprehensive surveys which have been conducted to inform the EIA and site investigations of other developments, and nearby areas of similar water depth and seabed type. The offshore SG1A Project also completed a validation benthic survey in December 2020[3], initial results from which are consistent with previous findings.

As mentioned above, the Firth of Forth Banks Complex NCMPA is protected for the presence of ocean quahog. This species is sensitive to direct habitat loss as they are understood to have low resilience to loss of habitat. Direct loss or disturbance to ocean quahog aggregations will be limited to the footprint of the offshore SG1A Project export cable corridor. The footprint of the offshore SG1A Project export cable corridor in the Firth of Forth Banks Complex NCMPA is expected to be 81.84 km^2, which represents 3.8% of the designated site. Any disturbance from the installation or decommissioning of the offshore SG1A Project will be short-term and localised. In consideration of this localised area of potential disturbance in relation to the areas of ocean quahog formations, it is unlikely to adversely affect the ocean quahog population (MarLIN, 2020). Therefore, the impact is expected to be low and the Conservation Objectives of the NCMPA will not be compromised by the proposed cable installation works.

Due to the localised impact footprint the offshore SG1A Project, and temporary and short-term nature of the effect, is not considered capable of significantly affecting the protected features of the designated site. The ocean quahog aggregations located outside of the footprint of the offshore SG1A Project will remain unaffected.

The offshore SG1A Project is therefore **not considered CoA**, other than insignificantly, the protected features of the Firth of Forth Banks Complex NCMPA as a result of disturbance, loss, or habitat loss**.**

7.1.1.2 Temporary increase in suspended sediment concentrations and associated deposition

Installation activities and the placement of cable protection materials on the seabed may result in the resuspension of sediments, which will settle to the seabed over a wider area and have the potential to impact benthic communities by smothering and temporary increases in suspended sediment concentrations.

The main project activity that has the potential to cause seabed disturbance is the installation or decommissioning of the cable, which may result in a temporary and localised increase in suspended

[3] Further information is provided in Section 3.8 of the SG1A EIAR (LF000012-CST-OF-LIC-DEV-REP-0003)

sediment concentrations (SSC). During installation, coarser fractions of sediment up to and including fine sand, which may be raised a few metres from the seafloor as a result of installation activities will be re-deposited within 10 m or less of the cable (Gooding *et al*., 2012). Finer silt fractions will remain in suspension for longer and concentrations are expected to fall to ambient levels within 70 m of the cable, with fine deposition occurring out to a maximum of 2- 3 km from the cable (Gooding *et al*., 2012; SG1A Screening Report; SG1A, 2020). The resulting sediment deposition thickness over the sediment plume footprints, would be indiscernible at the greatest distance to only a few centimetres beyond the export cable corridor (SG1A Screening Report; Xodus Group, 2020). There is the potential for smothering to occur in the immediate footprint of the cable however, ocean quahog has shown high resistance and resilience to heavy smothering (MarLIN, 2020). Laboratory experiments have found ocean quahog may take many days to reach the surface of sediments, but no mortality was seen. Additionally, in field conditions an increase in sediment smothering was found to have no effect on the population or growth (Powilliet *et al*., 2006;2009).

The offshore SG1A Project is therefore **not considered CoA**, other than insignificantly, the protected features of the Firth of Forth Banks Complex NCMPA as a result of a temporary increase in suspended sediment and associated smothering**.**

7.1.1.3 Increased risk of introducing or spread of invasive non-native species (INNS)

INNS are species that have been introduced, either intentionally or unintentionally, to areas outside their natural range. They-out compete and replace natural native flora and fauna, and in doing so, can negatively affect native species, regional ecosystems and economies (Cook *et a*l., 2014).

Proposed project activities such as vessel activity may introduce INNS into Scottish waters as INNS can get attached to the installation, survey vessels hulls, or may be present in ballast water.

An INNS management plan / biosecurity plan for vessels will be developed as part of the Construction Environment Management Plan (CEMP), in line with best practice guidance where relevant (Cook *et a*l., 2014) and the IMO Ballast Water Convention (IMO, 2004). The CEMP will be provided to MS-LOT prior to marine installation activity commencing. Contractors will be required to adhere to the INNS management plan, and this implementation will ensure that any risks of introducing INNS is reduced as much as possible. Measures that are relevant to the Ballast Water Management Convention and to the IMO control and management of ships' biofouling guidance will be implemented.

The offshore SG1A Project is therefore **not considered CoA** other than insignificantly, the protected features of the Firth of Forth Banks Complex NCMPA as a result of an increased risk of INNS**.**

7.1.1.4 Accidental release of pollution

A significant release of pollutants could result in an impact upon benthic communities. The potential for accidental fuel release resulting in a pollution event as a result of the offshore SG1A Project is very low. In the event of an accidental fuel release occurring, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are laid out in the Schedule of Mitigation and the CEMP. For all vessels over 400 GT (gross tonnage) a Shipboard Oil Pollution Emergency

Plan (SOPEP) will be in place. All offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL).

The offshore SG1A Project is therefore **not considered CoA** the protected features of the Firth of Forth Banks Complex NCMPA as a result of an accidental release of pollution.

7.1.2 Operation (including maintenance and repair)

7.1.2.1 Habitat loss/disturbance or increases in suspended sediment

Once installed, submarine cables generally do not require high levels of routine maintenance other than confirming that there are no areas of exposure or significant movements indicative of external influence. Operation, Inspection and maintenance of the cables after installation can be found in Section 3 of the EIAR.

The potential effects of seabed disturbance and suspended sediment which could be associated with repair and remediation activities are expected to be less than those resulting from installation, and is anticipated to be minimal. All maintenance activities will be subject to the same management procedures in relation to INNS and accidental pollution.

The offshore SG1A Project is therefore **not considered CoA**, other than insignificantly, the protected features of the Firth of Forth Banks Complex NCMPA during operation.

7.1.2.2 Introduction of new substrate

The offshore SG1A export cable will be buried where possible, and at an estimated minimum of 80% of its length. The seabed in these cases is expected to return to its original condition and areas where infrastructure is present is understood from preliminary research to support an ecologically similar assemblage of benthic species (Sheehan *et al.,* 2020), with recovery and re-colonisation commencing immediately following cable installation (Kraus and Carter, 2018). Where burial to target depths is not achieved, mechanical cable protection may be required consisting of rock placement, concrete mattresses or grout bags, in discrete localised areas over up to 20% of the offshore SG1A Project export cable corridor.

Based on desktop study using seabed data available in the public domain, it is expected that the offshore SG1A export cable which is located within the Firth of Forth Banks Complex NCMPA will be buried completely and no mechanical protection is expected to be required. In order to assess the worst case scenario however, further information is provided here.

The sections of the offshore SG1A export cable which are expected to require mechanical protection are those where there are technical difficulties in burying the cable to the target depth of burial, for example areas of hard substratum or over existing installed cables and pipelines. In these areas where natural seabed habitat will be buried beneath the mechanical protection. Rock placement is the preferred protection method which is expected to be formed of a berm of graded rock (5”-8”) at a height of up to 1 m and a width of up to 6 m. The deposited protection materials will be different from the natural seabed

however, in most cases, the protective materials are not expected to create a substantial variation to the baseline habitat conditions.

On the basis of the localised maximum extent of any installed mechanical protection, in reference to the baseline environmental conditions where this protection is expected to be installed, and the expectation that the offshore SG1A export cable will be buried entirely within the Firth of Forth Banks NCMPA, the offshore SG1A Project is **not considered CoA**, other than insignificantly, via introduction of new substrate to the protected features of the Firth of Forth Banks Complex NCMPA.

7.2 In-combination

The section of the offshore SG1A export cable corridor which overlaps with the Firth of Forth Banks Complex NCMPA overlaps with the consented Seagreen Project offshore windfarm site. Therefore, there is the potential for an in-combination effect on benthic ecology features. The worst case scenario in relation to benthic ecology features of the NCMPA would be consecutive installation periods, which would extend the duration of any habitat disturbance. As detailed in section 7.1.1, the offshore SG1A installation period will be temporary in nature, short term in duration and localised to the area of seabed in which the installation activities are occurring which has a small zone of influence for benthic ecology features of the NCMPA.

On this basis, it is unlikely that the offshore SG1A Project will lead to in-combination effects to the impacts which may result from the consented Seagreen OWF installation activities.

In relation to the Firth of Forth SSSI, as there is no potential connectivity to terrestrial or intertidal features of the, there is no pathway for in-combination effects.

7.3 Conclusion

A summary of the assessment of the CoA on designated sites with benthic ecology features in relation to the offshore SG1A Project is shown in Table 7-1.

Table 7-1 Summary of potential for CoA on designated sites with benthic ecology qualifying features

Designated site	Potential effect	Conclusion (all phases)
Firth of Forth Banks Complex NCMPA	Direct habitat loss / disturbance loss of habitat	Not CoA
	Temporary increase in suspended sediment concentrations and associated deposition	Not CoA
	Increased risk of introducing or spread of invasive non-native species (INNS)	Not CoA
	Accidental release of pollution	Not CoA
In combination	No pathway for effect	

8. Marine Ornithology

8.1 Forth Islands SPA – Assessment of LSE

The Forth Islands SPA is located on the east coast of Scotland. It covers an area of approximately 98 km^2 and comprises of islands in the Firth of Forth supporting seabird colonies, including Inchmickery, Isle of May, Fidra, The Lamb, Craigleith, Bass Rock and Long Craig. The SPA includes marine extensions up to approximately 3 km around the islands. The SPA is home to The SPA regularly supports in excess of 20,000 individual seabirds in the breeding season including several species that occur in internationally important numbers (NatureScot, 2009).

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- *Population of the species as a viable component of the site*
- *Distribution of the species within site*
- *Distribution and extent of habitats supporting the species*
- *Structure, function and supporting processes of habitats supporting the species*
- *No significant disturbance of the species.*

8.1.1 Construction, installation and decommissioning

8.1.1.1 Disturbance /displacement due to vessel presence (including noise and lighting)

There is the potential that the installation and decommissioning of a subsea cable such as the offshore SG1A Project and the associated work vessel presence and activity may disturb seabirds and displace them from foraging or resting habitat , effectively resulting in localised habitat loss during the period of disturbance (Drewitt and Langston, 2006). Disturbance/displacement can potentially affect birds' productivity and survival chances.

The vulnerability of the qualifying features of the Forth Islands SPA to vessel disturbance are provided in Table 8-1.

Table 8-1 Vulnerability of qualifying features to vessel disturbance

Species	Vulnerability to vessel disturbance [4]
Gannet	Low
Cormorant	Moderate
European shag	Moderate
Kittiwake	Low
Herring gull	Low
Atlantic puffin	Moderate
Guillemot	Moderate
Razorbill	Moderate
Common tern	Low
Sandwich tern	Low
Arctic tern	Low
Roseate tern	Low
Lesser black-backed gull	Low

Disturbance to seabirds will be restricted to the offshore SG1A Project export cable corridor footprint and at any one time to the immediate vicinity of the offshore SG1A Project vessels during installation or decommissioning. As detailed in Section 3, there will be a maximum of two vessels on site at any one time during installation of the offshore SG1A export cable. By nature of their activity offshore SG1A Project vessels will be slow moving (at a maximum of a few knots) or static when conducting operations.

The area within which birds may be disturbed due to vessel movements and activity (e.g., by visual disturbance, noise and night time lighting) is considered to be very small in the context of the potential foraging ranges of the SPA qualifying species Therefore, at any one time, disturbance is likely to affect only a very small proportion of SPA individuals and affected individuals would have large areas of nearby alternative foraging habitat they could use. Disturbance which is associated with vessel presence or activity will be short-term and temporary events, as vessels move through an area. Any disturbance which is

[4] Vulnerability has been assigned based on Garthe and Hüppop, 2004; Furness *et al*.,2012;2013; Jarret *et al*., 2018; Goodship and Furness; 2019.

associated with the offshore SG1A Project during any phase are therefore considered unlikely to affect the breeding productivity or survival rates of the individuals affected or the SPA population.

There is a relatively high baseline level of vessel activity in the Firth of Forth (see Section 10S: Shipping and Navigation of the EIAR LF000012-CST-OF-LIC-DEV-REP-0003), including in the marine extensions of the Forth Islands SPA. On this basis, the individuals of Forth Islands SPA qualifying species which use the offshore SG1A Project corridor are expected to experience relatively high levels of potential disturbance from baseline vessel activity. The potential disturbance/displacement resulting from the activity of up to two offshore SG1A Project construction vessels in areas with high baseline marine traffic is unlikely to cause detectable or more than negligible additional disturbance to Forth Islands SPA seabirds.

Any effects from this disturbance/displacement of seabirds which occur are expected to be reversible following the completion of construction work. In addition, for all phases of offshore SG1A Project, affected birds are expected to quickly return to areas once vessel activity there ceases. This, combined with the highly localised nature of disturbance, means there would be no repeated disturbance over a wide area or extended period due to the offshore SG1A project. Therefore, **no LSE is predicted.**

8.1.1.2 Displacement due to increased water turbidity

The installation or decommissioning of the offshore SG1A export cable will result in a temporary and localised increase in suspended sediment concentrations (SSC), leading to increases in water turbidity. As a result of installation or decommissioning activities, coarser fractions of sediment up to and including fine sand, may be raised a few metres from the seafloor and re-deposited within 10 m (Gooding *et al*., 2012). Finer silt fractions will be suspended for longer, but concentrations are expected to fall to ambient levels within 70 m of the cable (Gooding *et al*., 2012; SG1A Screening Report; SG1A, 2020). Therefore, any increases in turbidity will be highly localised, particularly for coarser sediments, and will be short-term and temporary in duration, and at any one time affecting only a very small proportion of the SPA.

The increase in water turbidity has the potential to effect diving birds that visually hunt demersal or benthic prey. The likely consequence of turbidity increases on diving species will be small-scale displacement movements to alternative foraging areas. Given the nearby (<100 m away) availability of unaffected waters, it is considered unlikely that affected individuals would attempt to continue foraging in highly turbid water if this results in significantly reduced hunting success. The areas potentially affected by increased water turbidity and the timing of occurrence, will correspond very closely to the location and timing of offshore SG1A Project vessel activity. Indeed, the individual birds potentially affected by turbidity increases are considered likely to show a disturbance response to the vessel activity and therefore already be displaced from the areas potentially affected by turbidity. For this reason, it is considered that increased water turbidity is unlikely to lead to displacement that is additional to that caused by vessel disturbance.

The impact of displacement caused by increased water turbidity is therefore considered to be localised in spatial extent, short term in duration, intermittent and with high reversibility, and not be additional to the displacement cause by vessel disturbance. Therefore, **no LSE is predicted.**

8.1.1.3 Indirect effects due to changes in distribution of prey items

Potential impacts to fish and shellfish species (including bird prey species) which may result from the offshore SG1A Project effects such as EMF, noise and barrier effects to migratory fish species have been assessed within the EIAR and are not considered further here. The EIAR confirms that all potential impacts to fish and shellfish species will be not significant in EIA terms.

The main impact on bird prey species due to the offshore SG1A Project is likely to be caused by physical disturbance to the seabed during cable installation and decommissioning. Bird species which target benthic prey such as sand eels and bivalve molluscs are thus potentially vulnerable to seabed disturbance affecting their prey.

Within the Forth Islands SPA potentially sensitive bird species to indirect effects due to changes in distribution of prey include the guillemot, gannet, kittiwake, razorbill, and Atlantic puffin (NatureScot, 2009; Cook & Burton, 2010). Key prey species for these birds include sandeel, small crustaceans and mollusc species. All birds species which feed primarily on fish prey are considered to have low sensitivity.

Seabed disturbance caused by the offshore SG1A Project during any phase will be temporary, localised to the export cable corridor (the width of disturbance is unlikely to exceed 6 m, see Section 3 Table 8-2, however the maximum width of the temporary zone of influence, due to plough or Remotely Operated Vehicle (ROV) tracks, will be approximately 10m) and short term in duration. This could cause a correspondingly localised reduction in benthic prey available to birds. However, the reduction in prey availability would be temporary only because full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA.

Considering the localised and temporary nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.1.1.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollutant release as a result of the offshore SG1A Project is very low. In the event of an accidental pollution release occurring, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are provided in Section 3. For all vessels over 400 GT (gross tonnage) a Shipboard Oil Pollution Emergency Plan (SOPEP) will be in place. All offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL). In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted.**

8.1.2 Operation (Including maintenance and repairs)

8.1.2.1 Disturbance / displacement due to vessel presence (including noise and lighting)

Once installed, submarine cables generally do not require high levels of routine maintenance other than confirming that there are no areas of exposure or significant movements indicative of external influence. It is expected that in addition to the post-installation survey, where needed further surveys will be conducted to monitor the behaviour of the installed offshore SG1A export cable and the seabed.

Operation and maintenance vessels would be expected to be on location a brief period (a matter of weeks in most cases). Vessel movements would be limited during this time and the vessel will be stationary while operating on site, except when transiting to and from port.

Vessel disturbance during operation will be the same in nature but of less frequency and duration that during construction, where no LSE is predicted. Considering this, and the temporary, reversible and short-term nature of vessel presence associated with the operational phase, **no LSE is predicted.**

8.1.2.2 Displacement due to increased water turbidity

Sediment disturbance from any cable repair and remediation activities associated with offshore SG1A Project could occur from the excavation of the damaged cable from the seabed and the installation of a new section of cable onto the seabed. The increase in water turbidity which would be associated with these actions is anticipated to be less than that associated with construction. Increases in turbidity will be both limited to the section of cable that requires maintenance and the vicinity of the cable. Therefore, on this basis, **no LSE is predicted.**

8.1.2.3 Indirect effects due to changes in distribution of prey items

In relation to the offshore SG1A Project operational phase, the main potential impacts to prey species which forms a pathway for LSE to the Conservation Objectives of the Forth Islands SPA, is the presence of mechanical protection (e.g. rock placement).

Based on desktop study using seabed data available in the public domain, it is expected that the offshore SG1A export cable which is located within the Forth Islands SPA will be buried and no mechanical protection is expected to be required. In the interest of conservative assessment however, further consideration has been made as to the LSE.

The sections of the offshore SG1A export cable which are expected to require mechanical protection are those where there are technical difficulties in burying the cable to the target depth of burial, for example areas of hard substratum or over existing installed cables and pipelines. In these areas where natural seabed habitat will be buried beneath the mechanical protection. Rock placement is the preferred protection method which is expected to be formed of a berm of graded rock (5”-8”) at a height of up to 1 m and a width of up to 6 m. The deposited protection materials will be different from the natural seabed

however, in most cases, the protective materials are not expected to create a substantial variation to the baseline habitat conditions.

The reduction in prey availability would be temporary only because full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA.

Considering the localised nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.1.2.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollution as a result of the offshore SG1A Project is very low as the cable maintenance vessels will comply with the requirements of the MARPOL international convention, as well as best practice for works in the marine environment. Leaching of chemical pollutants from the cable is also considered to be highly unlikely given the use of modern cable materials and protection. In the event of an accidental pollution event, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are laid out in Section 3 and for all vessels over 400 GT a SOPEP will be in place. In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted**.

8.2 Outer Firth of Forth and St Andrews Bay Complex SPA – Assessment of LSE

The Outer Firth of Forth and St Andrews Bay Complex SPA is located off the south-east coast of Scotland. It covers an area of c. 2,721 km^2 including the Firth of Forth, the outer Firth of Tay and St Andrews Bay. The Outer Firth of Forth and St Andrews Bay Complex SPA supports a large and diverse marine bird assemblage and is designated for the protection of 21 seabird and waterbird species (JNCC, 2020).

The Outer Firth of Forth and St Andrews Bay Complex SPA provides protection for feeding, moulting and roosting habitat for various non-breeding inshore waterfowl qualifying species (red-throated diver, Slavonian grebe, common eider, long-tailed duck, common scoter, velvet scoter, common goldeneye and red-breasted merganser). The SPA also protects foraging habitat for various non-breeding (wintering or passage) seabird species (common guillemot, razorbill, shag, kittiwake, black-headed gull, common gull, herring gull and little gull). The SPA supports more than 35% of the common eider and over 23% of the velvet scoter British wintering populations, along with the largest Scottish concentrations of wintering red-throated diver and passage little gull (JNCC, 2020).

During the breeding season, the Outer Firth of Forth and St Andrews Bay Complex SPA provides feeding grounds for an assemblage of over 100,000 seabirds. To a large extent these are same species and individuals that breed on the Forth Islands SPA. The qualifying breeding seabird species are: Arctic tern, common tern, European shag, northern gannet, Atlantic puffin, black-legged kittiwake, Manx shearwater, common guillemot and herring gull. The SPA hosts the largest concentration of breeding common terns in Scotland (JNCC, 2020).

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, subject to natural change, thus ensuring that the integrity of the site is maintained in the long-term and it continues to make an appropriate contribution to achieving the aims of the Birds Directive for each of the qualifying species.

This contribution would be achieved through delivering the following objectives for each of the site's qualifying features:

- *Avoid significant mortality, injury and disturbance of the qualifying features, so that the distribution of the species and ability to use the site are maintained in the long-term;*
- *To maintain the habitats and food resources of the qualifying features in favourable condition.*

8.2.1 Construction, installation and decommissioning

8.2.1.1 Disturbance / displacement due to vessel presence (including noise and lighting)

There is the potential that the installation, or decommissioning of a subsea cable such as the offshore SG1A Project and the associated work vessel presence and activity may disturb seabirds and waterfowl inhabiting the area and displace them from foraging or resting habitat effectively resulting in localised habitat loss or during the period of disturbance (Drewitt and Langston, 2006). Disturbance/displacement can potentially affect a birds' productivity and survival changes.

The vulnerability of the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA to vessel disturbance are provided in Table 8-3.

Table 8-3 Vulnerability of qualifying features to vessel disturbance

Species	Vulnerability to vessel disturbance
Common eider	High
Long-tailed duck	High
Common scoter	Very high
Velvet scoter	Very high
Common goldeneye	High
Red-breasted merganser	High
Red-throated diver	Very high
Manx shearwater	Low
Gannet	Low
European shag	Moderate
Great-crested grebe	Moderate
Slavonian grebe	Moderate
Herring gull	Low
Atlantic puffin	Moderate
Guillemot	Moderate
Razorbill	Moderate
Arctic tern	Low
Kittiwake	Low
Black-headed gull	Low
Common gull	Low
Little gull	low

Disturbance to seabirds and waterfowl will be restricted to the offshore SG1A Project export cable corridor footprint and at any one time to the immediate vicinity of the offshore SG1A Project vessels during installation or decommissioning. As detailed in Section 3, there will be a maximum of two vessels on site at any one time during installation of the offshore SG1A export cable. By nature of their activity offshore SG1A Project vessels will be slow moving (at a maximum of a few knots) or static when conducting operations.

The area within which seabirds and waterfowl may be disturbed due to vessel movements and activity (e.g., by visual disturbance, noise and night time lighting) is considered to be very small in the context of the potential foraging ranges of the SPA qualifying species Therefore, at any one time, disturbance is likely to affect only a very small proportion of SPA individuals and affected individuals would have large areas of nearby alternative foraging habitat they could use. Disturbance which is associated with vessel presence or activity will be short-term and temporary events, as vessels move through an area. Any disturbance which is associated with the offshore SG1A Project during any phase are therefore considered unlikely to affect the breeding productivity or survival rates of the individuals affected or the SPA population even for those species, such as Red-throated diver, who have very high vulnerability to disturbance.

There is a relatively high baseline level of vessel activity in the Firth of Forth (see Section 10: Shipping and Navigation of the EIAR LF000012-CST-OF-LIC-DEV-REP-0003). On this basis, the individuals of the Outer Firth of Forth and St Andrews Bay Complex SPA qualifying species which use the offshore SG1A Project corridor are expected to experience relatively high levels of potential disturbance from baseline vessel activity. The potential disturbance/displacement resulting from the activity of up to two offshore SG1A Project construction vessels in areas with high baseline marine traffic is unlikely to cause detectable or more than negligible additional disturbance to Outer Firth of Forth and St Andrews Bay Complex SPA seabirds or waterfowl.

Any effects from this disturbance/displacement which occur are expected to be reversible following the completion of construction works. In addition, for all phases of offshore SG1A Project, affected birds are expected to quickly return to areas once vessel activity there ceases. This, combined with the highly localised nature of disturbance, means there would be no repeated disturbance over a wide area or extended period due to the offshore SG1A project. Therefore, **no LSE is predicted.**

8.2.1.2 Displacement due to increased water turbidity

The installation or decommissioning of the cable will result in a temporary and localised increase in suspended sediment concentrations (SSC), leading to increases in water turbidity. As a result of installation or decommissioning activities, coarser fractions of sediment up to and including fine sand, may be raised a few metres from the seafloor and re-deposited within 10 m (Gooding *et al*., 2012). Finer silt fractions will be suspended for longer and but concentrations are expected to fall to ambient levels within 70 m of the cable (Gooding *et al*., 2012; SG1A Screening Report; SG1A, 2020). Thus any increases in turbidity will be highly localised, particularly for coarser sediments, and will be short-term and temporary in duration, and at any one time affecting only a very small proportion of the SPA.

The increase in water turbidity has the potential to effect diving birds that visually hunt demersal or benthic prey, particularly in inshore waters. The SPA qualifying species considered to have greatest vulnerability to increases in turbidity are Red-throated diver, European shag, Slavonian grebe and red-breasted merganser.

These species all hunt visually for prey (mainly small fish species) in relatively shallow (typically <25m depth) inshore waters. The likely consequence of turbidity increases on these species will be small-scale displacement movements to alternative foraging areas. Given the nearby (<100 m away) availability of unaffected waters, it is considered unlikely that affected individuals would attempt to continue foraging in highly turbid water if this results in significantly reduced hunting success. The areas potentially affected by increased water turbidity and the timing of occurrence, will correspond very closely to the location and timing of offshore SG1A Project vessel activity. Indeed the individual birds potentially affected by turbidity increases are considered likely to show a disturbance response to the vessel activity and therefore already be displaced from the parts so affected. For this reason it is considered that increased water turbidity is unlikely to lead to displacement that is additional to that caused by vessel disturbance

The impact of displacement caused by increased water turbidity is therefore considered to be localised in spatial extent, short term in duration, intermittent and with high reversibility, and not be additional to the displacement cause by vessel disturbance. Therefore, **no LSE is predicted.**

8.2.1.3 Indirect effects due to changes in distribution of prey items

Potential impacts to fish and shellfish species (including bird prey species) which may result from the offshore SG1A Project effects such as EMF, noise and barrier effects to migratory fish species have been assessed within the EIAR and are not considered further here. The EIAR confirms that all potential impacts to fish and shellfish species will be not significant in EIA terms.

The main impact on bird prey species due to the offshore SG1A Project is likely to be caused by physical disturbance to the seabed during cable installation and decommissioning. Bird species which target benthic prey such as sand eels and bivalve molluscs are thus potentially vulnerable to seabed disturbance affecting their prey. The Outer Firth of Forth and St Andrews Bay SPA qualifying species that have by far the greatest potential sensitivity to this effect are wintering seaduck species that prey on bivalve molluscs, in particular common scoter and velvet scoter. These two species have relatively restricted foraging habitat within the SPA, essentially limited to inshore waters of <25m depth with soft sediments. Some of the SPA qualifying seabird species (e.g. kittiwake and auk species) commonly target sand eel prey, however in comparison to the seaduck species these seabird species all have very extensive areas of foraging habitat available to them and so have correspondingly lower sensitivity to this effect.

Seabed disturbance caused by the offshore SG1A Project during any phase will be temporary, localised to the export cable corridor (the width of disturbance is unlikely to exceed 6 m, see Section 3 Table 8-4, however the maximum width of the temporary zone of influence, due to plough or Remotely Operated Vehicle (ROV) tracks, will be approximately 10m) and short term in duration. This could cause a correspondingly localised reduction in benthic prey available to birds. However, the reduction in prey availability would be temporary only becasue full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA, including the seaduck species with relatively restricted foraging habitat.

Considering the localised and temporary nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.2.1.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollutant release as a result of the offshore SG1A Project is very low. In the event of an accidental pollution release occurring, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are provided in Section 3. For all vessels over 400 GT (gross tonnage) a Shipboard Oil Pollution Emergency Plan (SOPEP) will be in place. All offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL). In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted.**

8.2.2 Operation (Including maintenance and repairs)

8.2.2.1 Disturbance /displacement due to vessel presence (including noise and lighting)

Once installed, submarine cables generally do not require high levels of routine maintenance other than confirming that there are no areas of exposure or significant movements indicative of external influence. It is expected that in addition to the post-installation survey, where needed further surveys will be conducted to monitor the behaviour of the installed offshore SG1A export cable and the seabed.

Operation and maintenance vessels would be expected to be on location a brief period (a matter of weeks in most cases). Vessel movements would be limited during this time and the vessel will be stationary while operating on site, except when transiting to and from port.

Vessel disturbance during operation will be the same in nature but of less frequency and duration that during construction, where no LSE is predicted. Considering this, and the temporary, reversible and short-term nature of vessel presence associated with the operational phase, **no LSE is predicted.**

8.2.2.2 Displacement due to increased water turbidity

Sediment disturbance from any cable repair and remediation activities associated with offshore SG1A Project could occur from the excavation of the damaged cable from the seabed and the installation of a new section of cable onto the seabed. The increase in water turbidity which would be associated with these actions is anticipated to be less than that associated with construction. Increases in turbidity will be both limited to the section of cable that requires maintenance and the vicinity of the cable. Therefore, on this basis, **no LSE is predicted.**

8.2.2.3 Indirect effects due to changes in distribution of prey items

In relation to the offshore SG1A Project operational phase, the main potential impacts to prey species which forms a pathway for LSE to the Conservation Objectives of the Outer Firth of Forth and St Andrews Bay Complex SPA, is the presence of mechanical protection (e.g. rock placement).

Based on desktop study using seabed data available in the public domain, it is expected that the offshore SG1A export cable which is located within the SPA will be buried and no mechanical protection is expected to be required. In the interest of conservative assessment however, further consideration has been made as to the LSE.

The sections of the offshore SG1A export cable which are expected to require mechanical protection are those where there are technical difficulties in burying the cable to the target depth of burial, for example areas of hard substratum or over existing installed cables and pipelines. In these areas where natural seabed habitat will be buried beneath the mechanical protection. Rock placement is the preferred protection method which is expected to be formed of a berm of graded rock (5”-8”) at a height of up to 1 m and a width of up to 6 m. The deposited protection materials will be different from the natural seabed however, in most cases, the protective materials are not expected to create a substantial variation to the baseline habitat conditions.

The reduction in prey availability would be temporary only because full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA.

Considering the localised nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.2.2.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollution as a result of the offshore SG1A Project is very low as the cable maintenance vessels will comply with the requirements of the MARPOL international convention, as well as best practice for works in the marine environment. Leaching of chemical pollutants from the cable is also considered to be highly unlikely given the use of modern cable materials and protection. In the event of an accidental pollution event, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are laid out in Section 3 and for all vessels over 400 GT a SOPEP will be in place. In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted**.

8.3 Firth of Forth SPA – Assessment of LSE

The Firth of Forth SPA is a complex of estuarine and coastal habitats extending to the MLWS tide level and covering an area of c.63 km^2 in south east Scotland stretching from Alloa to the coasts of Fife and East Lothian. The site includes extensive invertebrate-rich intertidal flats and rocky shores, areas of saltmarsh, lagoons and sand dune (NatureScot, 2001).

The Firth of Forth SPA supports populations of waterfowl species consistent with that of the Outer Firth of Forth and St Andrews Bay Complex SPA. As presented in Table 6-1, wader species have been screened out of further consideration in this report which solely considers effects of the offshore SG1A Project offshore export cable corridor.

Conservation objective:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and

To ensure for the qualifying species that the following are maintained in the long term:

- *Population of the species as a viable component of the site*
- *Distribution of the species within site*
- *Distribution and extent of habitats supporting the species*
- *Structure, function and supporting processes of habitats supporting the species*
- *No significant disturbance of the species*

8.3.1 Construction, installation and decommissioning

8.3.1.1 Disturbance / displacement due to vessel presence (including noise and lighting)

There is the potential that the installation, or decommissioning of a subsea cable such as the offshore SG1A Project and the associated work vessel presence and activity may disturb seabirds and waterfowl inhabiting the area and displace them from foraging or resting habitat effectively resulting in localised habitat loss or during the period of disturbance (Drewitt and Langston, 2006). Disturbance/displacement can potentially affect a birds' productivity and survival changes.

The vulnerability of the qualifying features of the Outer Firth of Forth and St Andrews Bay Complex SPA to vessel disturbance are provided in Table 8-5.

Table 8-5 Vulnerability of qualifying features to vessel disturbance

Species	Vulnerability to vessel disturbance
Eider	High
Long-tailed duck	High
Common scoter	Very high
Velvet scoter	Very high
Goldeneye	High
Red-breasted merganser	High
Red-throated diver	Very high
Cormorant	Moderate
Sandwich tern	Low
Red-necked grebe	Moderate
Slavonian grebe	Moderate

Disturbance to waterfowl will be restricted to the offshore SG1A Project export cable corridor footprint and at any one time to the immediate vicinity of the offshore SG1A Project vessels during installation or decommissioning. As detailed in Section 3, there will be a maximum of two vessels on site at any one time during installation of the offshore SG1A export cable. By nature of their activity offshore SG1A Project vessels will be slow moving (at a maximum of a few knots) or static when conducting operations.

The area within which waterfowl may be disturbed due to vessel movements and activity (e.g., by visual disturbance, noise and night time lighting) is considered to be very small in the context of the potential foraging ranges of the SPA qualifying species Therefore, at any one time, disturbance is likely to affect only a very small proportion of SPA individuals and affected individuals would have large areas of nearby alternative foraging habitat they could use. Disturbance which is associated with vessel presence or activity will be short-term and temporary events, as vessels move through an area. Any disturbance which is associated with the offshore SG1A Project during any phase are therefore considered unlikely to affect the breeding productivity or survival rates of the individuals affected or the SPA population even for those species, such as Red-throated diver, who have very high vulnerability to disturbance.

There is a relatively high baseline level of vessel activity in the Firth of Forth (see Section 10: Shipping and Navigation of the EIAR LF000012-CST-OF-LIC-DEV-REP-0003). On this basis, the individuals of the Firth of Forth SPA qualifying species which use the offshore SG1A Project export cable corridor are expected to experience relatively high levels of potential disturbance from baseline vessel activity. The potential disturbance/displacement resulting from the activity of up to two offshore SG1A Project construction vessels in areas with high baseline marine traffic is unlikely to cause detectable or more than negligible additional disturbance to Firth of Forth SPA waterfowl.

Any effects from this disturbance/displacement which occur are expected to be reversible following the completion of construction works. In addition, for all phases of offshore SG1A Project, affected birds are expected to quickly return to areas once vessel activity there ceases. This, combined with the highly localised nature of disturbance, means there would be no repeated disturbance over a wide area or extended period due to the offshore SG1A Project. Therefore, **no LSE is predicted.**

8.3.1.2 Displacement due to increased water turbidity

The installation or decommissioning of the cable will result in a temporary and localised increase in suspended sediment concentrations (SSC), leading to increases in water turbidity. As a result of installation or decommissioning activities, coarser fractions of sediment up to and including fine sand, may be raised a few metres from the seafloor and re-deposited within 10 m (Gooding *et al*., 2012). Finer silt fractions will be suspended for longer and but concentrations are expected to fall to ambient levels within 70 m of the cable (Gooding *et al*., 2012; SG1A Screening Report; SG1A, 2020). Thus any increases in turbidity will be highly localised, particularly for coarser sediments, and will be short-term and temporary in duration, and at any one time affecting only a very small proportion of the SPA.

The increase in water turbidity has the potential to effect diving birds that visually hunt demersal or benthic prey, particularly in inshore waters. The SPA qualifying species considered to have greatest vulnerability to increases in turbidity are Red-throated diver, Slavonian grebe and red-breasted merganser. These species all hunt visually for prey (mainly small fish species) in relatively shallow (typically <25m depth) inshore waters. The likely consequence of turbidity increases on these species will be small-scale displacement movements to alternative foraging areas. The foraging range of species present within the Firth of Forth SPA is a minimum of 9 km for red-throated diver and up to 80 km for eider (Woodward *et al*., 2019).

Given the nearby (<100 m away) availability of unaffected waters, it is considered unlikely that affected individuals would attempt to continue foraging in highly turbid water if this results in significantly reduced hunting success. The areas potentially affected by increased water turbidity and the timing of occurrence, will correspond very closely to the location and timing of offshore SG1A Project vessel activity. The individual birds potentially affected by turbidity increases are considered likely to show a disturbance response to the vessel activity and therefore already be displaced from the parts so affected. For this reason, it is considered that increased water turbidity is unlikely to lead to displacement that is additional to that caused by vessel disturbance.

The impact of displacement caused by increased water turbidity is therefore considered to be localised in spatial extent, short term in duration, intermittent and with high reversibility, and not be additional to the displacement cause by vessel disturbance. Therefore, **no LSE is predicted.**

8.3.1.3 Indirect effects on seabirds due to changes in distribution of prey items

Potential impacts to fish and shellfish species (including bird prey species) which may result from the offshore SG1A Project effects such as EMF, noise and barrier effects to migratory fish species have been assessed within the EIAR and are not considered further here. The EIAR confirms that all potential impacts to fish and shellfish species will be not significant in EIA terms.

The main impact on bird prey species due to the offshore SG1A Project is likely to be caused by physical disturbance to the seabed during cable installation and decommissioning. Bird species which target benthic prey such as sand eels and bivalve molluscs are thus potentially vulnerable to seabed disturbance affecting their prey. The Firth of Forth SPA qualifying species that have by far the greatest potential sensitivity to this effect are wintering seaduck species that prey on bivalve molluscs, in particular common scoter and velvet scoter. These two species have relatively restricted foraging habitat within the SPA, essentially limited to inshore waters of <25m depth with soft sediments.

Seabed disturbance caused by the offshore SG1A Project during any phase will be temporary, localised to the export cable corridor (the width of disturbance is unlikely to exceed 6 m, see Section 3 Table 8-6, however the maximum width of the temporary zone of influence, due to plough or Remotely Operated Vehicle (ROV) tracks, will be approximately 10m) and short term in duration. This could cause a correspondingly localised reduction in benthic prey available to birds. However, the reduction in prey availability would be temporary only because full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA, including the seaduck species with relatively restricted foraging habitat.

Considering the localised and temporary nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.3.1.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollutant release as a result of the offshore SG1A Project is very low. In the event of an accidental pollution release occurring, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are provided in Section 3. For all vessels over 400 GT (gross tonnage) a Shipboard Oil Pollution Emergency Plan (SOPEP) will be in place. All offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL). In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted.**

8.3.2 Operation (Including maintenance and repairs)

8.3.2.1 Disturbance / displacement due to vessel presence (including noise and lighting)

Once installed, submarine cables generally do not require high levels of routine maintenance other than confirming that there are no areas of exposure or significant movements indicative of external influence. It is expected that in addition to the post-installation survey, where needed further surveys will be conducted to monitor the behaviour of the installed offshore SG1A export cable and the seabed.

Operation and maintenance vessels would be expected to be on location a brief period (a matter of weeks in most cases). Vessel movements would be limited during this time and the vessel will be stationary while operating on site, except when transiting to and from port.

Vessel disturbance during operation will be the same in nature but of less frequency and duration that during construction, where no LSE is predicted. Considering this, and the temporary, reversible and short-term nature of vessel presence associated with the operational phase, **no LSE is predicted.**

8.3.2.2 Displacement due to increased water turbidity

Sediment disturbance from any cable repair and remediation activities associated with offshore SG1A Project could occur from the excavation of the damaged cable from the seabed and the installation of a new section of cable onto the seabed. The increase in water turbidity which would be associated with these actions is anticipated to be less than that associated with construction. Increases in turbidity will be both limited to the section of cable that requires maintenance and the vicinity of the cable. Therefore, on this basis, **no LSE is predicted.**

8.3.2.3 Indirect effects due to changes in distribution of prey items

In relation to the offshore SG1A Project operational phase, the main potential impacts to prey species which forms a pathway for LSE to the Conservation Objectives of the Firth of Forth SPA, is the presence of mechanical protection (e.g. rock placement).

Based on desktop study using seabed data available in the public domain, it is expected that the offshore SG1A export cable which is located within the SPA will be buried and no mechanical protection is expected to be required. In the interest of conservative assessment however, further consideration has been made as to the LSE.

The sections of the offshore SG1A export cable which are expected to require mechanical protection are those where there are technical difficulties in burying the cable to the target depth of burial, for example areas of hard substratum or over existing installed cables and pipelines. In these areas where natural seabed habitat will be buried beneath the mechanical protection. Rock placement is the preferred protection method which is expected to be formed of a berm of graded rock (5”-8”) at a height of up to 1 m and a width of up to 6 m. The deposited protection materials will be different from the natural seabed

however, in most cases, the protective materials are not expected to create a substantial variation to the baseline habitat conditions.

The reduction in prey availability would be temporary only because full or partial recovery of the benthic community in affected areas is likely within one year. The extent of the area affected by seabed disturbance will be very small in the context of the extent of foraging habitat which is available to bird species in the SPA.

Considering the localised nature of seabed disturbance, the expected rapid rate of recovery of benthic prey species in areas affected and the large to very large extent of foraging habitat available, the overall change in prey availability to SPA qualifying species as a result of seabed disturbance will be very low or negligible. On this basis, no **LSE is predicted.**

8.3.2.4 Accidental pollution events

A release of pollutants could result in an impact upon qualifying features of the SPA. The potential for accidental pollution as a result of the offshore SG1A Project is very low as the cable maintenance vessels will comply with the requirements of the MARPOL international convention, as well as best practice for works in the marine environment. Leaching of chemical pollutants from the cable is also considered to be highly unlikely given the use of modern cable materials and protection. In the event of an accidental pollution event, appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures are laid out in Section 3 and for all vessels over 400 GT a SOPEP will be in place. In light of the various measures to prevent pollution and to quickly deal with any events that do occur, **no LSE is predicted**.

8.4 In-combination

There is one key infrastructure development that will overlap with offshore SG1A Project which has the potential to result in an in-combination effect on the SPAs; the Inch Cape export cable corridor. However, the offshore SG1A Project intends to significantly follow the route of this Inch Cape corridor where possible.

Due to the small scale and localised nature of the works for the offshore SG1A Project, this in-combination assessment only considers other projects or activities within the Firth of Forth.

There are a number of offshore wind farms (OWF) located within in the Firth of Forth, which have the potential to affect the SPAs. OWF in the vicinity of the offshore SG1A Project include:

- The Seagreen Project (consented, pre-construction);
- Berwick Bank OWF (scoping);
- Marr Bank OWF (concept/early planning);
- Inch Cape OWF (consented); and
- Neart na Gaoithe OWF (under construction).

The main impact concern for seabird SPA qualifying features in relation to the OWF projects listed above is potential mortality through collisions with the turbine blades. The offshore SG1A Project is only a single offshore export cable and therefore will not contribute to any in-combination collision mortality with other OWF projects.

The shared pathway of effect between the offshore SG1A Project, the OWF projects listed and other project or activity occurring in the Firth of Forth, is through the vessel disturbance and the potential to contribute to the cumulative disturbance impact on seabirds and waterfowl.

As presented in project alone assessments in Section 8.1, 8.2 and 8.3, the vessel activity (both construction and operation) associated with the offshore SG1A Project is extremely low (only two construction vessels) and will be highly localised. Therefore, the offshore SG1A Project is not considered to contribute to a LSE in-combination with any other project. Therefore, **No LSE is concluded.**

8.5 Conclusion

A summary of the assessment of the LSE on designated sites in relation to the offshore SG1A Project is shown in
Table 8-7.

Table 8-7 Summary of potential for LSE

Designated site	Potential effect	Conclusion (all phases)
Forth Island SPA	Disturbance / displacement due to vessel presence	No LSE
	Displacement due to increased water turbidity	No LSE
	Indirect effects due to changes in distribution of prey items	No LSE
	Accidental pollution events	No LSE
Outer Firth of Forth and St Andrews Bay Complex SPA	Disturbance / displacement due to vessel presence	No LSE
	Displacement due to increased water turbidity	No LSE
	Indirect effects due to changes in distribution of prey items	No LSE
	Accidental pollution events	No LSE
Firth of Forth SPA	Disturbance / displacement due to vessel presence	No LSE

	Displacement due to increased water turbidity	No LSE
	Indirect effects due to changes in distribution of prey items	No LSE
	Accidental pollution events	No LSE
In-combination	No LSE	

9. Marine Mammals

9.1 Isle of May SAC – Assessment of LSE

The Isle of May, located 3.9 km from the offshore SG1A Project at the entrance to the Firth of Forth on the east coast of Scotland, supports a breeding colony of grey seals. The Isle of May SAC is occupied annually by the largest breeding colony of grey seals in the east coast of Scotland and the fourth-largest breeding colony in the UK, contributing approximately 4.5% of the annual UK pup production of this species.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- *Population of the species as a viable component of the site*
- *Distribution of the species within site*
- *Distribution and extent of habitats supporting the species*
- *Structure, function and supporting processes of habitats supporting the species*
- *No significant disturbance of the species*

9.1.1 Construction, installation and decommissioning

9.1.1.1 Injury, temporary disturbance or displacement from underwater noise

The most likely potential impact to marine mammals from the offshore SG1A Project is disturbance resulting from underwater noise generated by pre and post-installation surveys and cable installation vessels, including those involved in trenching and cable laying activities.

Underwater noise generated by geophysical survey equipment constitutes the only source of sound with the potential to significantly disturb, displace or cause injury to grey seals. The UHRS technology (boomers and sparkers), Ultra-short Baseline (USBL) and the Sub-Bottom Profiler (SBP) which are used for geophysical surveys both utilise frequencies levels within the general hearing range of grey seals, therefore the assessment has focused upon the potential effects of these pieces of equipment. The Multi-Beam Echosounder (MBES), Side-Scan Sonar (SSS), Single Beam Echosounder (SBES), subsea altitude metre, sound velocity profiler, acoustic doppler current profiler and obstacle avoidance sonar which are also used all emit noise at frequencies which are out with the hearing threshold of grey seals. Survey activities are expected to take place throughout installation, including two weeks for the pre-installation survey in Q2 2023 and one week for the post-installation survey in survey Q2 2024. The vertically focused equipment results in a relatively small area of ensonification and the short-term nature of the surveys means the risks to grey seals are extremely localised (JNCC, 2008). Additionally, the survey vessel will be slowly moving along the length of the cable installation corridor, sound sources will generally not be static.

The generation of underwater noise during geophysical surveys will be temporary, short-term and localised, which in conjunction with the highly mobile and wide-ranging nature of marine mammal species is unlikely to cause a negative effect in terms of disturbance, displacement or injury. In addition, the surveys are expected to the take place outwith the breeding season (September- December) and moulting seasons (December -April) for grey seals (Marine Scotland, 2014). During the periods when survey are expected to take place it is therefore anticipated that the majority of grey seals individuals will be offshore for their at sea period. Therefore, elevated encounters during the installation period are less likely.

Detailed underwater noise modelling of geophysical survey equipment has been undertaken to support the EIAR and full details of the modelling results can be found in Section 8.9 of the EIAR. Outputs from this underwater noise modelling have been used to inform this assessment of LSE.

Other noise sources, such as noise which is generated from cable laying, trenching, jetting, rock placement and cable burial are understood to be masked by the noise which is generated by the vessel itself (Nedwell and Edwards, 2004).

The number of vessels which are anticipated to undertake cable installation and associated survey works will be low in the context of existing vessel activity in the area. At present, it is expected that up to two primary installation vessels will be operating during the installation phase at any one time (one dynamic positioning (DP2) cable lay vessel, approximately 150 m in length and one DP2 cable protection vessel approximately 100 m length), which will be assisted by a number of smaller support and guard vessels. The associated survey works are expected to utilise an offshore DP2 survey vessel of up to 100 m in length, accompanied by a smaller inshore survey vessel. The additional installation, support, and survey vessels in the project area is not considered to be a substantive change from baseline vessel activity in the Firth of Forth, considering the moderate to high density of shipping present in the area. As such, the project's vessel noise emissions will not be significantly above ambient vessel noise levels, and hence are unlikely to cause a negative effect (Farcas *et al.*, 2020).

Potential injuries to pinnipeds (i.e. injury which results from a permanent threshold shift in hearing abilities) is limited to impulsive noise sources which exceed the injury thresholds. Injury which may result from impulsive underwater noise emissions is understood to occur within a maximum distance of a 30 m from the source, in the worst-case scenario (Southall *et al*, 2007; Section 8.9.1.1 of the offshore SG1A Project EIAR). Considering the distance from the Isle of May SAC to the offshore SG1A export cable corridor at its nearest point (3.9 km), the potential for injury is considered limited.

Behavioural disturbances may occur further beyond ranges associated with injury (up to 995 m for Ultra High Resolution Seismic (UHRS) and 130 m for Sub-Bottom Profiler (SBP) equipment, see Section 8.9.1.1 of the offshore SG1A Project EIAR), and even when behavioural impact ranges do not overlap directly with a designated site it is possible that animals from that site, being mobile species, may move into the disturbance range. The main geophysical survey activities will occur towards the start and end of the offshore SG1A Project programme, although when they occur they will take place over a relatively short period and vessels will not be in one location for the whole period but will rather traverse the export cable corridor. Some geophysical survey activity is expected to be required throughout the offshore SG1A construction phase, at more localised areas than the geophysical surveys which will be carried out pre and post construction. Noise emissions will only occur at a singular location for a brief period of time and displaced seals are likely to return to the region once the emissions have ceased or move out of an area (Brasseur *et al*., 2010). Given the large expanse of comparable marine habitat surrounding the vessel and cable installation operations, it is highly unlikely that offshore SG1A Project activities would compromise regional movements, breeding, feeding or other life functions of grey seals.

Any impact would be temporary and transient in nature, which in conjunction with the highly mobile and wide-ranging nature of grey seals is unlikely to cause a negative effect. However, in the absence of clear industry, best practice mitigation it **is not possible to conclude that no LSE will occur**. The offshore SG1A Project has committed to standard mitigation measures and best practice procedures including the provision of Marine Mammal Observers (MMO) during all SBP and UHRS survey operations, and where possible the avoidance of conducting UHRS surveys in close proximity to the Isle of May grey seal breeding season. These mitigation measures will significantly reduce the risk of injury, disturbance or displacement of grey seals. Further information on embedded and additional mitigation measures are provided in Section 4 and Section 8.10.3 of the offshore SG1A Project EIAR. Therefore, **while LSE cannot be ruled out pre-mitigation, the risk is reduced post-mitigation, and the proposed works will not adversely affect the Conservation Objectives of the site.**

9.1.1.2 Collision risk from vessel activities

Vessel presence during offshore SG1A export cable installation and associated survey activities poses a potential collision risk to marine mammals occupying the offshore SG1A Project area. Collision risk associated with vessel strikes are greatest for large vessels (i.e. greater than 80 m) travelling at speeds in excess of 14 knots (Laist *et al.,* 1997). Erratic vessel movement, such as short transit paths and sharp turning are also thought to contribute to the risk of collision with marine megafauna (Laist *et al*., 1997). offshore SG1A Project vessels which are engaged in cable installation and survey activities will be moving at slow speeds with intermittent stationary periods (e.g. during operations requiring the vessel to remain at a fixed location) and, where possible, using indicative transit routes within the offshore SG1A Project which will be detailed in the VMP. It is understood that these attributes substantially reduce the risk of collision with grey seals occupying the offshore SG1A Project area.

In addition, all vessels will adhere to the Scottish Marine Wildlife Watching Code (NatureScot, 2017) through training of relevant personnel, ensuring no significant risk of vessel collision with seals occupying the offshore SG1A Project area. Furthermore, as detailed above, the temporary and localised presence of two construction vessels and installation activities along with any maintenance works for the offshore SG1A Project will not result in a substantive change to baseline vessel activity in area. In consideration of this, and the likely avoidance of grey seals to obstructions, **no LSE is predicted**.

9.1.1.3 Increased turbidity affecting habitat use

Increased turbidity does not place significant constraints on the habitat use or foraging success of seals because they supplement their vision with tactile cues. Seals regularly utilise turbid and unlit waters as primary foraging habitat (e.g. the Wash, Humber Estuary, Thames Estuary, and a variety of other important tidal-estuary environments) by using their highly sensitive vibrissae (i.e. whiskers) to sense very low frequency vibrations and minute movements in water, such as those generated by small fish (Dehnhardt *et al*., 1998; Mills and Renouf, 1986). Given the short-term and localised nature of potential changes to water quality and the absence of an influential impact mechanism, **no LSE is predicted**.

9.1.1.4 Accidental Pollution Events

All marine mammal species are considered to possess some level of sensitivity to accidental pollution events. However, the potential for an unplanned fuel release to result in an accidental pollution event from the offshore SG1A Project is very low due to the inclusion of standard practice mitigation measures. In the event of an accidental fuel release occurring, appropriate standard practice vessel management procedures will be implemented accordingly. Standard pollution prevention measures are laid out within the CEMP. Moreover, all offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL), and all vessels over 400 GT (gross tonnage) will have a Shipboard Oil Pollution Emergency Plan (SOPEP) in place. As such **no LSE is predicted** from accidental pollution events.

9.1.2 Operation (incl. maintenance and repair)

9.1.2.1 Injury, temporary disturbance / displacement from underwater noise

During the offshore SG1A Project's operational phase, the only activities which may result in underwater noise emissions with the potential to adversely affect marine mammals are routine inspection and maintenance activities which employ geophysical survey devices and USBL. If repair or remediation works are required as a part of routine maintenance, then vessels employing USBL technology would be expected to be on location for 2 to 6 weeks, although the specifics will vary depending on the situation.

Surveys which will be carried out during the operational phase of the Project (as required) are expected to mainly engage ROV, MBES and SSS technologies, as well as cable detection systems, none of which are considered likely to cause injury due to their highly directional nature and their operating frequencies being outwith those which are important or which could be detected by seals (Southall *et al.*, 2019). SBP may also be used during routine maintenance which is detectable by grey seals however effects will be highly localised and no greater than that identified during construction.

Contemporary data suggests that even with very intense noise emissions, such as those from pile driving activity, harbour seals are likely to return to the region of the noise source once the emissions have ceased (Brasseur *et al,* 2010). As such, it is unlikely that underwater noise generated by S1GA Project activities will cause seals associated with the Isle of May SAC to avoid the feeding grounds surrounding the site (known as displacement) in such a way that would influence the health or breeding ability of individual animals

(Kastelein *et al.* 2006) or adversely impact a significant portion of the population (e.g. through displacement or disturbance).

Any disturbance impacts to seals will be temporary and short-term and highly localised to the Project area. In consideration of the above, along with the available habitat surrounding the Isle of May SAC and the plastic at-sea foraging behaviour of this mobile species, disturbance from underwater noise is not expected to generate important impacts to the population or the conservation objectives of this site and, therefore, **no LSE is predicted.**

9.1.2.2 Collision risk from vessel activities

The potential risk of collision with operational vessels is considered equal to or less than the impact during construction. Any offshore SG1A Project vessel movements during the operation phase are likely to be associated with surveys of the offshore SG1A Project export cable corridor, moving at a set speed along a prescribed route, or will be associated with repair and remediation activities in which case the vessel will be largely stationary. The offshore SG1A Project activities will occur in line with the Scottish Marine Wildlife Watching Code. On this basis, the collision risk which may be associated with the offshore SG1A Project's operational activities are temporary and short term in nature and **no LSE is concluded.**

9.1.2.3 Increased turbidity affecting habitat use

Increased turbidity does not place significant constraints on the habitat use or foraging success of seals because they supplement their vision with tactile cues. Seals regularly utilise turbid and unlit waters as primary foraging habitat (e.g. the Wash, Humber Estuary, Thames Estuary, and a variety of other important tidal-estuary environments) by using their highly sensitive vibrissae (i.e. whiskers) to sense very low frequency vibrations and minute movements in water, such as those generated by small fish (Dehnhardt *et al*., 1998; Mills and Renouf, 1986). Given that maintenance activities with the potential to generate changes in suspended sediment levels would likely be very short-term and highly localised in nature**, no LSE is predicted**.

9.1.2.4 Accidental Pollution Events

As mentioned in Section 0 all marine mammal species are considered to possess some level of sensitivity to accidental pollution events. However, the potential for an unplanned fuel release to result in an accidental pollution event from the proposed offshore SG1A Project activities is very low. It is expected that this the likelihood of an accidental pollution event during operation is less than that during installation. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures, including those as identified under MARPOL, will be in place. As such **no LSE is predicted.**

9.2 Firth of Tay and Eden Estuary SAC – Assessment of LSE

The Firth of Tay and Eden Estuary SAC is located approximately 30 km from the offshore SG1A Project off the Angus and north Fife coastlines on the east coast of Scotland. The site supports harbour porpoise, bottlenose dolphins, grey seals and harbour seals; however, the latter of these is the only marine mammal qualifying feature which forms a primary reason for site selection due to their regular occurrence there. The Firth of Tay and Eden Estuary supports a nationally important breeding colony comprising roughly 600 individuals, which constitutes approximately 2% of the UK harbour seal population.

Conservation objectives:

To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features; and

To ensure for the qualifying species that the following are maintained in the long term:

- *Population of the species as a viable component of the site*
- *Distribution of the species within site*
- *Distribution and extent of habitats supporting the species*
- *Structure, function and supporting processes of habitats supporting the species*
- *No significant disturbance of the species*

9.2.1 Construction, installation and decommissioning

9.2.1.1 Injury, temporary disturbance or displacement from underwater noise

The most likely potential impact to marine mammals from the offshore SG1A Project is disturbance resulting from underwater noise generated by pre and post-installation surveys and cable installation vessels, including those involved in trenching and cable laying activities.

Underwater noise generated by geophysical survey equipment constitutes the only source of sound with the potential to significantly disturb, displace or cause injury to harbour seals. The UHRS technology (boomers and sparkers),Ultra-short Baseline (USBL) and the Sub-Bottom Profiler (SBP) which are used for geophysical surveys both utilise frequencies levels within the general hearing range of harbour seals, therefore the assessment has focused upon the potential effects of these pieces of equipment. The Multi-Beam Echosounder (MBES), Side-Scan Sonar (SSS), Single Beam Echosounder (SBES), subsea altitude metre, sound velocity profiler, acoustic doppler current profiler and obstacle avoidance sonar which are also used all emit noise at frequencies which are out with the hearing threshold of harbour seals. Survey activities are expected to take place throughout installation, including four weeks for the pre-installation survey in Q2 2022 and one week for the post-installation survey in survey Q2 2023. The vertically focused equipment results in a relatively small area of ensonification and the short-term nature of the surveys means the risks to grey seals are extremely localised (JNCC, 2008). Additionally, the survey vessel will be slowly moving along the length of the cable installation corridor, sound sources will not be static.

The generation of underwater noise during geophysical surveys will be temporary, short-term and localised, which in conjunction with the highly mobile and wide-ranging nature of marine mammal species is unlikely to cause a negative effect in terms of disturbance, displacement or injury. In addition, the surveys are expected to the take place during the breeding season (late May -July) for harbour seals (Marine Scotland, 2014). During the periods when survey are expected to take place it is therefore anticipated that the harbour seal individuals will be spending the majority of their time onshore and will therefore be more sensitive to terrestrial impact close to their haul outs. However, as the offshore SG1A Project is located more than 30km from the designated site, it is assumed there is no potential for terrestrial disturbance.

Detailed underwater noise modelling of geophysical survey equipment has been undertaken to support the EIAR and full details of the modelling results can be found in Section 8.9 of the EIAR. Outputs from this underwater noise modelling have been used to inform this assessment of LSE. The potential sources of underwater noise during construction which are of relevance to the qualifying features of the Firth and Tay Eden Estuary SAC are geophysical survey equipment (see Section 9.1.1.1 and detailed above in this Section). As detailed in Section 9.1.1.1, the maximum number of vessels (2) and localised extent of any disturbance which may be caused by the generation of underwater noise will be small in comparison with the baseline vessel traffic in this region. The additional installation, support, and survey vessels in the project area is not considered to be a substantive change from baseline vessel activity in the Firth of Forth, considering the moderate to high density of shipping present in the area. As such, the project's vessel noise emissions will not be significantly above ambient vessel noise levels, and hence are unlikely to cause a negative effect (Farcas *et al.*, 2020).

Potential injuries to pinnipeds (i.e. injury which results from a permanent threshold shift in hearing abilities) is limited to impulsive noise sources which exceed the injury thresholds. Injury which may result from impulsive underwater noise emissions is understood to occur within a maximum distance of a few hundred metres from the source, in the worst-case scenario (Southall *et al.*, 2007). Considering the distance from the Firth of Tay and Eden Estuary SAC to the offshore SG1A export cable corridor at its nearest point (3.9 km), and considering the availability of comparable marine habitat in areas surrounding the vessel, the potential for injury is considered limited. When operating the vessel will be moving, therefore seals will move away from the noise source prior to it causing any harmful impacts or injury.

Behavioural disturbances may occur further beyond ranges associated with injury, and even when behavioural impact ranges do not overlap directly with a designated site it is possible that animals from that site, being mobile species, may move into the disturbance range. The main geophysical survey activities will occur towards the start and end of the offshore SG1A Project programme, although when they occur they will take place over a relatively short period and vessels will not be in one location for the whole period but will rather traverse the export cable corridor. Noise emissions will only occur at a singular location for a brief period of time and displaced seals are likely to return to the region once the emissions have ceased (Brasseur *et al.*, 2010). Given the large expanse of comparable marine habitat surrounding the vessel and cable installation operations, it is highly unlikely that offshore SG1A Project activities would compromise regional movements, breeding, feeding or other life functions of concurrent marine mammals.

Any impact would be temporary and transient in nature, which in conjunction with the highly mobile and wide-ranging nature of marine mammal species is unlikely to cause a negative effect. The distance of the offshore SG1A Project to the Firth of Tay and Eden Estuary SAC is 30km which is far greater than the maximum range of injury/disturbance for the qualifying species (1 km), therefore it is expected that **no LSE will occur**.

9.2.1.2 Collision risk from vessel activities

Vessel presence during offshore SG1A export cable installation and associated survey activities poses a potential collision risk to marine mammals occupying the offshore SG1A Project area. Collision risk associated with vessel strikes are greatest for large vessels (i.e. greater than 80 m) travelling at speeds in excess of 14 knots (Laist *et al.,* 1997). Erratic vessel movement, such as short transit paths and sharp turning are also thought to contribute to the risk of collision with marine megafauna (Laist *et al*., 1997). offshore SG1A Project vessels which are engaged in cable installation and survey activities will be moving at slow speeds with intermittent stationary periods (e.g. during operations requiring the vessel to remain at a fixed location) and, where possible, using indicative transit routes within the offshore SG1A Project which will be detailed in the VMP. It is understood that these attributes substantially reduce the risk of collision with harbour seals occupying the offshore SG1A Project area.

In addition, all vessels will adhere to the Scottish Marine Wildlife Watching Code (NatureScot, 2017) through training of relevant personnel, ensuring no significant risk of vessel collision with seals occupying the Project area. Furthermore, as detailed above, the temporary and localised presence of two construction vessels and installation activities along with any maintenance works for the offshore SG1A Project will not result in a substantive change to baseline vessel activity in area. In consideration of this, and the likely avoidance of harbour seals to obstructions, **no LSE is predicted**.

9.2.1.3 Increased turbidity affecting habitat use

Increased turbidity does not place significant constraints on the habitat use or foraging success of seals because they supplement their vision with tactile cues. Seals regularly utilise turbid and unlit waters as primary foraging habitat (e.g. the Wash, Humber Estuary, Thames Estuary, and a variety of other important tidal-estuary environments) by using their highly sensitive vibrissae (i.e. whiskers) to sense very low frequency vibrations and minute movements in water, such as those generated by small fish (Dehnhardt *et al*., 1998; Mills and Renouf, 1986). Given the short-term and localised nature of potential changes to water quality and the absence of an influential impact mechanism, **no LSE is predicted**.

9.2.1.4 Accidental Pollution Events

All marine mammal species are considered to possess some level of sensitivity to accidental pollution events. However, the potential for an unplanned fuel release to result in an accidental pollution event from the offshore SG1A Project is very low due to the inclusion of standard practice mitigation measures. In the event of an accidental fuel release occurring, appropriate standard practice vessel management procedures will be implemented accordingly. Standard pollution prevention measures are laid out within the CEMP. Moreover, all offshore SG1A Project activities will be executed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL), and all vessels over 400 GT (gross tonnage) will have a Shipboard Oil Pollution Emergency Plan (SOPEP) in place. As such **no LSE is predicted** from accidental pollution events.

9.2.2 Operation (incl. maintenance and repair)

9.2.2.1 Injury, temporary disturbance / displacement from underwater noise

During the offshore SG1A Project's operational phase, the only activities which may result in underwater noise emissions with the potential to adversely affect marine mammals are routine inspection and maintenance activities which employ geophysical survey devices and USBL. If repair/remediation works are required as a part of routine maintenance, then vessels employing USBL technology would be expected to be on location for 2 to 6 weeks, although the specifics will vary depending on the situation.

Surveys which will be carried out during the operational phase of the Project (as required) will mainly engage ROV, MBES and SSS technologies, as well as cable detection systems, none of which are considered likely to cause injury due to their highly directional nature and their operating frequencies being outwith those which are important or which could be detected by seals (Southall *et al.*, 2019). SBP may also be used during routine maintenance which is detectable by grey seals however effects will be highly localised and no greater than that identified during construction.

Contemporary data suggests that even with very intense noise emissions, such as those from pile driving activity, harbour seals are likely to return to the region of the noise source once the emissions have ceased (Brasseur *et al,* 2010). As such, it is unlikely that underwater noise generated by S1GA Project activities will cause seals associated with the Firth of Tay and Eden Estuary SAC to avoid the feeding grounds surrounding the site (known as displacement) in such a way that would influence the health or breeding ability of individual animals (Kastelein *et al.* 2006) or adversely impact a significant portion of the population (e.g. through displacement or disturbance).

Any disturbance impacts to seals will be temporary and short-term and highly localised to the Project area. In consideration of the above, along with the available habitat surrounding the Firth of Tay and Eden Estuary SAC and the plastic at-sea foraging behaviour of this mobile species, disturbance from underwater noise is not expected to generate important impacts to the population or the conservation objectives of this site and, therefore, **no LSE is predicted.**

9.2.2.2 Collision risk from vessel activities

The potential risk of collision with operational vessels is considered equal to or less than the impact during construction. Any offshore SG1A Project vessel movements during the operation phase are likely to be associated with surveys of the offshore SG1A Project export cable corridor, moving at a set speed along a prescribed route, or will be associated with repair and remediation activities in which case the vessel will be largely stationary. The offshore SG1A Project activities will occur in line with the Scottish Marine Wildlife Watching Code. On this basis, the collision risk which may be associated with the offshore SG1A Project's operational activities are temporary and short term in nature and **no LSE is concluded.**

9.2.2.3 Increased turbidity affecting habitat use

Increased turbidity does not place significant constraints on the habitat use or foraging success of seals because they supplement their vision with tactile cues. Seals regularly utilise turbid and unlit waters as primary foraging habitat (e.g. the Wash, Humber Estuary, Thames Estuary, and a variety of other important tidal-estuary environments) by using their highly sensitive vibrissae (i.e. whiskers) to sense very low frequency vibrations and minute movements in water, such as those generated by small fish (Dehnhardt *et al.*, 1998; Mills and Renouf, 1986). Given that maintenance activities with the potential to generate changes in suspended sediment levels would likely be very short-term and highly localised in nature**, no LSE is predicted**.

9.2.2.4 Accidental Pollution Events

As mentioned in Section 0, all marine mammal species are considered to possess some level of sensitivity to accidental pollution events. However, the potential for an unplanned fuel release to result in an accidental pollution event from the proposed offshore SG1A Project activities is very low. It is expected that this the likelihood of an accidental pollution event during operation is less than that during installation. In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly. Standard pollution prevention measures, including those as identified under MARPOL, will be in place. As such, **no LSE is predicted.**

9.3 In-combination

Project activities such as vessel movements (collision risk), geophysical surveys (underwater noise) and infrastructure installation (underwater noise) on the seabed can all result in in-combination effects, through a shared pathway of effect with the offshore SG1A Project.

There is one key infrastructure development which will overlap with offshore SG1A Project, and has the potential to result in an in-combination effect on the Isle of May SAC and Firth of Tay and Eden Estuary SAC, which is the Inch Cape. The worst case scenario for the qualifying feature of these SACs would be consecutive periods of activity such as installation within the offshore SG1A Project export cable corridor.

Pinnipeds are understood to move away from areas of disturbance and return when the source of disturbance has been removed. The shared pathway of effect between the offshore SG1A Project and offshore wind farms for the grey seals off the Isle of May SAC and harbour seals off the Firth of Tay and Eden Estuary SAC is through the temporary disturbance or displacement due to underwater noise from vessel activity. The offshore SG1A Project's vessel activity will be highly localised as cable laying vessels are static for extended periods of time and move only short distances as cable installation is taking place. In addition, the maximum number of vessels which will be on site at any one time during any phase of the project is expected to be 2, which is a negligible increase to the already high vessel activity in the region. As detailed in sections 9.1.1 and 9.1.2, only USBL and SBP equipment is expected to emit underwater noise within the threshold which could result in a behavioural impact to grey and harbour seals. Considering the temporary nature of any disturbance from vessel activity, it is assumed that grey and harbour seals will soon return to the areas from which they may have been disturbed from therefore reducing the temporal extent of the impact. It is not expected that the offshore SG1A Project will cause an in-combination effect to the impacts which may be caused by the already consented Inch Cape OWF installation or surveys.

Considering the existing level of traffic heading through the Firth of Forth, it is not considered that the offshore SG1A Project will contribute significantly to existing vessel disturbance to grey and harbour seals or other marine mammals. Therefore, considering the temporary and short term duration and localised extent of offshore SG1A Project installation, maintenance activities and the absence of an addition to the extent of disturbance in the vicinity of the Isle of May SAC and Firth of Tay and Eden Estuary SAC, the proposed offshore SG1A Project is not expected to contribute to any existing or potential disturbance of the SACs and the offshore SG1A Project is not capable of an in-combination effect.

9.4 Conclusion

A summary of the assessment of the LSE on designated sites with marine mammal features in relation to the offshore SG1A Project is shown in Table 9-1.

Table 9-1 Assessment summary of potential effects to SACs with marine mammal features

Designated site	Potential effect	Installation & Decommissioning	Operation & Maintenance
Isle of May SAC	Injury, temporary disturbance / displacement due to underwater noise	LSE cannot be ruled out	No LSE
	Collision risk from vessel activities	No LSE	No LSE
	Increased turbidity affecting habitat use	No LSE	No LSE
	Accidental Pollution Events	No LSE	No LSE
Firth of Tay and Eden Estuary SAC	Injury, temporary disturbance / displacement due to underwater noise	No LSE	No LSE
	Collision risk from vessel activities	No LSE	No LSE
	Increased turbidity affecting habitat use	No LSE	No LSE
	Accidental Pollution Events	No LSE	No LSE

It is acknowledged that LSE from noise emissions cannot be ruled out in the absence of mitigation measures being implemented. As such, the Competent Authority may elect to undertake an Appropriate Assessment of the activities in this respect. With the implementation of mitigation measures, outlined in

Section 3.2, there will be no adverse effect on the Conservation Objectives of the Isle of May SAC and Firth of Tay and Eden Estuary SAC.

10. References

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Appendix D: Offshore SG1A Navigational Risk Assessment

Seagreen 1A Export Cable Corridor Navigational Risk Assessment

Prepared by	Anatec Limited
Presented to	Seagreen 1A Ltd
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Revision Number	Date	Summary of Change
00	22 February 2021	Initial Draft
01	23 February 2021	Updated based on client comments

Table of Contents

Table of Figures

Table of Tables

Abbreviations Table

Abbreviation	Definition
AfL	Agreement for Lease
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ALB	All-weather Lifeboat
AtoN	Aid to Navigation
AW	Augusta Westland
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
CLV	Cable Lay Vessel
COLREGS	International Regulations for Preventing Collisions at Sea
CA	Cruising Association
DfT	Department for Transport
DWT	Deadweight Tonnage
DP	Dynamic Positioning
EMI	Electromagnetic Interference
EU	European Union
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GPS	Global Positioning System
GT	Gross Tonnage
HDD	Horizontal Directional Drilling
HMCG	Her Majesty's Coastguard
HVDC	High Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ILB	Inshore Lifeboats
IMO	International Maritime Organisation
km	Kilometre
KP	Kilometre Point

Abbreviation	Definition
m	Metre
MAIB	Marine Accident Investigation Branch
MCA	Maritime & Coastguard Agency
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMO	Marine Management Organisation
MSC	Maritime Safety Committee
NAVTEX	Navigational Telex
NCI	National Coastwatch Institution
nm	Nautical Mile
NRA	Navigation Risk Assessment
OWF	Offshore Wind Farm
PEC	Pilotage Exemption Certificate
PLGR	Pre Lay Grapnel Run
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
TCE	The Crown Estate Scotland
TH	Trinity House
UK	United Kingdom
UKCOS	UK Chamber of Shipping
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
VTS	Vessel Traffic Service

1 Introduction

1.1 Project Summary

Anatec Ltd were commissioned by SSE to undertake a Navigational Risk Assessment (NRA) for the Seagreen 1A Project, which comprises an additional export cable corridor between the consented Seagreen Project and the agreed landfall at Cockenzie.

An initial baseline assessment is undertaken to identify navigational features and shipping activity in the vicinity of the proposed export cable corridor. This, along with consultation with key stakeholders, is then used to identify the potential impacts related to shipping and navigation associated with the construction, operational and decommissioning phases of the cable corridor. The significance of each impact is then determined using the assessment methodology detailed in Section 4.

1.2 Objectives

The NRA undertaken for the subsea export cable route cable includes:

- Overview of navigational features;
- Marine traffic analysis;
- Formal Safety Assessment (FSA);
- Impacts on marine navigation and communication equipment; and
- Identification of mitigation measures.

2 Project Overview

The consented Seagreen Offshore Wind Farm is located in the outer Firth of Forth and Firth of Tay, approximately 66km from the East Lothian coastline at its closest point. 114 of the 150 consented offshore wind turbines have a grid connection into Tealing in Angus, and construction on this grid connection started in 2020.

The proposed Seagreen 1A project seeks consent for the onshore and offshore infrastructure to connect the remaining 36 consented turbines to the national electricity transmission network.

The proposed export cable corridor will run from the consented Seagreen Project Area to the identified landfall at Cockenzie. The proposed export cable corridor is approximately 108km in length.

2.1 Study Area

For the baseline vessel traffic analysis, a study area was defined to cover an area of 5 nautical miles (nm) around the proposed export cable corridor, cropped to the coastline. The study area is presented in Figure 2.1.

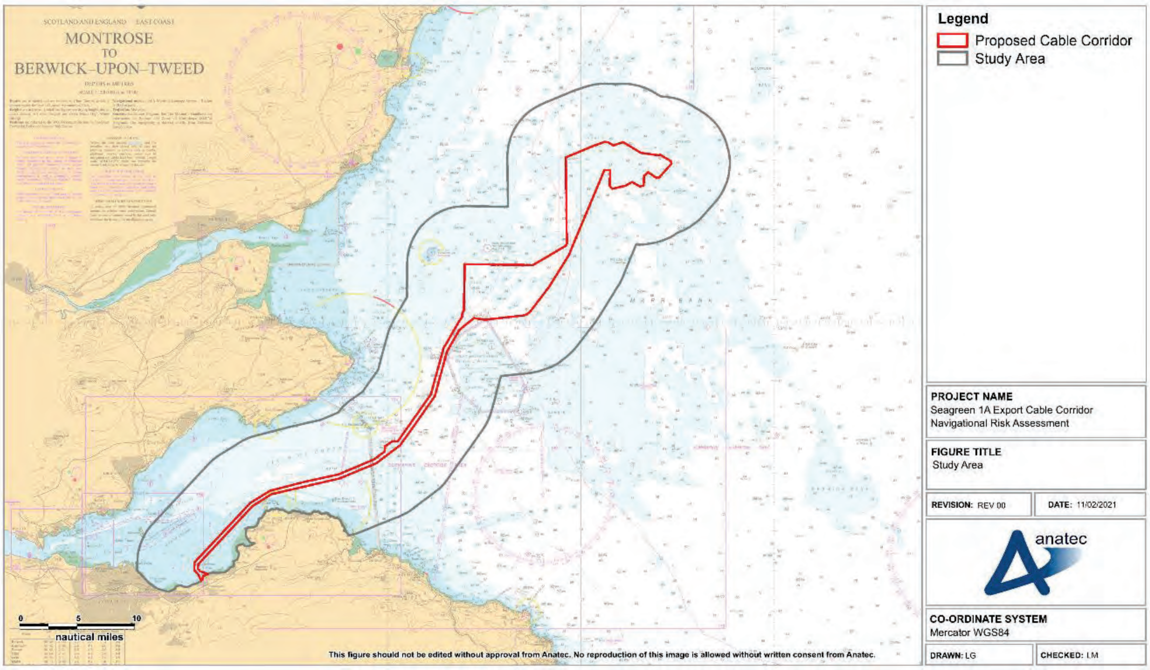

Figure 2.1 Study Area

The 5nm buffer is considered sufficient to characterise the shipping activity and navigational features close to the export cable corridor and to encompass any vessel traffic that may be impacted by the cable and associated operations. Where appropriate, the 5nm buffer has been extended to consider navigational features outside the study area that may impact vessel activity.

2.2 Cable Design & Installation

2.3 Design

The Seagreen 1A export cable will be an HVAC cable rated at up to 220kV or 275kV. It will consist of a 3-core aluminium or copper cored cable with steel armour wires and a polypropylene outer layer.

The key parameters of the export cable are outlined in Table 2.1.

Table 2.1 Export Cable Parameters

Export Cable Parameters	Value
Max number of export cables	1
Max number of export cable trenches	1
Anticipated cable corridor width max (km)	1
Anticipated working width max (m)	100
Anticipated buried export cable length*	Approximately 80%
Maximum rock or mattress protected length*	Approximately 20%
Temporary zone of influence during cable installation (due to plough or ROV tracks) (m)	6-10
If trenched, estimated width per trench (max) (m)	3
If trenched, cable burial depth (min – max) (m)	1-3
If protected, maximum height (m)	1
If protected, maximum width (m)	6
Number of construction vessels for export cable installation	2

2.4 Installation

Cable installation will involve the following activities:

- Seabed preparation
- Landfall preparation and HDD
- Main cable installation
- Rock placement / OSP rock nets / concrete mattresses / grout bags / HDD or form of / cast iron segments
- Post lay survey

Seabed preparation includes a pre-lay survey, construction of the pipeline crossing and a Pre Lay Grapnel Run (PLGR) to clear the seabed of any debris (such as discarded fishing gear). The estimated duration (worst case scenario) is expected to be 4 weeks.

At the Cockenzie landfall location, a trenchless installation technique (Horizontal Directional Drilling (HDD) or Direct Pipe) will be used to install a cable duct from the transition pit location (located onshore above MHWS and subject to a separate planning application) and out to approximately MLWS. The cable will be pulled to shore from an offshore vessel suspended by floats. The cable will be drawn through the ducts to the transition pit by a winch. Cables seaward of the pipe ends will be protected by jetting or trench excavation. Landfall works are expected to take up to 2 months (dependent on length of drill) for landfall preparation and drilling, and up to 1 week for the cable pull in.

Different approaches and techniques are available for offshore cable installation. These are:

- simultaneous cable lay and burial, using a cable plough or a mechanical trencher; and
- cable lay with post lay burial using a jetting ROV or a mechanical trencher.

A combination of methods may be used for cable installation, depending on ground conditions. The preferred approach will be confirmed on completion of the pre-construction geotechnical site investigation surveys. Further details regarding these options are provided below.

Cable Burial by Ploughing

The cable burial ploughs cut through the seabed, lifting the soil from a trench into which the cable is laid (Figure 2.2). The plough is designed to cut a narrow trench, with a slot of material temporarily supported which then falls back over the cable. The advantage of this method is that burial can be achieved as the cable is laid, thus minimising risk to the cable. However, the number of vessels which can carry out this method and that have the required cable carrying capacity for heavy power cable is limited.

The performance of a plough and the depth of burial which can be achieved are a function of plough geometry and seabed conditions, with dense or stiff soils providing the greatest challenge. One disadvantage of ploughing is slow speed and very high tow forces required.

Figure 2.2 Cable Plough

Cable Burial by Jetting

Where the seabed predominantly comprises soft sediments the export cable could be buried using a post-lay jetting technique, generally controlled from a DP vessel. The cable is laid on the seabed and a ROV fitted with high-pressure water jets is subsequently positioned above the cable (Figure 2.3). The jets fluidise a narrow trench into which the cable sinks under its own weight. The jetted sediments settle back into the trench and with typical tidal conditions the trench coverage is reinstated over several tidal cycles.

The advantage of this method is that the cable can be laid in a relatively rapid operation during suitable weather conditions. Cable burial can then be achieved separately with less concern over weather constraints disrupting operations. However, the performance of a jetting ROV is limited where sediments are more compacted.

Figure 2.3 Jetting ROV

The main cable installation operation is expected to take up to 2 weeks for either option.

There may be a requirement for additional external cable protection, such as rock, concrete mattresses or grout bags. This is discussed in more detail below (Section 2.6). If required, this operation could take up to 1 week (dependent on extent of cable requiring additional protection).

The post-lay survey is anticipated to take up to 1 week.

2.5 Export Cable Burial Depths and Trench Widths

Cable burial depth will be determined by a detailed hazard identification survey, which will assess the different locations and the various shipping and dredging activities. It is possible that the hazard identification survey will identify places where the cable burial depth may need to be varied due to local features, such as:

- sand waves;
- erosion of the seabed;
- shipping traffic anchor risk
- intense dredge or trawl fishing activities; and
- existing infrastructure or observed seabed obstacles.

The export cable burial depth will be between 1m and 2m depending on ground conditions and the outcome of further burial risk assessments. Based on current understanding of ground conditions it is expected that up to 80% of the export cable will be buried.

If buried, the estimated maximum trench width will be 3m and the maximum width of the temporary zone of influence, due to plough or ROV tracks, will be approximately 10m.

2.6 Alternative Export Cable Protection

Achieving satisfactory export cable burial depths may not be possible in some areas, due to hard substrate areas. The measures which may be utilised for the cable protection where burial is not achieved are:

- placement of concrete mattresses over the cable;
- rock placement to cover the cable on the seabed;
- placement of cast iron segments over the cable;
- OSP rock nets to cover the cable;
- HDD (or form of); or
- placement of grout bags over the cables which are then inflated with structural grout. The grout cures to provide an effective over cover protection system for the cables.

Alternative protection is also required where the cable crosses an existing pipeline.

2.7 Duration of Works

It is anticipated that the offshore export cable installation and associated works will take place between Q2 of 2023 and Q2 of 2024. Table 2.2 summarises the duration of works for the proposed export cable route.

Table 2.2 Installation Works Duration

Operation	Duration (worst case)
Seabed preparation	4 weeks
Cockenzie Landfall preparation and form of HDD	3 months
Main Cable Installation	2 weeks
Cable Pull in	1 week
Rock/grout bag/mattress placement	1 week
Post-lay survey	1 week

3 Guidance and Legislation

3.1 Legislation

The following legislation has been considered in this assessment:

- United Nations Convention on the Law of the Sea (UNCLOS) (UNCLOS, 1982);
- Submarine Telegraph Act (1885); and
- International Regulations for Preventing Collisions at Sea (COLREGS) 1972/78 (International Maritime Organization (IMO), 1972/78), as implemented in the UK through Merchant Shipping Notices:
- Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974), as amended, as implemented under UK legislation by The Merchant Shipping (Safety of Navigation) Regulations 2002 (Merchant Shipping Safety, 2002).

3.2 Primary Guidance

Impacts on shipping and navigation receptors are assessed using a Formal Safety Assessment (FSA) compliant with IMO guidelines. The primary guidance document used during the assessment is therefore given below:

- Revised Guidelines for FSA for Use in the Rule-Making Process [MSC-MEPC.2/Circ.12/Rev.2] (IMO, 2018).

3.3 Secondary guidance

The secondary guidance documents used during the assessment are listed below:

- *MGN* (Marine Guidance Note) *543 Offshore Renewable Energy Installations – Guidance on UK Navigational Practice, Safety and Emergency Response Issues* (MCA, 2016)[1];
- *International Association of Marine Aids to Navigation* (AtoN) *and Lighthouse Authorities* (IALA) *Recommendation O-129 on the Marking of Man-Made Offshore Structures, Edition Two* (IALA, 2013).

[1] At the time of writing, an updated version of MGN 543 is out for consultation and expected to be published later in 2020, superseding MGN 543.

4 Navigation Risk Assessment

4.1 FSA Methodology

The IMO FSA process approved under the IMO circular MSC/Circ.1023/MEPC/Circ.392 (IMO, 2002) has been applied within this study. This is a structured and systematic methodology based on risk analysis and cost benefit analysis (if applicable). There are five basic steps within this process (this assessment focuses on Steps 1-3):

- Step 1: Identification of hazards (a list of all relevant accident scenarios with potential causes and outcomes);
- Step 2: Assessment of risks (evaluation of risk factors);
- Step 3: Risk control options (devising regulatory measures to control and reduce the identified risks);
- Step 4: Cost benefit analysis (determining cost effectiveness of risk control measures); and
- Step 5: Recommendations for decision-making (information about the hazards, their associated risks and the cost effectiveness of alternative risk control measures).

Figure 4.1 presents a flow diagram of the FSA methodology applied.

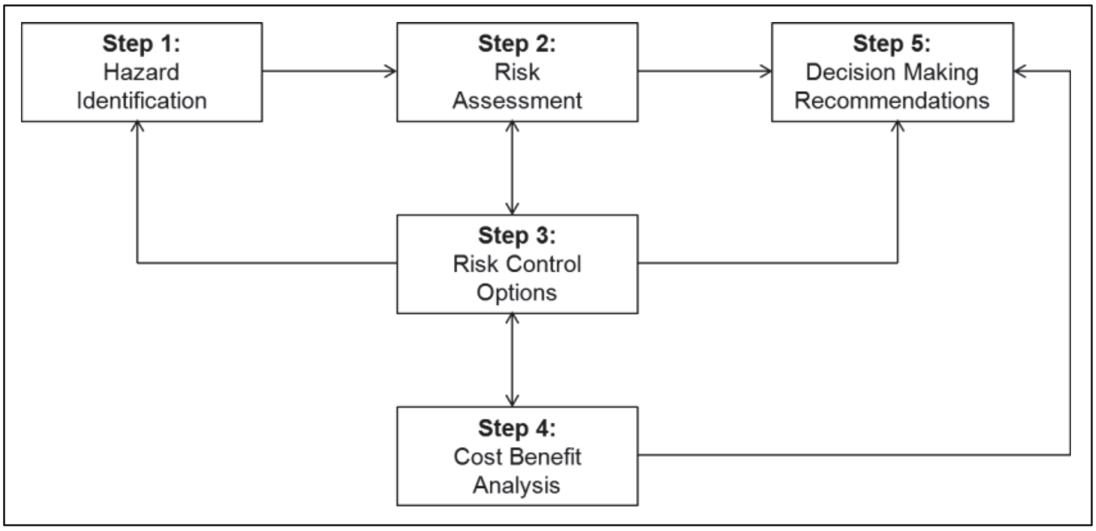

Figure 4.1 Formal Safety Assessment Process

The NRA uses a baseline assessment (established using the data sources listed in Section 5), in addition to consultation with local stakeholders to identify potential impacts relevant to shipping and navigation receptors that may arise as a result of the proposed Seagreen 1A export cable.

The impacts have been identified by phase, i.e. construction phase and operation and maintenance phase. It is noted that the impacts identified in the construction phase are also considered in the decommissioning phase. Where identified, the overall severity of consequence to the receptor and the frequency of occurrence has been determined. As this process incorporates a degree of subjectivity, the assessment uses the various sources provided within the NRA to inform the rankings assigned to each impact.

The severity of consequence has been assessed against the frequency of occurrence to provide the level of tolerability of the impact. Further detail of the assessment methodology is provided in Section 11.

4.2 Cumulative Impact Assessment Methodology

A Cumulative Impact Assessment has been undertaken for shipping and navigation within this NRA; this includes impacts of activities associated with other marine operations in the area and other marine developments. It is noted that commercial shipping, fishing, recreational and military transits have been considered as part of the baseline assessment.

4.3 Assumptions

The shipping and navigation baseline and impact assessment has been carried out based on the information available and responses received at the time of preparation. It is assumed that any notable changes will be re-assessed if and when required.

5 Data Sources

The main data sets used in this assessment are listed below, and described in detail in the following sections:

- Automatic Identification System (AIS) data;
- Vessel Monitoring System (VMS) satellite fishing data;
- Royal National Lifeboat Institution (RNLI) incident data;
- Marine Accident Investigation Branch (MAIB) incident data;
- UK Admiralty Charts;
- *Admiralty Sailing Directions, North Sea (West), NP 54, 10th Edition* (United Kingdom Hydrographic Office (UKHO), 2016); and
- Offshore wind farm (OWF) lease boundaries (TCE).

5.1 AIS Data

The baseline shipping analysis is based on an up-to-date data set consisting of twelve months of AIS data from January to December 2019.

AIS equipment is required to be fitted on all vessels of 300 GT and upwards engaged on international voyages, cargo vessels of 500 GT and upwards not engaged on international voyages, and passenger vessels irrespective of size, built on or after 1st July 2002. Under the Merchant Shipping (Vessel Traffic Monitoring and Reporting Requirements) Regulations 2004 (as amended in 2011), fishing vessels of 15m or more in length overall, UK registered or operating in UK waters, must be fitted with an approved (Class A) AIS (regulation 8A). In addition, all European Union (EU) registered fishing vessels of length 15m and above are required to carry AIS equipment by EU Directive. Smaller fishing vessels (below 15m) as well as recreational craft are not required to carry AIS but a proportion does so voluntarily. It is also noted that military vessels are not obligated to broadcast on AIS at all times. Therefore, these vessels (e.g. fishing, recreational and military vessels) will be under-reported within the AIS data.

The reporting interval between position reports for a given vessel typically ranges between a few seconds and up to three minutes, depending on its speed and navigational status (less frequent for anchored and moored vessels).

5.2 Satellite Fishing Data

The Vessel Monitoring System (VMS) satellite tracking data was obtained from Marine Scotland. The most recent available two years of fishing data (2016 and 2017) were reviewed within proximity to the proposed cable route.

5.3 RNLI and MAIB Incident Data

Incident data from the RNLI and MAIB was analysed as part of the baseline assessment.

The RNLI logs details of incidents it responds to, including the cause of the incident. The latest available data from 2008 to 2017 was analysed.

All UK commercial vessels are required to report accidents to the MAIB. Non-UK vessels do not have to report unless they are in a UK port or are inside the UK 12 nautical mile (nm) territorial waters and carrying passengers to a UK port. There are no requirements for non-commercial recreational craft to report accidents to the MAIB. The MAIB will record details of significant accidents of which they are notified by bodies such Her Majesty's Coastguard (HMCG), or by monitoring news and other information sources for relevant accidents. When reporting the location of incidents, the MAIB aim for 97% accuracy. The latest available data from 2008 to 2017 was analysed.

5.4 UK Admiralty Charts

Admiralty charts are nautical charts issued by the UKHO. Charts have been used to identify navigational features in the area. The following are the main charts used in this study:

- 190: Montrose to Fife Ness including the Isle of May
- 734: Firth of Forth Isle of May to Inchkeith
- 735: Firth of Forth Approaches Leith and Burntisland
- 1407: Montrose to Berwick-upon-Tweed
- 2: United Kingdom and Ireland

5.5 Admiralty Sailing Directions

Admiralty Sailing Directions, also known as Pilot Books, are used by mariners to identify established routes when steaming on passage, as well as coastline features, anchorages, ports, etc. North Sea (West), 10th Edition (UKHO, 2016) has been used in this assessment to identify the significant navigational features in the vicinity of the marine cable route.

5.6 Offshore Wind Farms

The OWF boundaries and potential areas of extension which are in proximity to the Seagreen 1A cable route were obtained from TCE (Scotland). The latest available layer is from January 2021.

5.7 Data Limitations

The main limitations associated with the data sets are outlined below.

- AIS equipment carriage is not mandatory for all vessels. Military vessels and smaller craft such as fishing vessels below 15m in length and recreational craft are not required to carry AIS, and therefore will be under-represented within the analysis.
- Trials carried out by Anatec in the North Sea found that a minority of fishing vessels do not broadcast on AIS at all times, especially when engaged in fishing, thus coverage of fishing vessels may be under-represented.

6 Navigational Features

This section presents the navigational features in proximity to the proposed export cable corridor.

6.1 Ports & Terminals

Figure 6.1 presents the ports, terminals and port limits located within close proximity to the cable corridor.

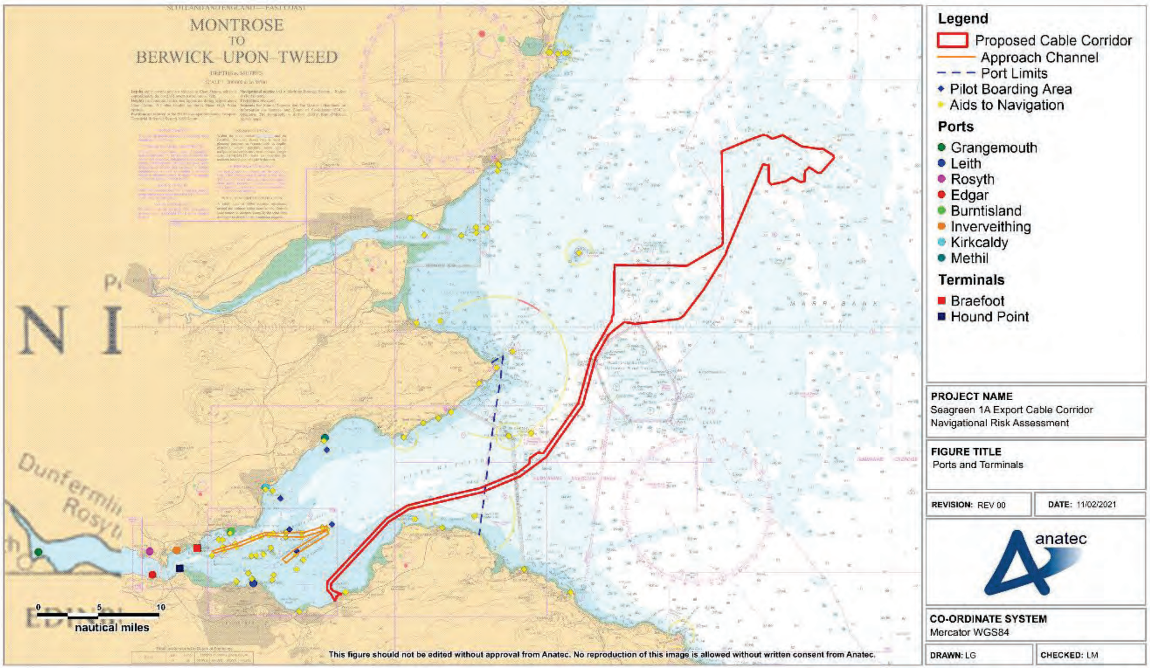

Figure 6.1 Ports and Terminals

Within the Firth of Forth are the ports of Leith, Rosyth and Grangemouth, the oil terminal at Hound Point and the gas terminal at Braefoot. The Forth ports handle about 5,000 vessel movements and over 48 million tonnes of cargo annually. The most important commodities are oil, petro-chemicals and liquefied gases, which pass through the port of Grangemouth and the two marine terminals at Hound Point and Barefoot. There is also considerable trade in cargo and containers through Grangemouth. Port Edgar lies in proximity to the export cable and accommodates a yacht marina administrated by City of Edinburgh Council.

Forth Ports Limited exercises jurisdiction over all the waters of Firth of Forth and the River Forth. Approximately 31km of the export cable route lies within the limit of authority of Forth Ports Ltd.

Leith approach channel is located approximately 3nm north-west of the export cable route. Leith approach channel from Leith approach buoy to the entrance lock is maintained at a dredged depth of 6.71m below Admiralty chart datum. The Forth Deep Water Channel which runs through the North Channel is approximately 4nm north of the export cable route.

There are 5 pilot boarding areas in proximity to the export cable (Ref. i). Pilotage is compulsory within the Forth area for:

- Vessels carrying 12 or more passengers;
- Vessels of 45m or more bound for the North Channel and Forth Deep Water Channel;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 80m or more bound for the Leith Channel;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Methil;
- Vessels of 45m or more carrying dangerous cargoes and all other vessels of 60m or more bound for Kirkcaldy.

6.2 Anchorage Areas

Figure 6.2 present the identified anchorage areas in close proximity to the cable route.

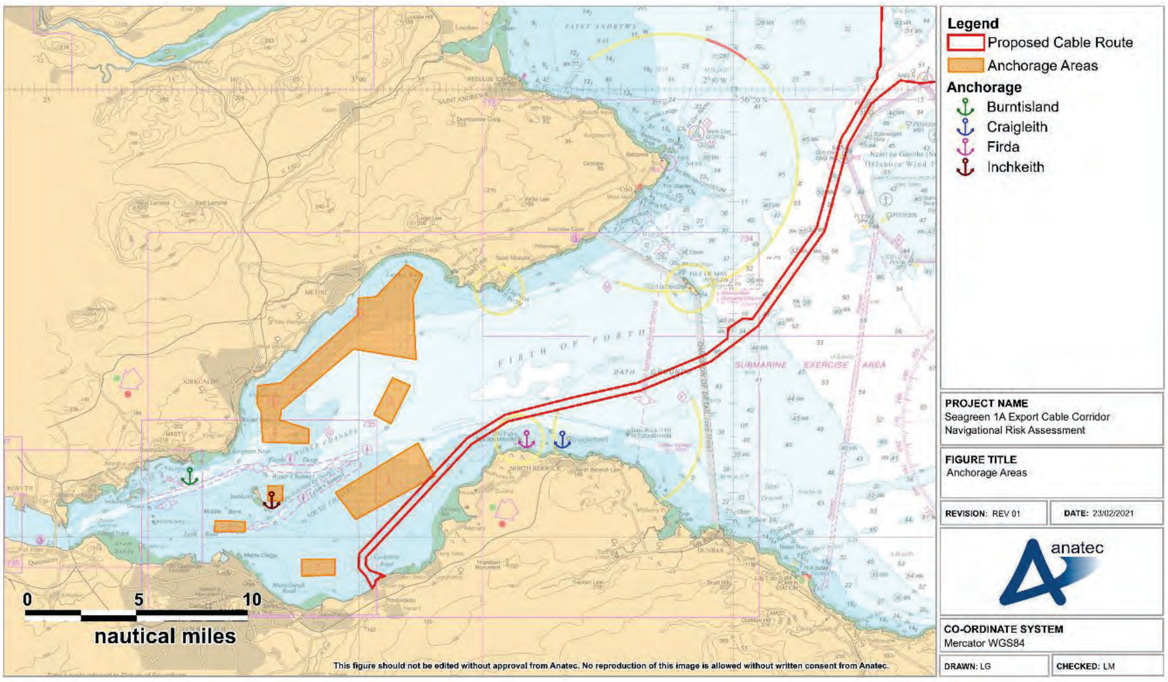

Figure 6.2 Anchorage Areas

A number of designated anchorage areas and anchor berths are located in the Firth of Forth and along the east coast of Scotland, one of which intersects the proposed export cable route.

Two anchorages are located south of the export cable route at Firda (approximately 1nm) and Craigleith (approximately 1.3nm from the export cable route).

6.3 Military Practice Zones

Figure 6.3 presents the military practice zones located within proximity of the export cable corridor.

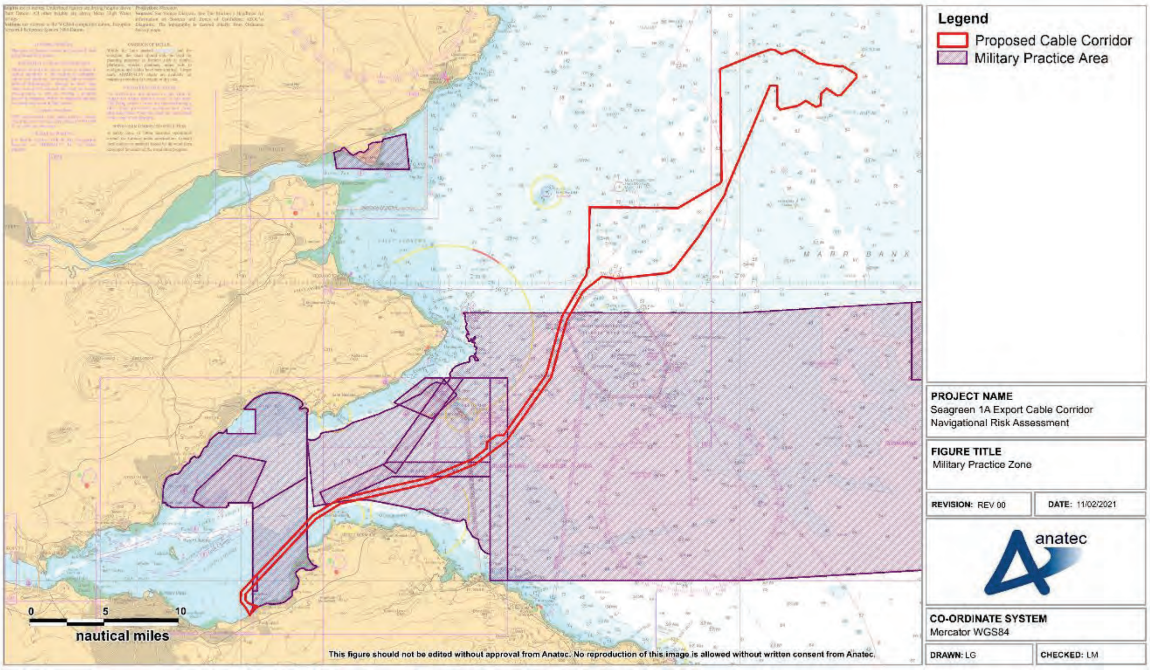

Figure 6.3 Military Practice Zone

The proposed export cable corridor intersects a number of Ministry of Defence (MOD) practice and exercise areas (PEXA), including submarine exercise and firing practice areas. No restrictions are placed on the right to transit the firing practice areas at any time. Exercises and firing only take place when the areas are considered to be clear of all shipping.

6.4 Offshore Wind Farms

Figure 6.4 presents the locations of offshore wind farms relative to the export cable corridor.

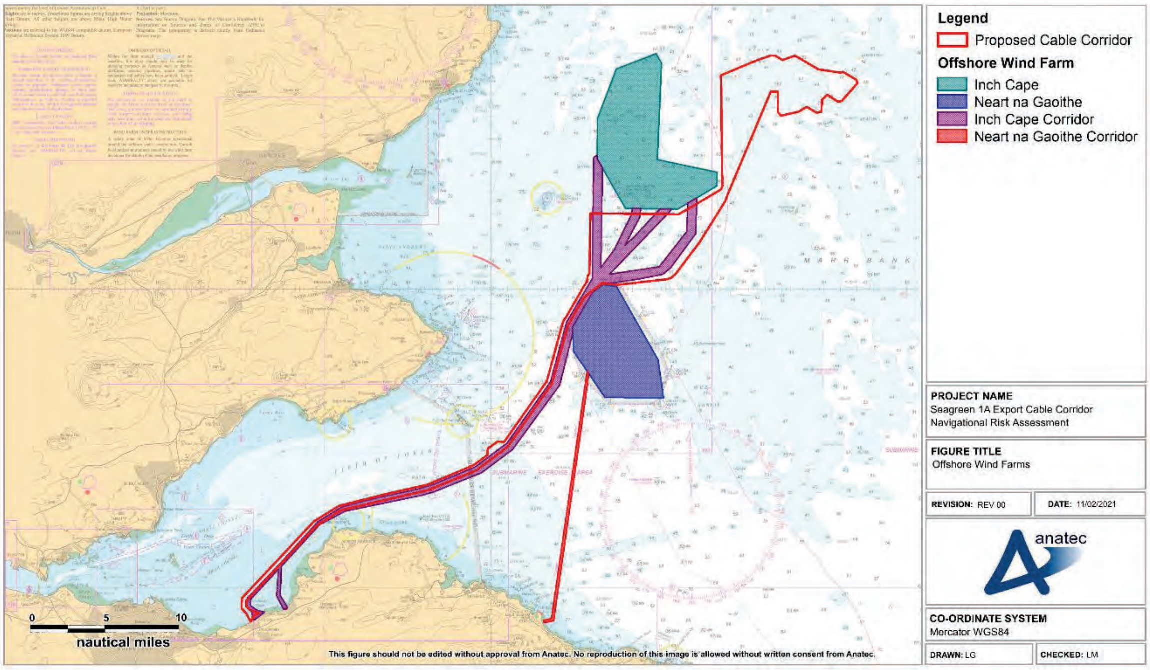

Figure 6.4 Offshore Wind Farms

Neart na Gaoithe is the closest consented wind farm site in proximity to the proposed export cable route, located 200m to the south. Construction on Neart na Gaoithe began in August 2020.

The Inch Cape development area is located 600m north of the proposed cable corridor. The proposed Seagreen 1A cable corridor is adjacent to the consented (but not yet constructed) Inch Cape Offshore Wind Farm cable corridor route.

6.5 Pipelines

Figure 6.5 presents the pipelines in proximity to the export cable corridor.

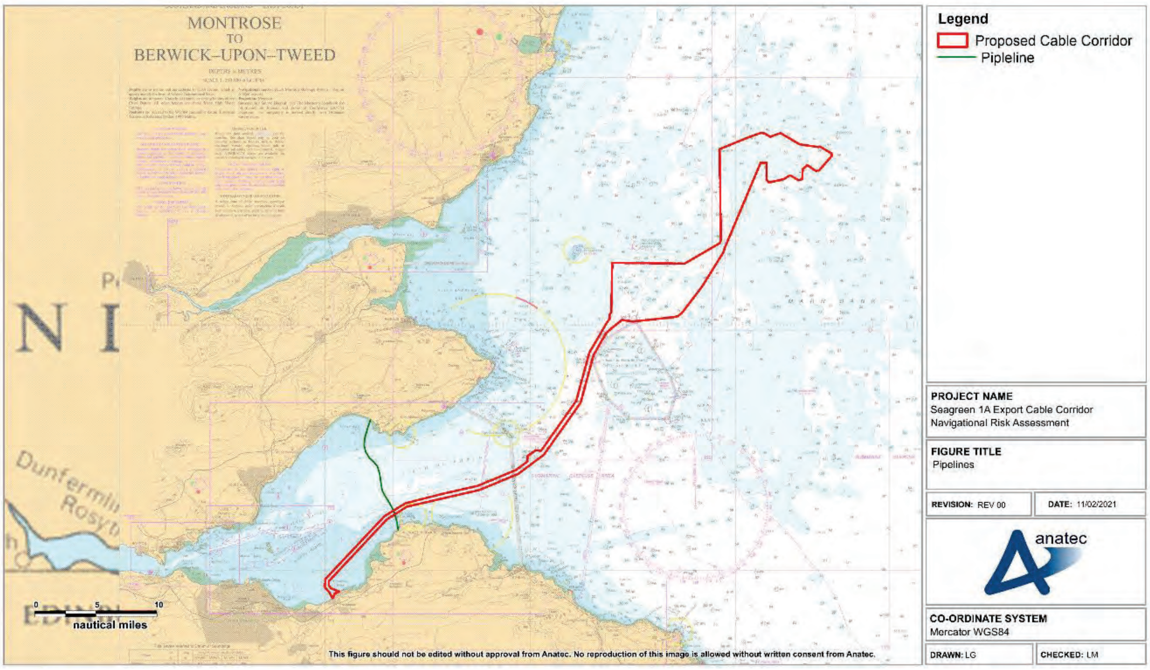

Figure 6.5 Pipelines

There is one gas pipeline that intersects the export cable, stretching across the mouth of the Firth of Forth. Anchoring is prohibited within an area covering approximately 1nm either side of this pipeline.

6.6 Key Areas

Figure 6.6 presents key areas in proximity to the export cable corridor.

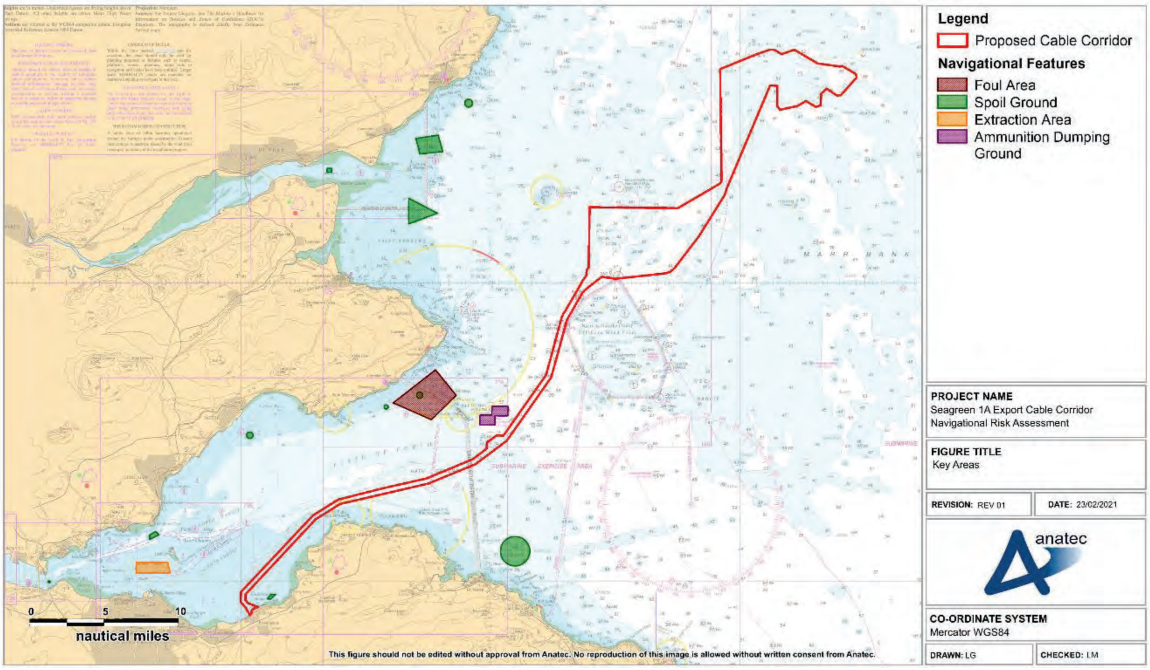

Figure 6.6 Key Areas

There are two charted ammunition dumping grounds (disused) approximately 1km north of the proposed export cable. There is also a foul area located approximately 4nm north of the proposed export cable, on the western side of the Isle of May. Vessels are cautioned from anchoring or fishing within this area due to the existence of foul area and obstructions on the seabed. One extraction area is located approximately 5nm north-east of the proposed cable corridor.

7 Emergency Response Overview and Assessment

The RNLI is organised into six divisions, with the relevant region for the proposed export cable being the East division. Based out of more than 230 stations, there are more than 350 lifeboats across the RNLI fleet, including both all-weather boats (ALBs) and inshore lifeboats (ILBs). There are numerous RNLI stations within proximity of the cable corridor which are presented in Figure 7.1.

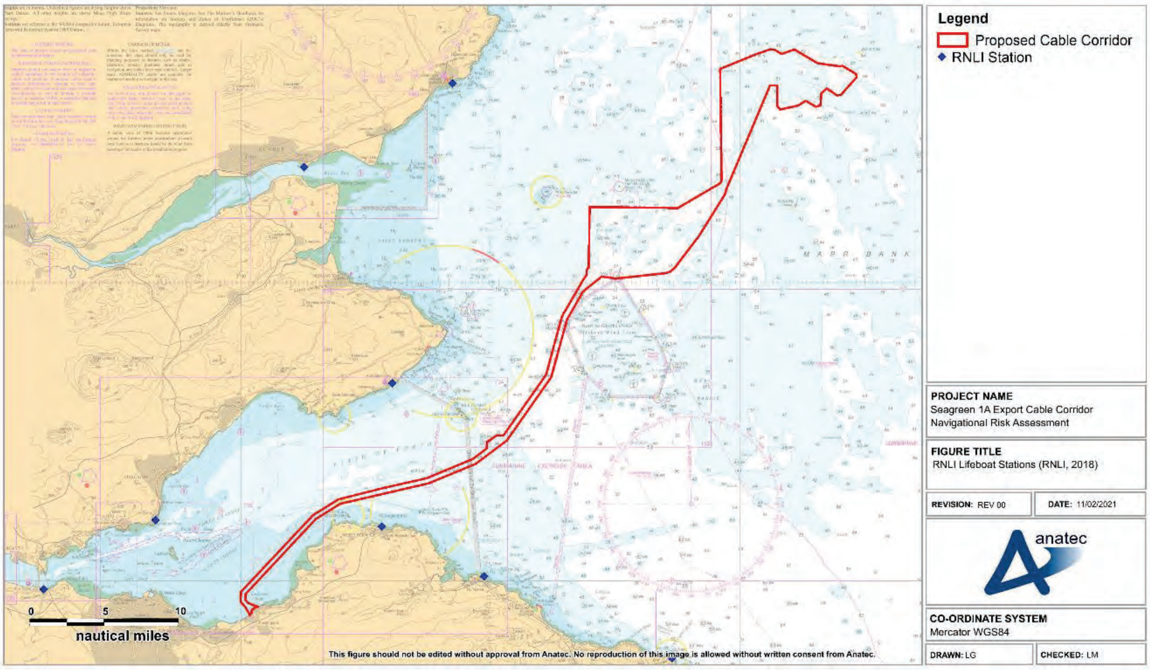

Figure 7.1 RNLI Lifeboat Stations (RNLI, 2018)

7.1 SAR Helicopters

In March 2013, the Bristow Group were awarded the contract by the MCA (as an executive agency of the Department for Transport (DfT)) to provide helicopter SAR operations in the UK over a ten-year period. Bristow have now been operating the service since April 2015. There are ten base locations for the SAR helicopter service. The nearest SAR helicopter base to the Project is Prestwick, located approximately 60nm southwest of the export cable route landfall (see Figure 7.2). This base operates two Leonardo Augusta Westland (AW) 189 aircraft.

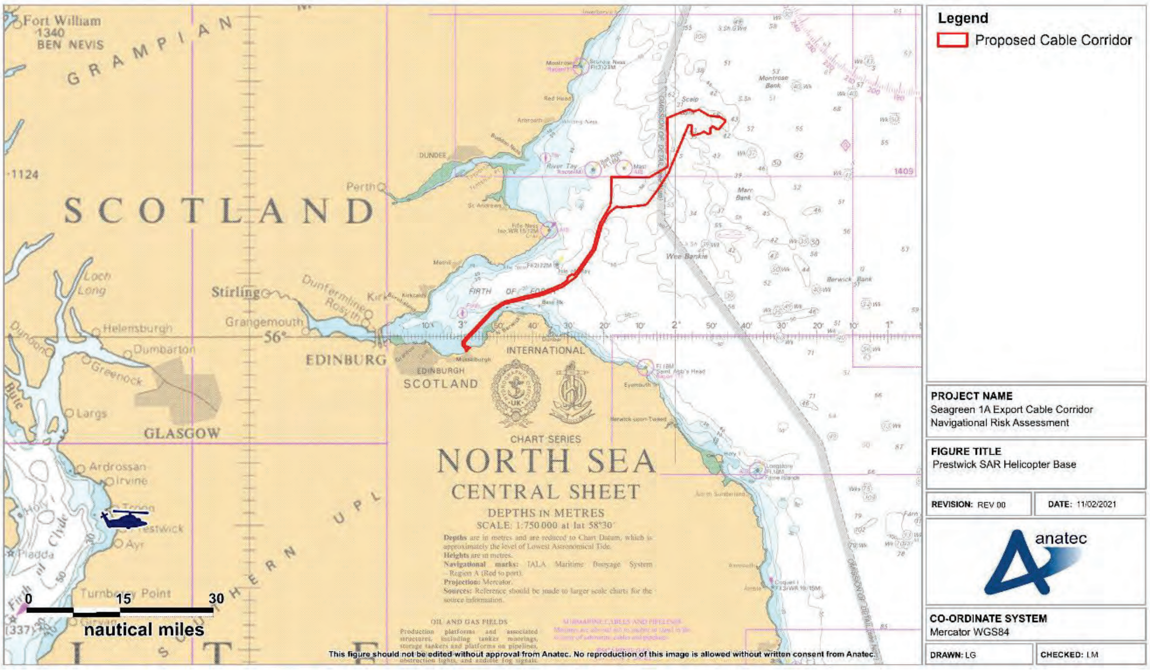

Figure 7.2 Prestwick SAR Helicopter Base

7.2 Emergency Towing Vessels, Fire Salvage

The MCA has no dedicated emergency towing vessels. Private towing companies may be asked to assist a drifting vessel as well as wreck removal, cargo recovery, towage and pollution prevention. These private vessels are situated throughout UK waters and ports.

The responsibility for dealing with fires lies with the vessel's operating company. The vessel's operating company is obligated to have a safety management system in place. HM Coastguard will monitor any situation for risk to life or marine pollution. SAR assets will be tasked to assist if the fire has not been dealt with or commercial salvers tasked to assist in saving the vessel and cargo if required.

8 Maritime Incidents

This section presents a historical review of incident data from RNLI (2008-2017) and MAIB (2008-2017) within the study area. This analysis is intended to provide a general indication as to whether the study area is of low or high risk in terms of maritime incidents. If the area was found to be a particularly high risk area for incidents, this may indicate that the proposed Seagreen 1A export cable could exacerbate the existing maritime safety risks in the area, particularly during the construction phase. During normal operations there is not likely to be an increased maritime safety risk as the cable should be suitably buried and/or protected.

8.1 MAIB

Figure 8.1 presents all MAIB incidents recorded within the study area between 2008 and 2017.

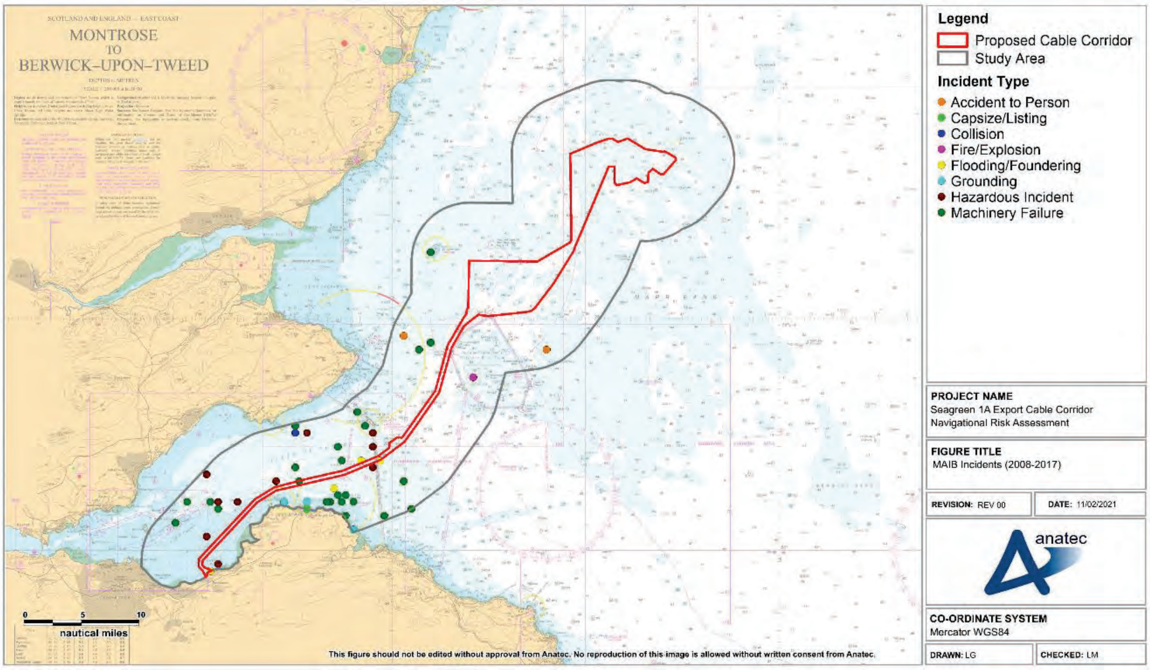

Figure 8.1 MAIB Incidents (2008-2017)

A total of 46 unique incidents were recorded within the study area between 2008 and 2017. The distribution of all incidents by type is presented in Figure 8.2.

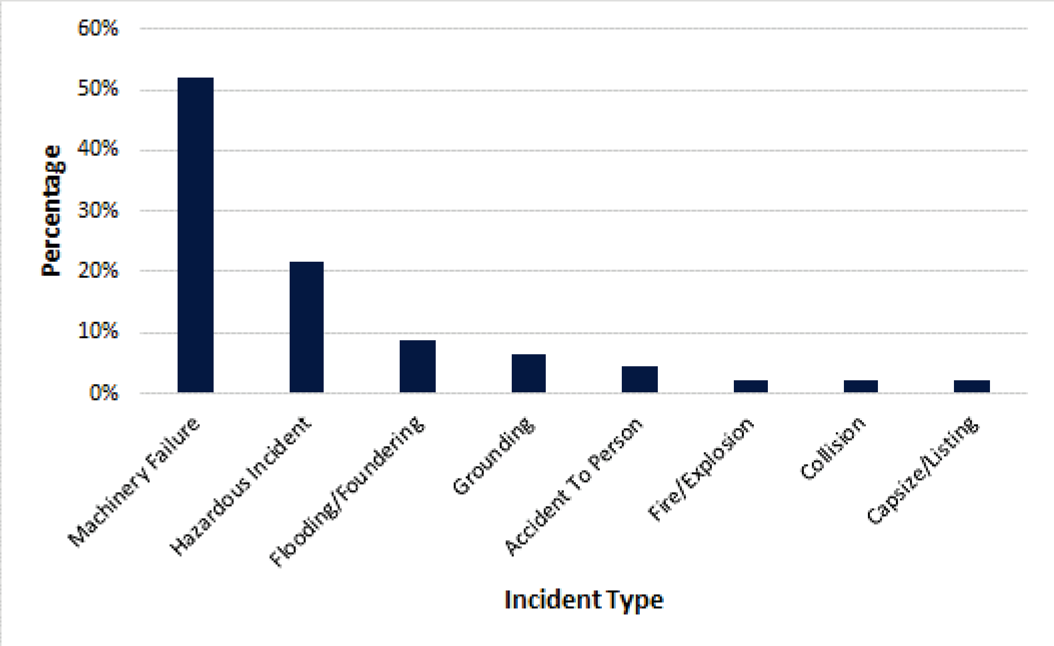

Figure 8.2 MAIB Incident Type Distribution

The most frequently recorded incident types included machinery failure (52%) followed by hazardous incidents (22%). Incident types that have the potential to impact the subsea cable include foundering, grounding, and machinery failure that may lead to a vessel dropping its anchor in an emergency. It is also noted, collisions or contacts over the marine cable route may also pose a risk as such incidents could potentially cause a vessel to founder over the cable.

Vessels frequently involved in maritime incidents were fishing vessels (63%) and dry cargo vessels (11%).

8.2 RNLI

Figure 8.3 presents all the RNLI incidents recorded within the study area between 2008 and 2017.

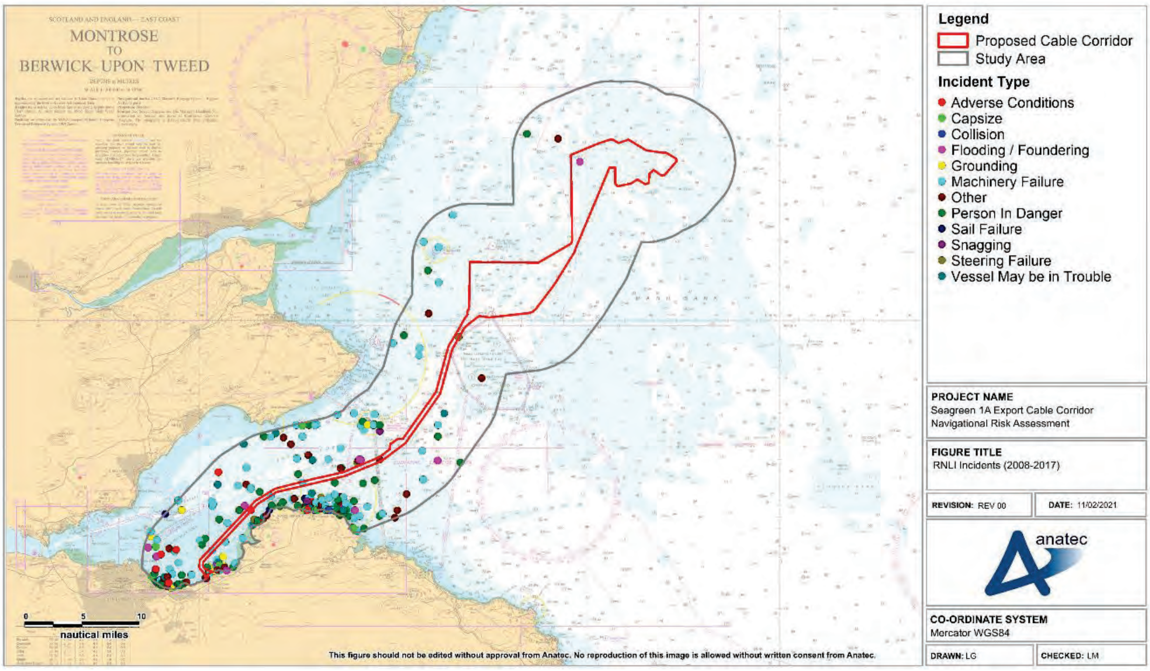

Figure 8.3 RNLI Incidents (2008-2017)

There were a total of 348 unique incidents recorded by the RNLI within the study area during the ten year study period. Figure 8.4 presents the incident type distribution for all incidents recorded.

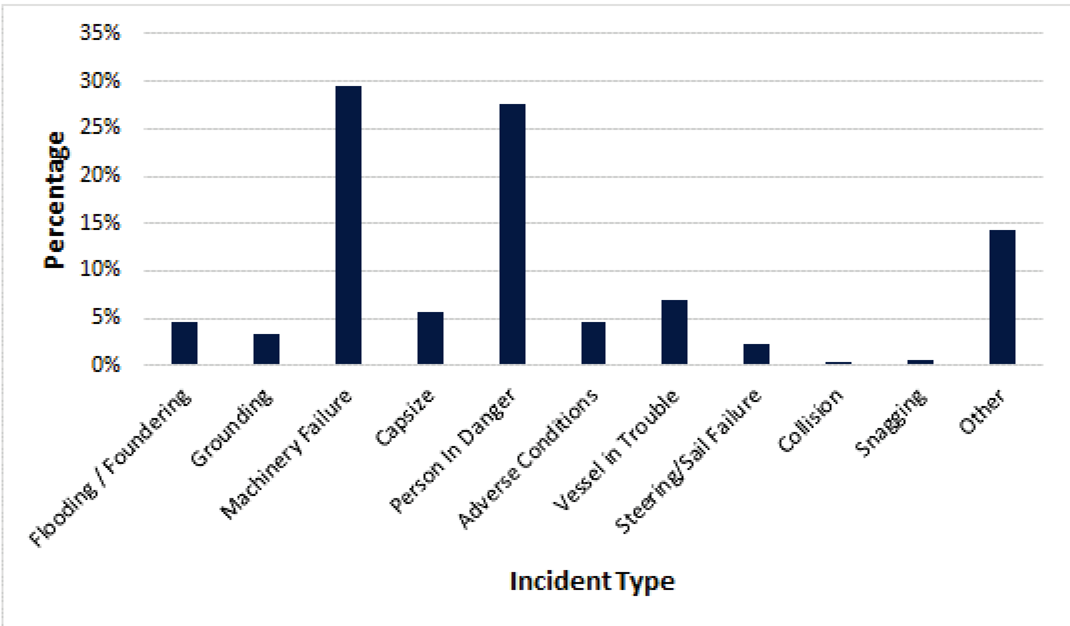

Figure 8.4 RNLI Incident Type Distribution (2008-2017)

Machinery failure (30%) was the most frequently recoded incident type in the study area, followed by person in danger (28%).

The majority of incidents recorded in the entire study area involved a person in danger (24%), followed by fishing vessels (23%), as presented in Figure 8.5.

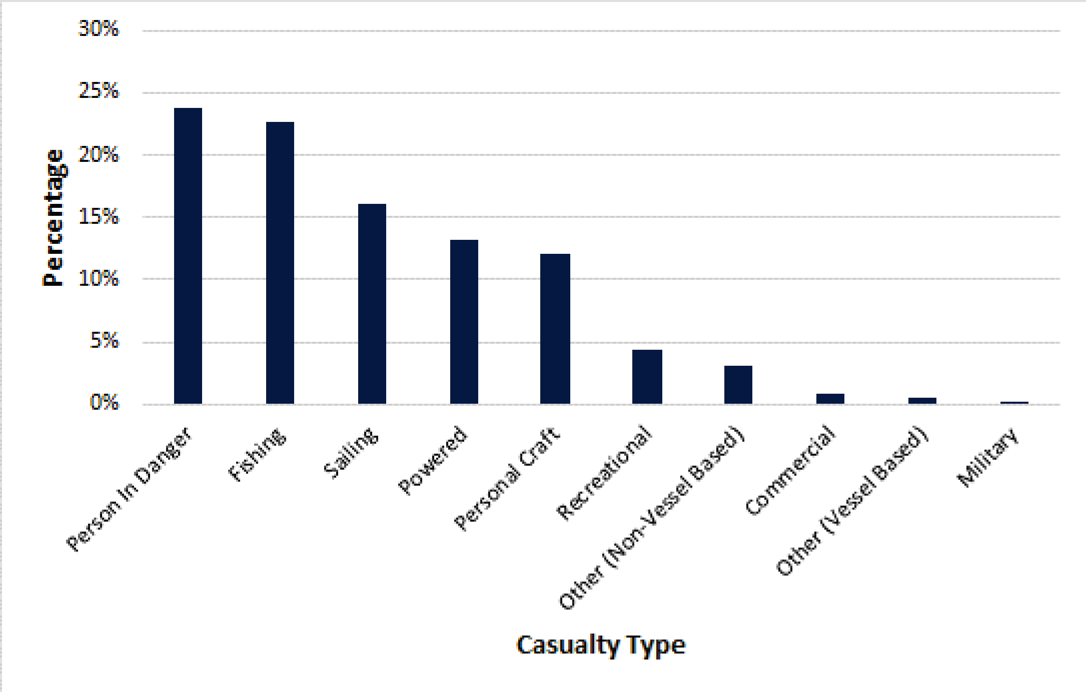

Figure 8.5 RNLI Incidents by Casualty Type (2008-2017)

9 Consultation

9.1 Meetings

9.1.1 14th January 2021

An overview of the proposed Seagreen 1A export cable was presented to a number of shipping and navigation consultees on the 14th January 2021. Consultees included representatives from Maritime & Coastguard Agency (MCA), Cruising Association (CA), Royal Yachting Association (RYA) and UK Chamber of Shipping (UKCOS). Table 9.1 presents the key points.

Table 9.1 14th January 2021

Organisation	Main Point	Where Addressed
RYA	Larger recreational vessels more likely to carry AIS, while day sailors are unlikely to broadcast on AIS. Recreational vessels can appear anywhere in the area however, it is not considered to be an issue with the Seagreen 1A project. The RYA Coastal Atlas is available for further information on recreational activity.	Impact on recreational activities during construction assessed in 11.4.1 , which takes into consideration that AIS data does not cover all recreational craft. The baseline recreational analysis is presented in Section 10.8.
MCA	It was queried whether consultation with harbour authorities will take place.	Consultation with Forth Ports and Northern Lighthouse Board was carried out and is summarised in Table 9.2.
UKCOS	It was queried if 10 years of MAIB statistics was sufficient and if any more data could be collected from their database.	The MAIB analysis presented Section 8.1 is intended to provide a general indication as to whether the study area is of low or high risk in terms of maritime incidents. The most recent 10 years was used as being representative of the current status in terms of technology and safety standards.

Organisation	Main Point	Where Addressed
UKCOS	The decommissioning plan was queried.	Impacts associated with decommissioning are outlined in Section 11.4.3. Decommissioning will be subject to a separate assessment at the time.
UKCOS	It was raised there has been previous consultation relating to capital and maintenance dredging associated with offshore wind farms and the special protection area for the outer Firth of Forth and St Andrews Bay. It was noted that the project may require Habitats Regulations Assessment (HRA) approval and further assessments.	Impacts associated with offshore wind farms and aggregate / maintenance dredging assessed in Section 11.4.1. HRA Assessment is addressed in the Nature Conservation Appraisal.
RYA	The potential issue of Unexploded Ordnance (UXO) within the Firth of Forth which remain from WW2 was raised.	UXO surveys carried out as part of the pre-installation works.
CA	CA members will mainly be transiting on passage from Arbroath down to Holy Island. No major issues were anticipated.	Impact on recreational activities during construction assessed in 11.4.1.

9.1.2 19th January 2021

A meeting with representatives from Forth Ports and the Northern Lighthouse Board (NLB) was held on Tuesday 19th January 2021. An overview of the proposed Seagreen 1A export cable, including the baseline assessment was presented. Table 9.2 presents the key points.

Table 9.2 19th January 2021

Organisation	Main Point	Where Addressed
Forth Ports	It was stated there are no concerns with the proposed cable and that good communication, including Notices to Mariners and frequent calls, during the works will be key.	Ongoing communication with Forth Ports and the Seagreen 1A project is planned.

Organisation	Main Point	Where Addressed
Forth Ports	It was clarified that Forth Ports use a Vessel Traffic Service (VTS) to monitor shipping activity within the Firth of Forth and covers the area out to the port limits. It was also noted that whilst they can see beyond this, the official area covered by the VTS is within port limits.	The port limits are presented within the navigational features (Section 6).
Forth Ports	It was noted that the proposed cable route crosses the main channels in the approach to ports, but most commercial traffic tends to keep to the north of the proposed export cable route. Vessels most likely to transit into Cockenzie and around the Southern extents of the cable will be fishing and recreational craft.	Impact on disruption to vessel routeing/timetables during construction assessed in Section 11.4.1. Impact on fishing and recreational activities during construction assessed in 11.4.1.
Forth Ports	It was raised that there are ports/docks at Inverkeithing, Methil, Kirkcaldy etc. (associated with Fife and Kirkcaldy) to be aware of. It was noted that only a small amount of vessel traffic is associated with these areas	Ports are presented within the navigational features in Section 6.
Forth Ports	It was stated that Forth Ports are alerted if any vessels stop within the exclusion zone surrounding the existing gas pipeline in the area, as they have designated monitoring for the pipeline using radar/AIS.	The existing gas pipeline is presented in Section 6. Any impact associated with external protection regarding the pipeline crossing is assessed in Section 11.4.2.
NLB	No specific concerns were raised with the proposed export cable as long as it is clear of any anchorage areas and does not impact any future developments at Cockenzie.	Anchorage areas relative to the export cable route are presented in Section 6. The cable will be in a form of HDD duct or buried close to landfall, therefore no impact on future developments at Cockenzie are anticipated.

Organisation	Main Point	Where Addressed
Forth Ports	It was stated that Forth Ports are regularly consulted during any construction works taking place within the Firth of Forth.	Ongoing communication with Forth Ports and the Seagreen 1A project is planned.

10 Baseline Shipping Analysis

10.1 Introduction

This section presents the analysis of the AIS shipping data within the study area defined for the proposed Seagreen 1A export cable.

Assessments of the vessel numbers, types, sizes and densities are provided below. An AIS data set consisting of 12 months was used to provide up-to-date coverage of the study area, accounting for seasonal trends. The time period used was between 1st January 2019 and 31st December 2019.

10.2 Vessel Type

Figure 10.1 presents the AIS tracks colour-coded by vessel type. Following this, Figure 10.2 presents the vessel type distribution, based on unique vessels per day.

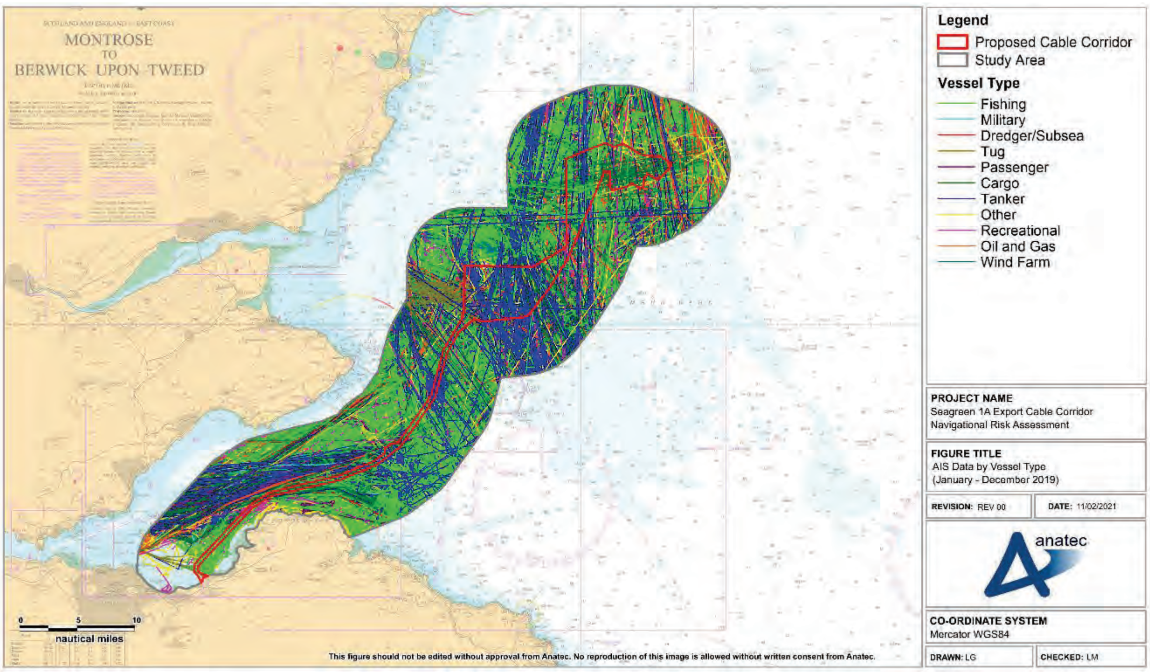

Figure 10.1 AIS Data by Vessel Type (January – December 2019)

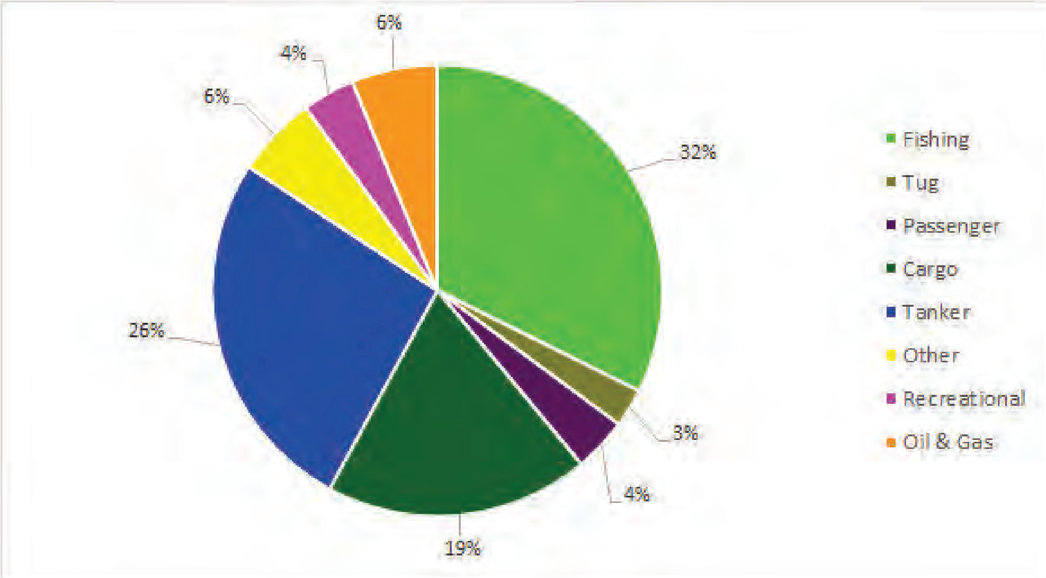

Figure 10.2 Vessel Type Distribution

The most common vessel type recorded within the export cable study area was fishing vessels which accounted for 32% of the overall distribution, followed by tankers (26%) and cargo vessels (19%). Vessels in the 'other' category included RNLI lifeboats, buoy laying vessels, research vessels, pilot vessels etc.

It is again noted that recreational craft and small fishing vessels less than 15m in length will be under-represented due to AIS carriage requirements. In addition there may be some loss of coverage further offshore, especially in the winter period, due to the range from the AIS receivers.

Section 10.9 presents a detailed baseline analysis of fishing activity recorded within the study area.

The tracks of cargo vessels and tankers recorded in the study area are presented in Figure 10.3 to provide a clearer visual of the positions of these vessels.

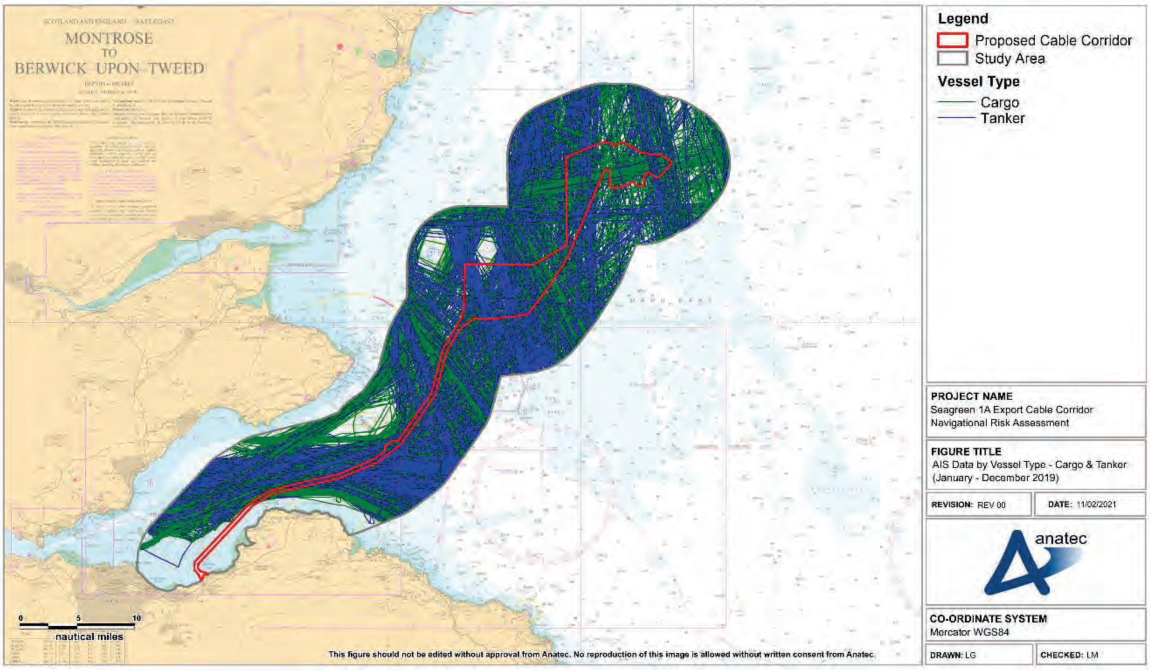

Figure 10.3 AIS Data by Vessel Type - Cargo & Tanker (January – December 2019)

It can be seen that cargo vessels and tankers were transiting the entire study area, with the exception of shallow waters nearshore. A high volume of cargo and tanker traffic in the study area was observed entering / exiting the Firth of Forth, transiting to ports such as Grangemouth and Leith. Cargo vessels and tankers was also seen further offshore on passage to destinations such as Aberdeen, Immingham and Rotterdam.

10.3 Vessel Numbers

Figure 10.4 presents the average daily unique vessel count per month.

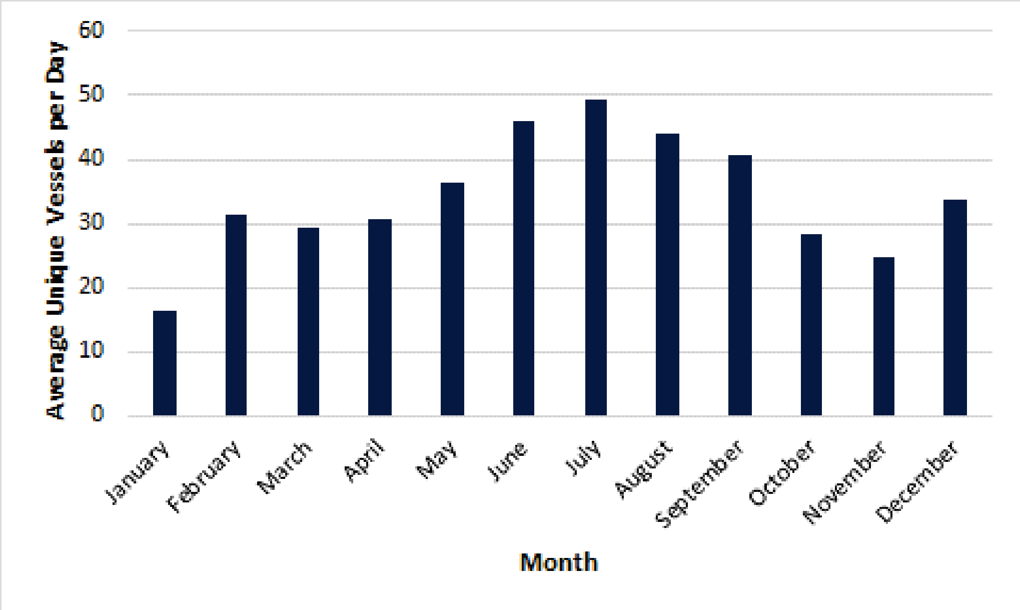

Figure 10.4 Average Daily Vessel Count per Month

There was an average of 34 unique vessels recorded per day within the study area during the 12-month period. July was the busiest month with an average of 49 unique vessels per day. The quietest month recorded was January with an average of 17 vessels per day. The significant difference can be attributed to the higher level of fishing and recreational activity recorded within the summer months.

10.4 Vessel Density

Figure 10.5 presents the vessel density for all AIS vessel tracks based on the number of track intersects of a 250m x 250m grid covering the study area.

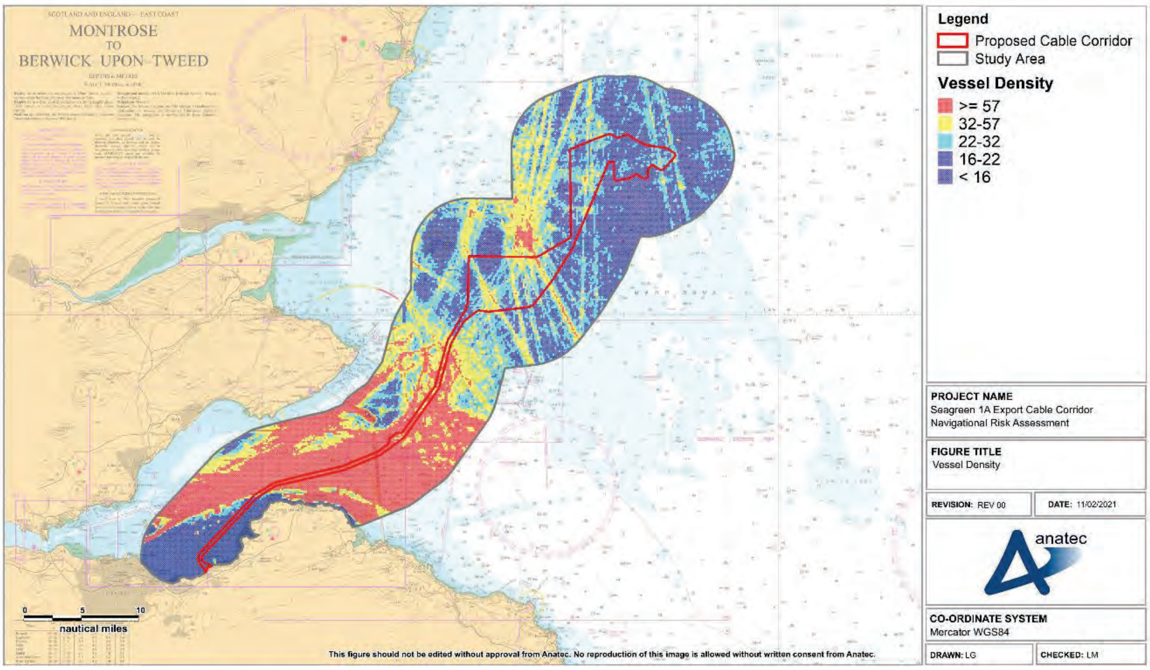

Figure 10.5 Vessel Density (January – December 2019)

High density within the study area can be associated with cargo vessels and tankers entering / exiting ports within the Firth of Forth such as Grangemouth, Rosyth and Leith, and the terminals at Braefoot and Hound Point. Low density areas can be seen in coastal waters within the Forth Ports limits and further offshore.

10.5 Vessel Sizes

10.5.1 Vessel Length

Figure 10.6 presents the AIS vessel tracks recorded in the study area, colour-coded by vessel length. The vessel length distribution (excluding 2% unspecified) is then presented in Figure 10.7, based on unique vessels per day.

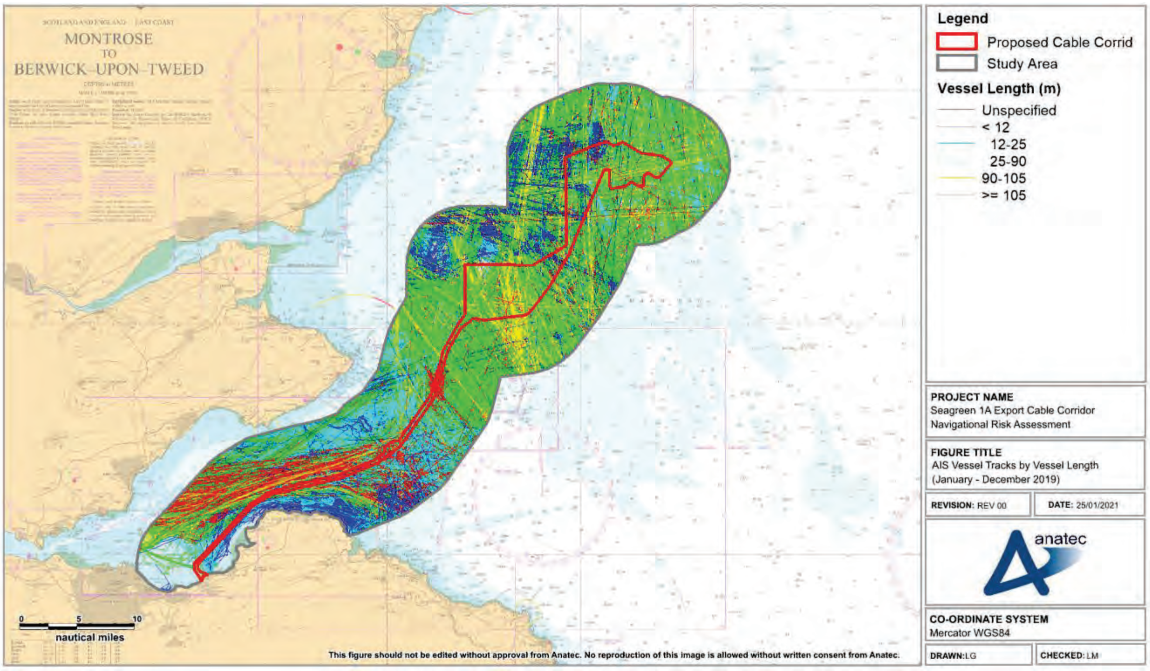

Figure 10.6 AIS Vessel Tracks by Vessel Length (January – December 2019)

Larger vessels can be seen transiting the Firth of Forth to terminals such as Hound Point where oil is loaded onto tankers. Smaller vessels can be seen in coastal waters and further offshore and the majority can be associated with small fishing vessels.

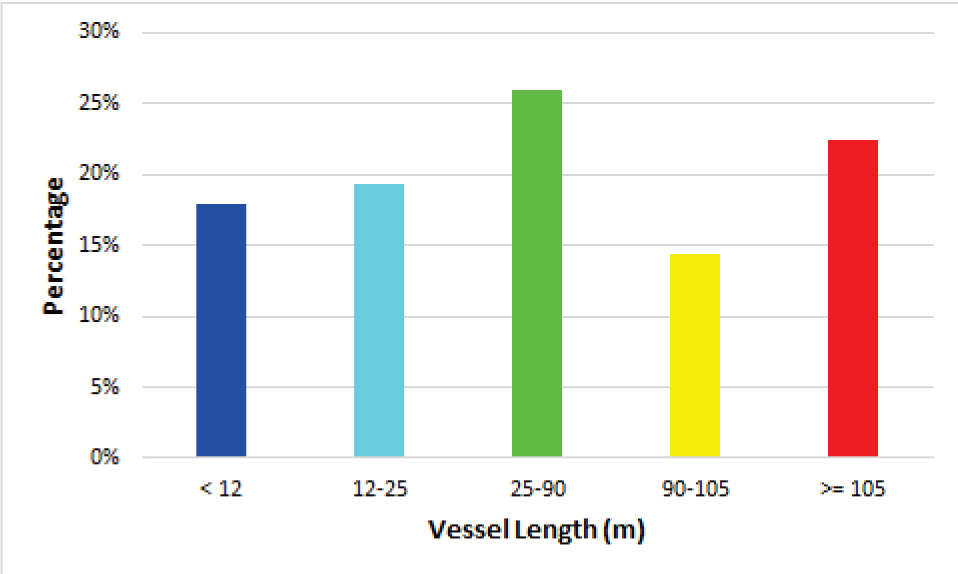

Figure 10.7 AIS Vessel Length Distribution

The average vessel length recorded in the study area was 73m. The largest vessel recorded was a 336m crude oil tanker transiting to Hound Point oil terminal within the Firth of Forth.

10.5.2 Vessel Draught

Figure 10.8 presents the AIS vessel tracks recorded in the study area, colour-coded by vessel draught. The vessel draught distribution is then presented in Figure 10.9. It is noted 40% of vessels did not broadcast a draught. These have been excluded from the distribution however, as the vast majority of these are fishing vessels or small recreational craft, it is expected that these would have small draughts (e.g. less than 5m).

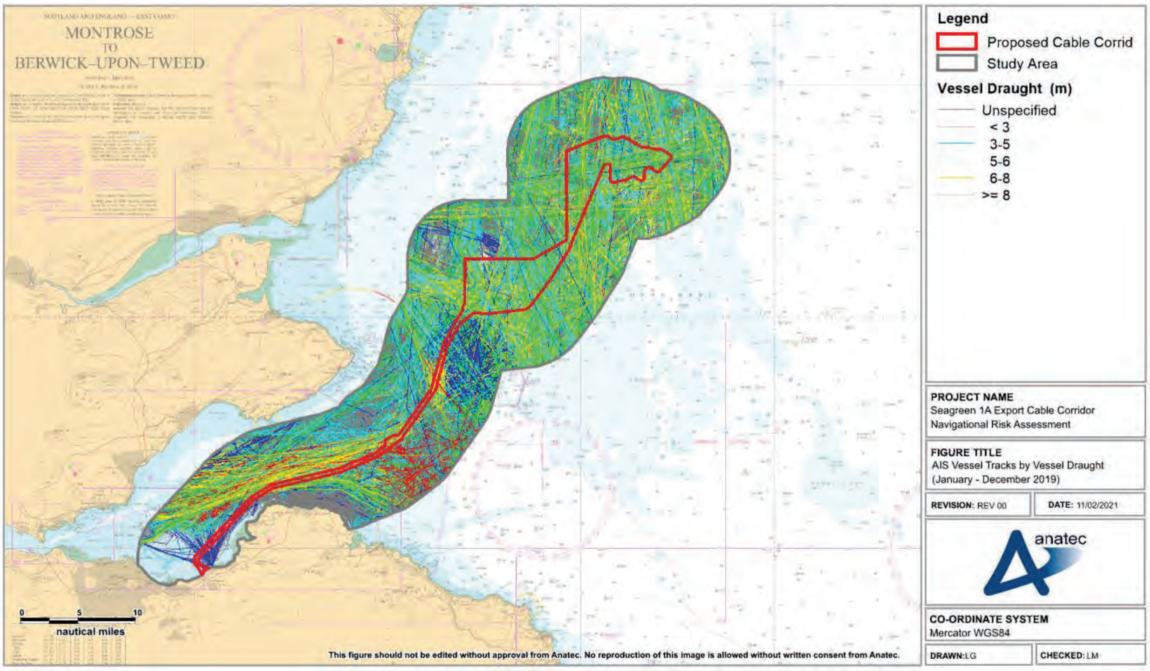

Figure 10.8 AIS Vessel Tracks by Vessel Draught (January – December 2019)

Vessels with larger draughts can be seen transiting within the Firth of Forth. Leith approach channel (presented in Section 6) is maintained at a dredged depth of 6.71m below Admiralty chart datum. The vessel with the largest draught was a crude oil tanker transiting to Singapore and had a draught of 20.8m.

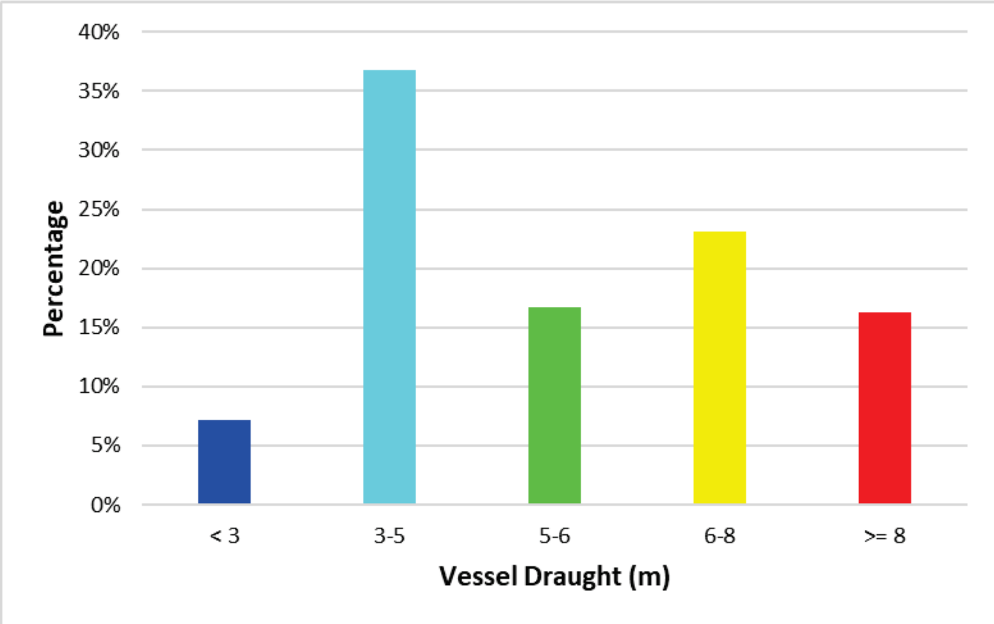

Figure 10.9 AIS Vessel Draught Distribution

The average vessel draught recorded in the study area was 6m. As noted above, smaller draught vessels (recreational craft and fishing vessels) are likely under-represented in the above graph, and the average draught is therefore likely to be smaller.

10.5.3 Vessel Deadweight Tonnage

Figure 10.10 presents the AIS vessel tracks in the study area, colour-coded by vessel Deadweight Tonnage (DWT). This is not broadcast on AIS and, where possible, has been researched separately by Anatec based on the ship identity information. In some cases, approximations were based on the vessel type and dimensions (mainly for small fishing vessels and recreational craft estimated to be less than 500 DWT).

Vessel DWT is closely related to the size of anchor carried by the vessel, with those with larger DWT carrying larger anchors. Larger anchors pose a greater risk of anchor dragging or emergency anchoring onto the cable (see Section 11).

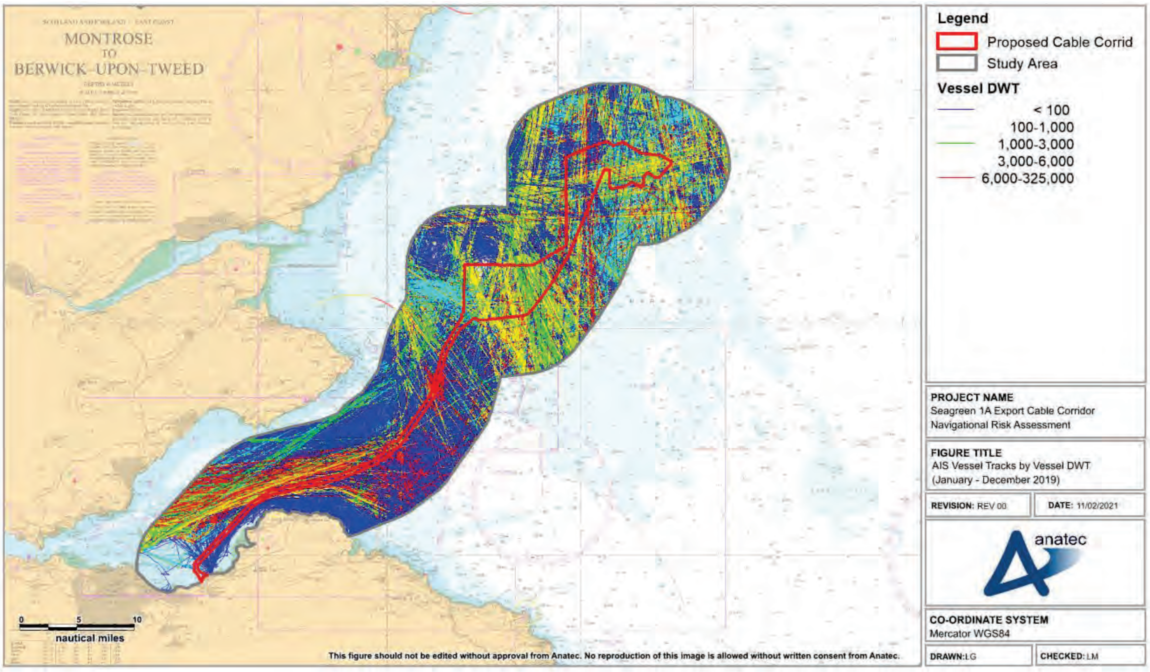

Figure 10.10 AIS Vessel Tracks by Vessel DWT (January – December 2019)

The vessel DWT distribution, based on unique vessels per day, is presented in Figure 10.11, excluding < 1% unspecified vessels whose draught could not be estimated due to limited information.

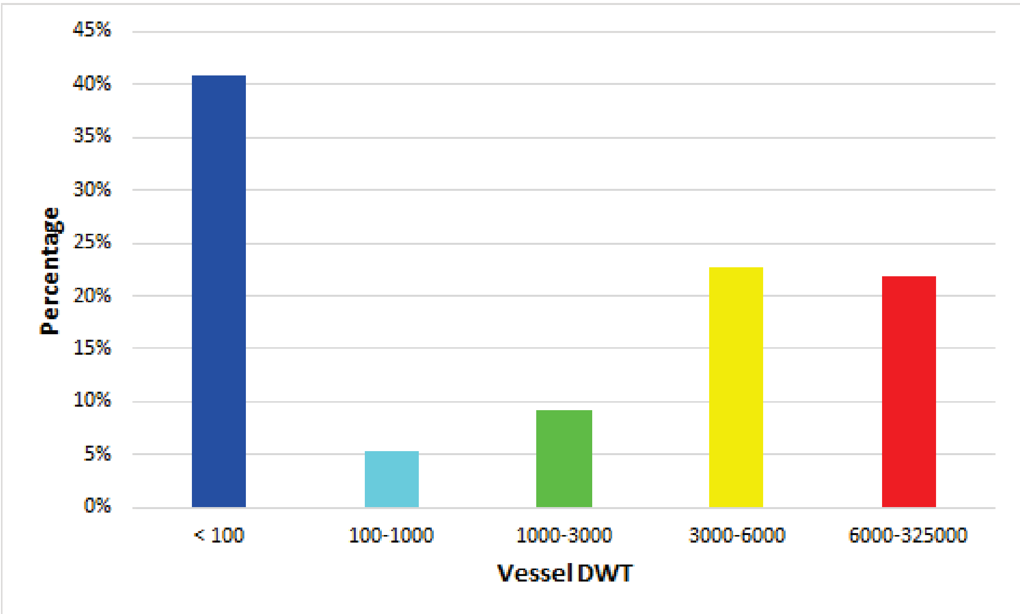

Figure 10.11 AIS Vessel DWT Distribution

It can be seen that 41% of vessels recorded in the summer were identified or estimated to have a DWT less than 100 and can be seen transiting the entire study area. This is reflective of the high number of small fishing and recreational vessels in the study area.

10.6 Vessel Speed

Figure 10.12 presents the AIS vessel tracks recorded in the study area, colour-coded by average vessel speed. The average speed distribution is then presented in Figure 10.13 (excluding 2% unspecified).

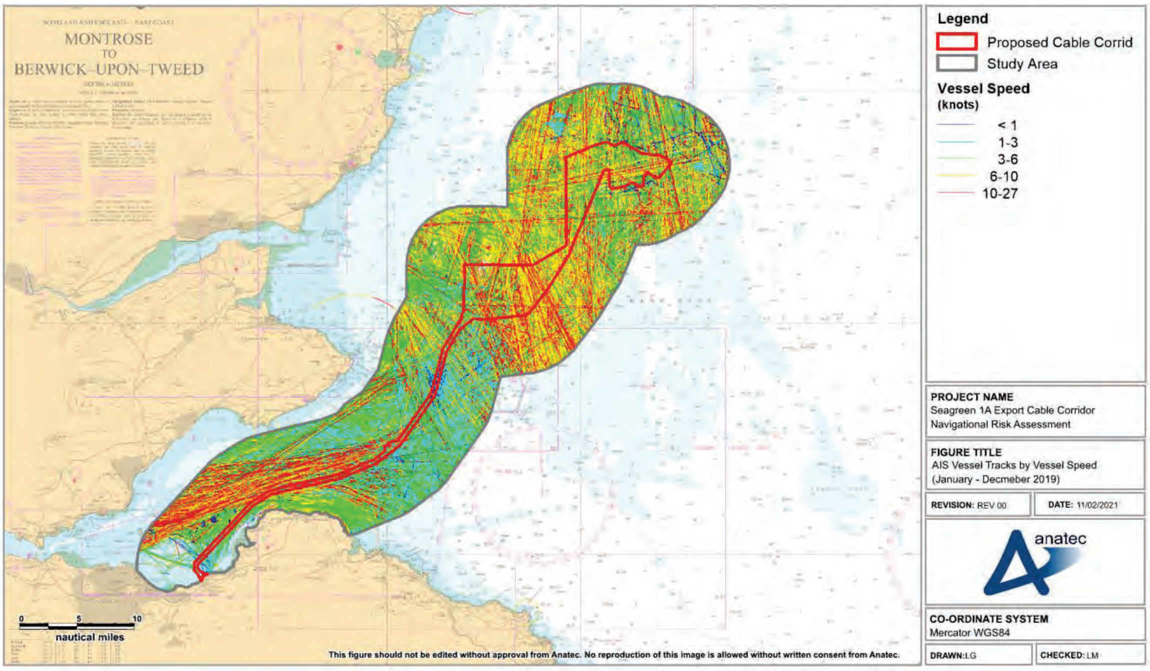

Figure 10.12 AIS Vessel Tracks by Vessel Speed (January – December 2019)

The vessels travelling at higher speeds can be seen entering / exiting the Firth of Forth and further offshore. Vessels navigating the waters of the port east of the Forth Railway bridge must observe the following speed restrictions:

- Vessels of 100m or more in length – 12 knots over the ground; and
- Vessels of less than 100m in length – 15 knots over the ground.

All vessels west of the Forth Railway Bridge must follow a speed restriction on 12 knots over the ground.

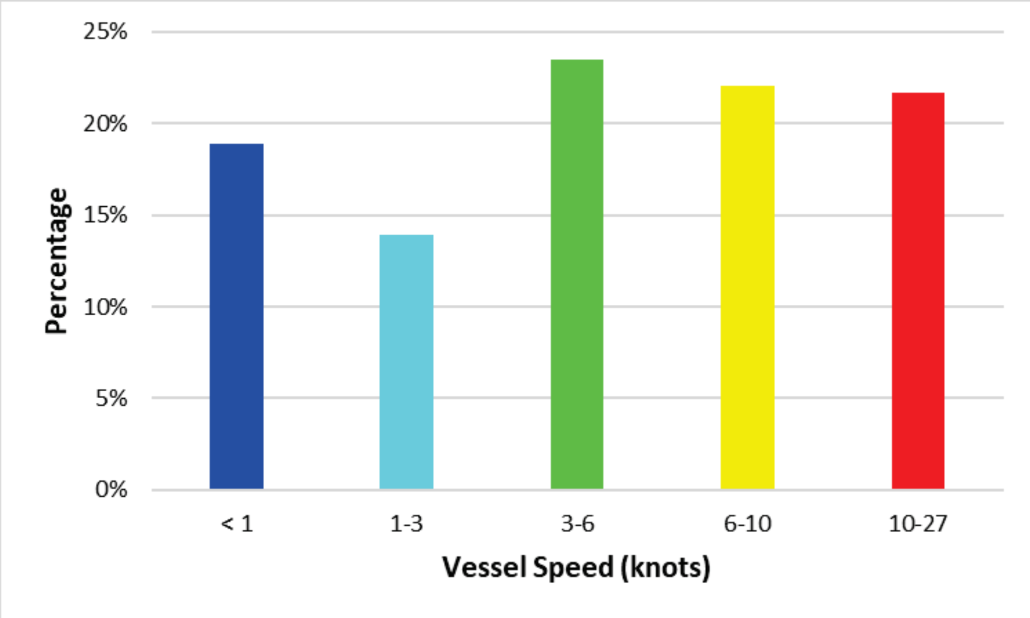

Figure 10.13 AIS Vessel DWT Distribution

The average vessel speed recorded in the study area was six knots. The fastest vessel recorded was a wind farm support vessel travelling at 27 knots.

10.7 Anchored Vessels

Vessels can transmit their navigation status via AIS; however, they do not always do so accurately. In order to produce a reliable set of anchored vessels within the study area, any AIS tracks from vessels within the AIS data that transmitted their navigation status as ‘At Anchor’ were checked to ensure their behaviour matched that of an anchored vessel. In addition, AIS tracks from vessels which transmitted a navigation status other than ‘At Anchor’ were used as input to Anatec’s Speed Analysis model. The program uses a predefined set of parameters to detect any tracks that may be from an anchored vessel based on their speed and course. This output is then manually checked, and any tracks that can be confirmed as coming from an anchored vessel are combined with those ‘At Anchor’ tracks which were already verified.

Figure 10.14 presents the tracks of vessels deemed to be at anchor within the study area, over the entire twelve month study period. Following this, Figure 10.15 presents a detailed overview of anchored vessels within the study area.

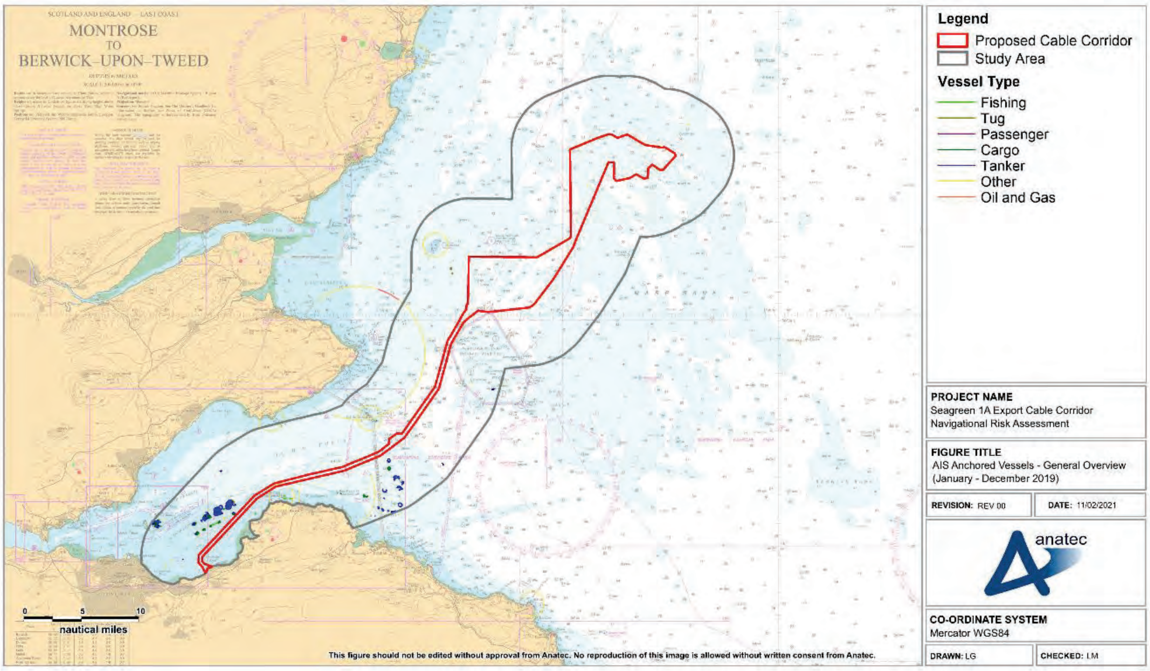

Figure 10.14 AIS Anchored Vessels – General Overview (January – December 2019)

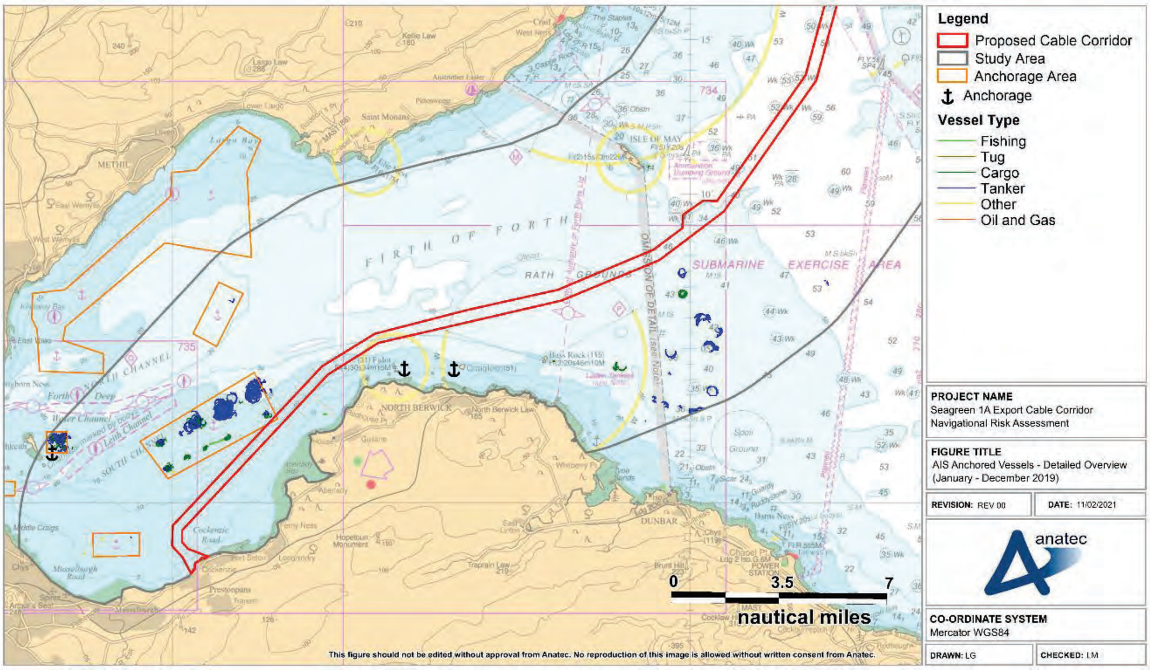

Figure 10.15 AIS Anchored Vessels – Detailed Overview (January – December 2019)

It can be seen the majority of anchored vessels recorded in the study area are associated with designated anchorage areas close the cable corridor (see Section 6.2) and in a popular area just outside port limits.

There was an average of 2 unique vessels per day recorded at anchor within the study area. The majority of anchored vessels were tankers (65%) and cargo vessels (27%) transiting to destinations such as Grangemouth, Hound Point and Leith.

10.8 Recreational Vessels

Figure 10.16 presents the AIS tracks of all recreational vessels recorded on AIS within the study area, colour-coded by vessel length. It is noted that recreational activity may be under-represented in the above figure as recreational craft are not required to carry AIS.

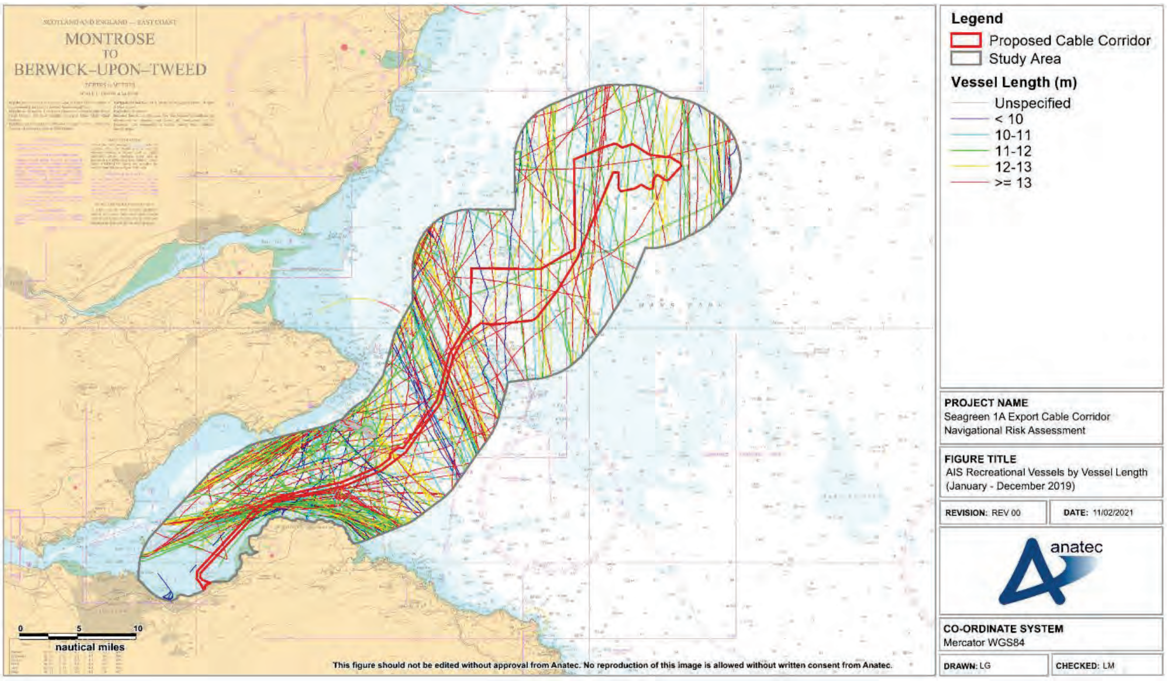

Figure 10.16 AIS Recreational Vessels by Vessel Length (January – December 2019)

Excluding vessels with unspecified lengths, the average length of recreational vessels within the study area was 12m.

There was an average of one unique vessel per day recorded over the twelve month period. The busiest month was July with an average of five unique vessels per day. There were no recreational vessels recorded in January. Figure 10.17 presents the number of unique recreational vessels recorded in the study area per day for each month of the study period.

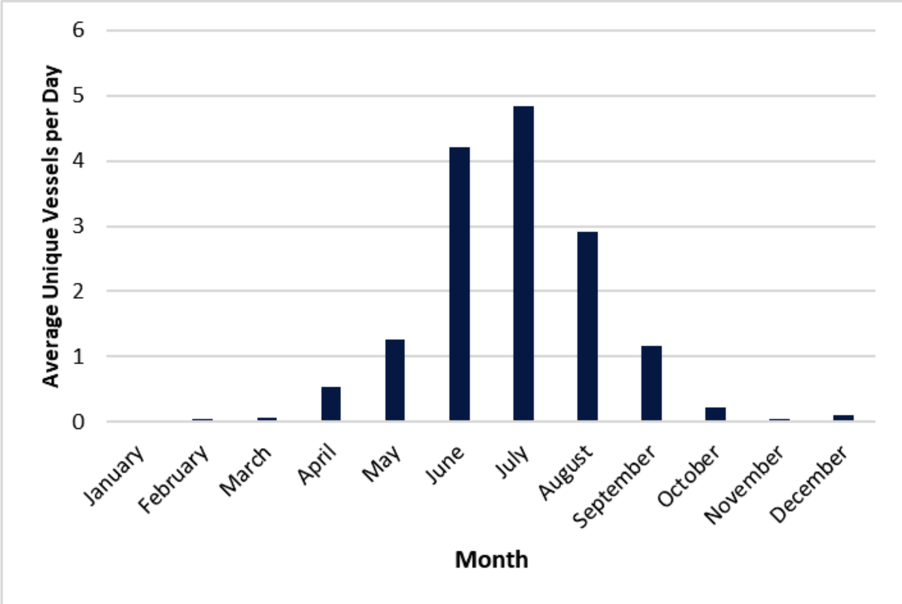

Figure 10.17 Daily Recreational Vessel Count per Month

Scotland's marine and coastal areas support a range of recreational, sporting and visitor activities, ranging from coastal walking to international sporting events. Marine recreation and tourism activity is widely distributed around the coast and ranges from individual, social and club participation to competitive events and commercial ventures. Much of this activity takes advantage of some of the most attractive coastal scenery and most varied and demanding marine conditions in the world, offering conditions for a range of activities and abilities, making it important to ensure these qualities are maintained and enhanced.

Based on existing data from Scotland's National Marine Plan (Ref. ii) the most popular recreational activities within the Firth of Forth area are windsurfing, personal water craft and cruising.

There are a number of recreational facilities located in proximity to the SG1A ECR such as Queensferry Boat Club, Forth Cruising Club, and Royal Forth Yacht Club. Port Edgar accommodates a yacht marina administrated by City of Edinburgh Council. Figure 10.18 presents a satellite image of Port Edgar Marina.

Figure 10.18 Port Edgar Marina (Practical Boat Owner, ww.pbo.co.uk)

10.9 Baseline Fishing Analysis

This section presents an analysis of fishing vessel activity in the study area using the results of the twelve months AIS analysis and additional VMS satellite data. AIS data covers all fishing vessels 15m and above in length, while VMS data covers vessels 12m and above.

Smaller vessels are therefore under-represented, particularly within the 6nm fisheries limit.

10.9.1 AIS Analysis

10.9.1.1 Vessel Gear Type

Figure 10.19 presents the AIS fishing tracks recorded in the study area, colour-coded by gear type. Following this, Figure 10.20 presents the gear type distribution based on unique vessels per day. Gear type information is not included in the AIS data and has been researched separately using Anatec's in-house databases. It is again noted that fishing vessels under 15m will be under-represented in the AIS data.

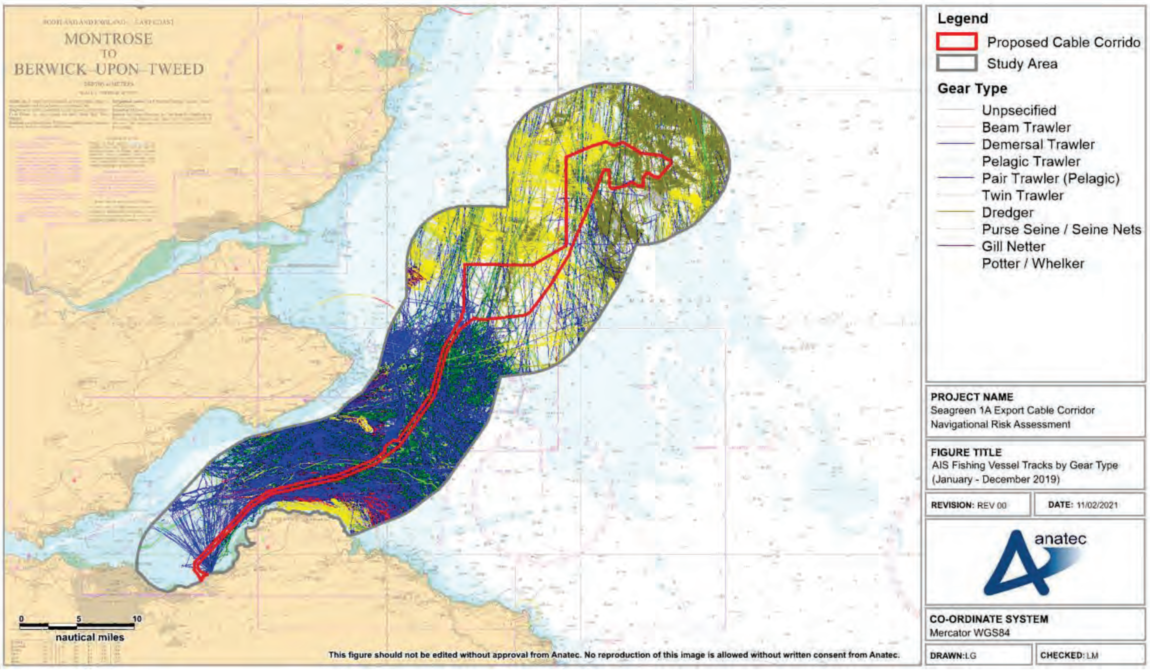

Figure 10.19 AIS Fishing Vessel Tracks by Gear Type (January – December 2019)

It can be seen that high levels of fishing activity were recorded throughout the entire study area, largely by demersal trawlers. Dredgers and potters / whelkers account for the majority of the fishing activity recorded in the north of the study area.

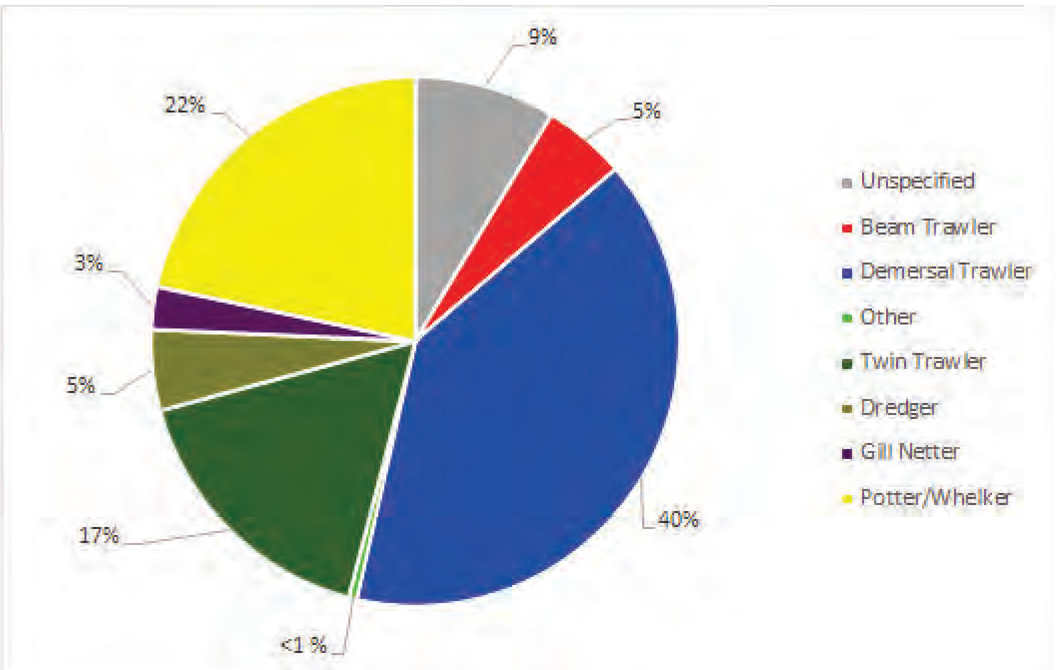

Figure 10.20 Fishing Gear Type Distribution

It can be seen that the most frequently recorded gear type in the study are was demersal trawlers (40%), followed by potters / whelkers (22%) and twin trawlers (17%). Gear types included in the 'other' are purse seines / seine nets, pelagic trawlers and pelagic pair trawlers.

Overall, approximately 67% of gear types in the area were demersal, i.e. towed along the seabed. This includes demersal otter trawlers, beam trawlers and boat dredges. Twin trawlers (17%) are also likely to be demersal. Demersal gears have the greatest potential of interacting with subsea cables as they tow their gear along the seabed.

10.9.1.2 Vessel Numbers

Figure 10.21 presents the fishing vessel count per month throughout the study period.

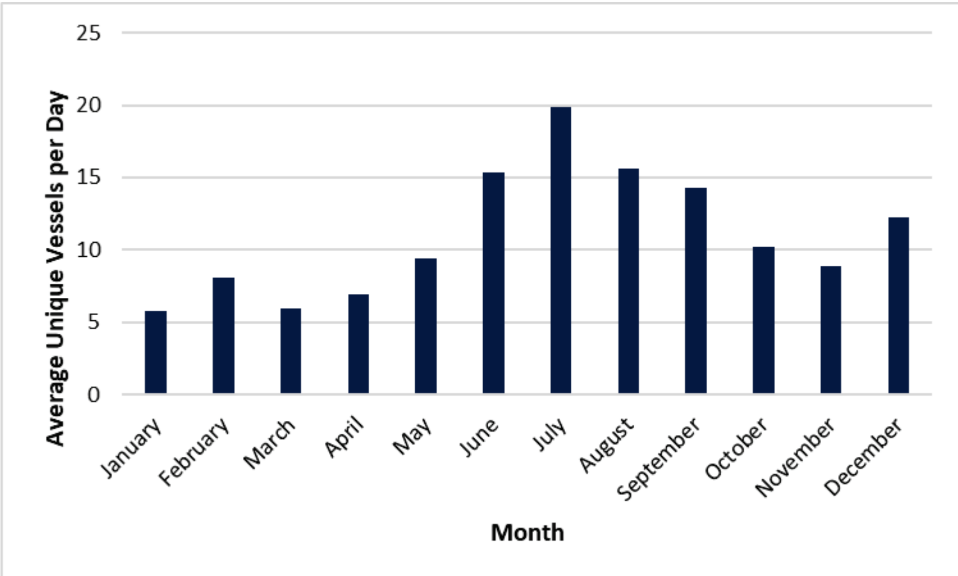

Figure 10.21 Unique Fishing Vessel Count per Month

The busiest month was July with an average of 20 unique vessels per day. The quietest month was January with an average of six unique vessels per day.

10.9.1.3 Vessel Length

Figure 10.22 presents the AIS fishing tracks recorded in the study area, colour-coded by vessel length. Following this, Figure 10.23 presents the vessel length distribution based on unique vessels per day, excluding < 6% unspecified.

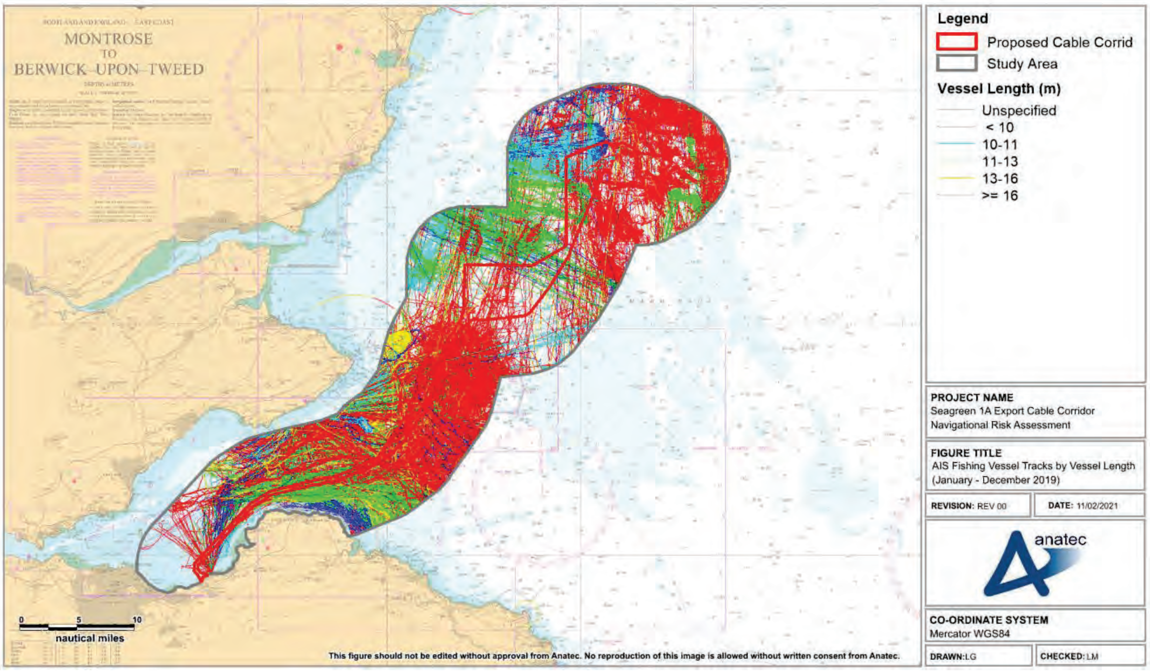

Figure 10.22 AIS Fishing Vessel Tracks by Vessel Length (January – December 2019)

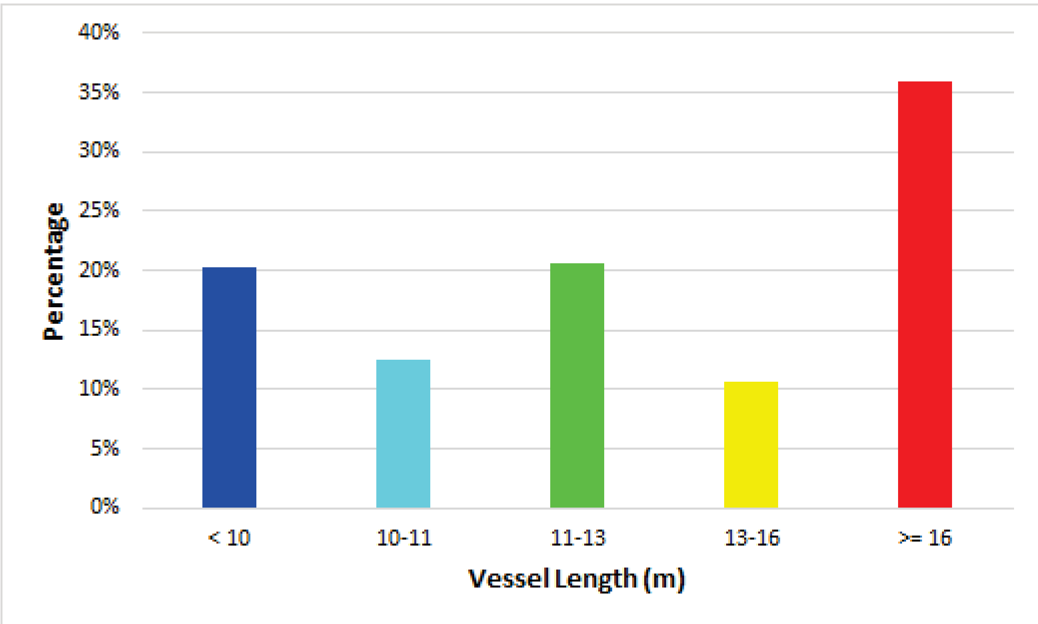

Figure 10.23 Fishing Vessel Length Distribution

The average fishing vessel length recorded was 15m. Approximately 60% of vessels were less than 15m in length and hence carrying AIS voluntarily. It is again noted that vessels less than 15m are likely under-represented, particularly within inshore waters.

10.9.1.4 Vessel Nationality

99% of fishing vessels were registered in the UK. Other nationalities recorded in the study area include Dutch and Danish.

10.9.1.5 Vessel Speed

Figure 10.24 presents the AIS fishing tracks recorded in the study area, colour-coded by average speed. Following this, Figure 10.25 presents the average speed distribution.

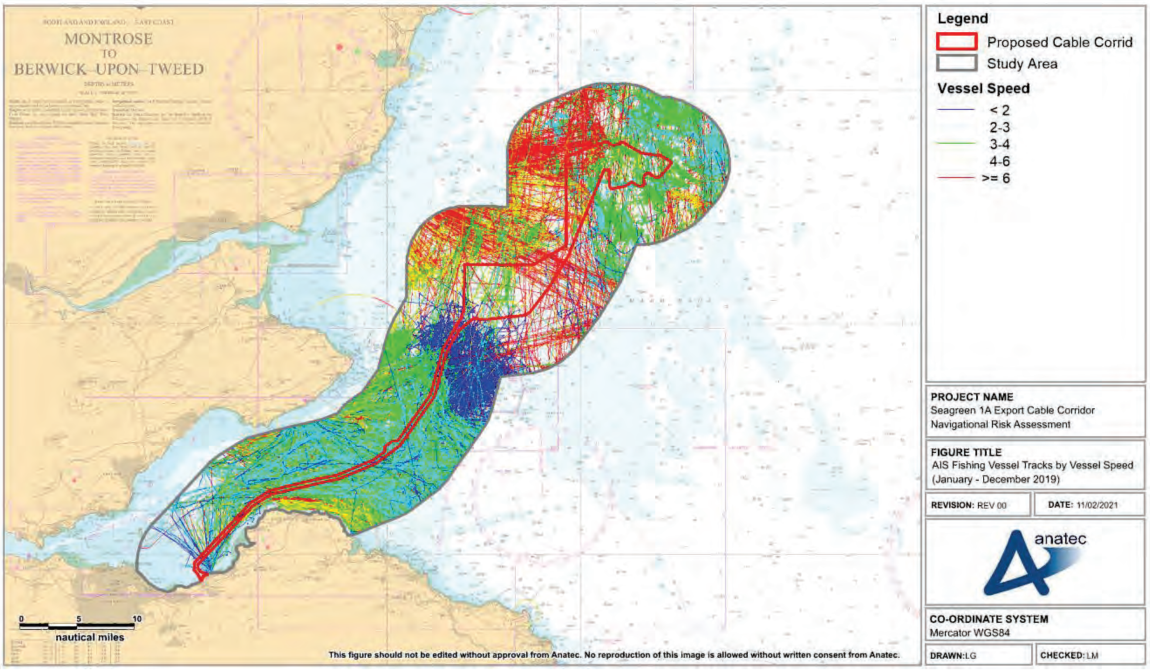

Figure 10.24 AIS Fishing Vessel Tracks by Vessel Speed (January – December 2019)

Fishing vessels with higher speeds can mostly be seen further offshore.

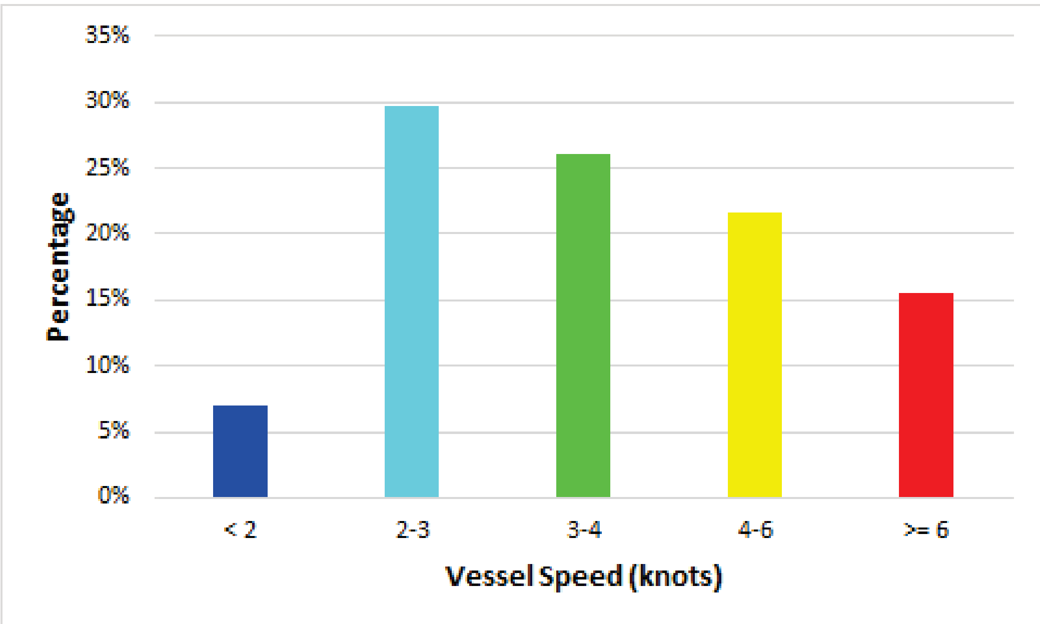

Figure 10.25 Fishing Vessel Speed Distribution

The average fishing vessel speed recorded in the area was 4 knots. Overall, 84% of vessel speeds were below six knots.

Vessels with average speeds less than six knots generally are much more likely to be engaged in fishing activities whilst those with higher speeds (i.e. greater than six knots) are likely transiting through the area. Vessels engaged in fishing activities will be more greatly impacted by the cable installation works than those transiting through the area.

10.9.2 VMS Analysis

The Vessel Monitoring System (VMS) satellite tracking data was obtained from Marine Scotland F. Vessel positions within VMS data are received approximately once every 1 to 2 hours for vessels of 12m in length and above. The data is comprehensive for UK vessels globally, and fishing vessels from EC countries within British Fishery limits and certain other countries, e.g., Norway.

Gear type and length information is not provided within the VMS data and, as vessel names and identities are redacted, it is not possible to research these vessels. The anonymity of VMS data also meant it was not possible to filter out guard vessels from the VMS analysis.

Figure 10.26 and Figure 10.27 present a plot of the fishing vessel sightings in 2018 and 2019, respectively.

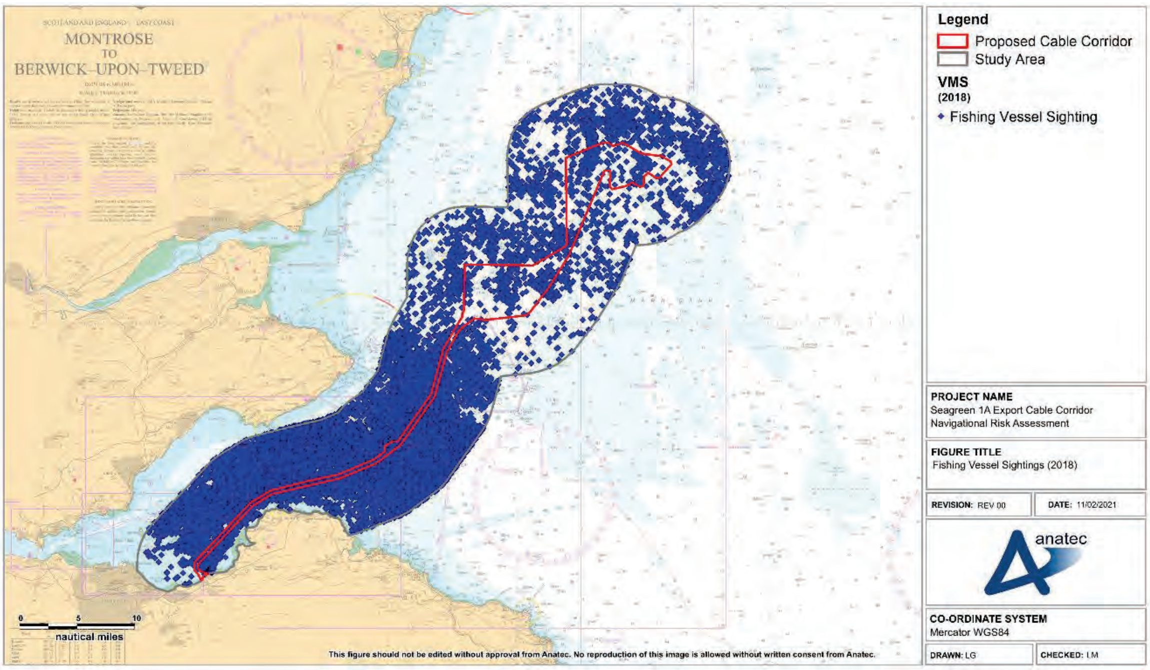

Figure 10.26 Fishing Vessel Sightings (2018)

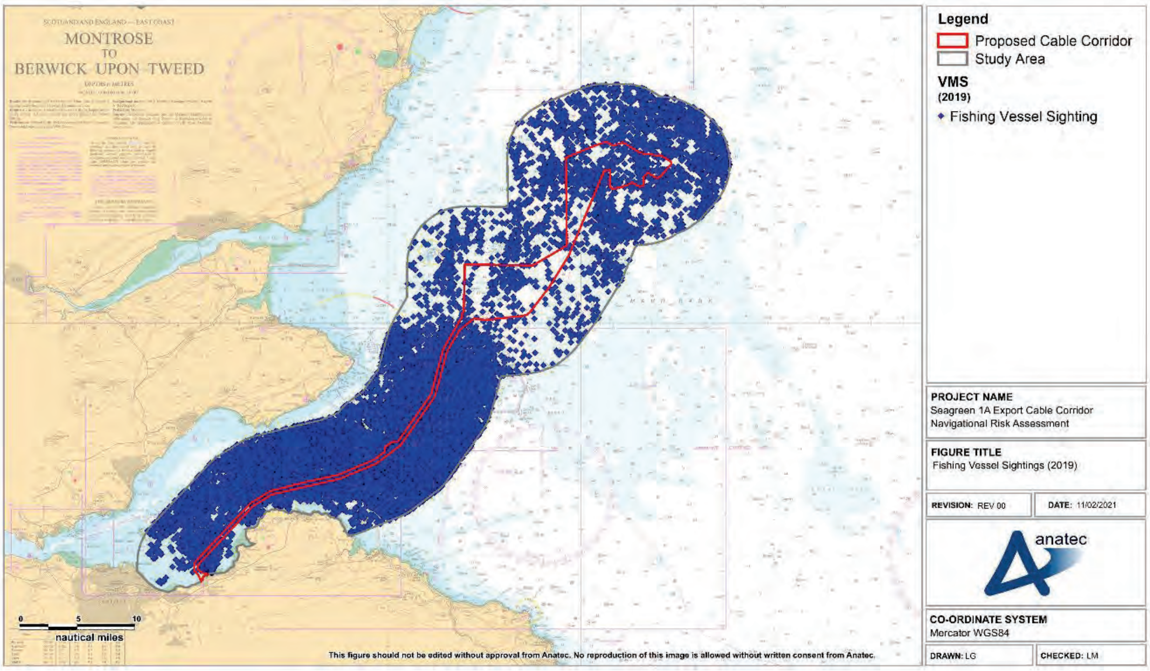

Figure 10.27 Fishing Vessel Sightings (2019)

It can be seen that the figures above correlate well with the AIS data (see Figure 10.19) in terms of overall fishing activity over the twelve month period.

10.9.3 Summary

Fishing activity was recorded on AIS during the study period throughout the entire study area. The most frequently recorded gear type in the study are was demersal trawlers (40%), followed by potters / whelkers (22%) and twin trawlers (17%). Purse seines / seine nets, pelagic trawlers and pelagic pair trawlers were also recorded actively fishing within the area.

The average fishing vessel length recorded was 15m. Approximately 60% of vessels were less than 15m in length and hence carrying AIS voluntarily. The average fishing vessel speed recorded in the area was 4 knots. Overall, 84% of vessel speeds were below six knots and therefore could be actively fishing.

The 2018 and 2019 VMS data shows a strong correlation with the AIS data, with fishing sightings recorded throughout the entire study area.

10.10 Future Baseline

In order to inform any likely future changes in shipping, a brief review of vessel traffic calling at major ports relevant to the area was carried out to determine the trends in shipping in the past years. Typical destinations broadcast by commercial vessels within the study area include Grangemouth, Leith, Aberdeen and Rotterdam. Although declining trends were identified in the total traffic visiting some of the Scottish ports, others European ports such as Rotterdam showed fairly consistent growth despite declines in certain commodities e.g. dry bulk. Despite any declines, forecasts for 2030 predict growth in international trade (Oxera, 2015).

In previous studies, a predicted increase of 10% has conservatively been assumed for the future change in shipping. It is noted that the growth in UK shipping in particular is uncertain due to the many unknowns surrounding the decision to leave the EU and therefore, this may affect commercial shipping activity.

Fishing activity was significant with the baseline assessment, however trends are difficult to predict and can depend on various influencing factors such as fish stocks, quotas, etc. Fishing activity could change significantly due to the changes in legislation post-Brexit.

Recreational activity may remain similar or increase slightly in future years, due to population growth and longer life expectancies, which means people have more leisure time. However, this can also be impacted by factors such as weather and economy.

11 Impact Assessment

This section identifies aspects of the proposed export cable corridor which have the potential to affect the shipping and navigation receptors identified from the baseline assessment.

11.1 Impacts Overview

The impacts identified based on the shipping and navigation baseline assessment are summarised and listed below in Table 11.1. The impacts are grouped by phase, i.e. construction / decommissioning, and operation and maintenance.

Table 11.1 Assessed Impacts

Phase	Impact
Construction / Decommissioning	Collision of a passing (third party) vessel with a vessel associated with the cable installation.
	Cable installation causing disruption to passing vessel routeing/timetables.
	Cable installation causing disruption to fishing and recreational activities.
	Cable installation causing disruption to military exercises.
	Cable installation causing disruption to aggregate dredging activities.
	Cable installation vessel allides with wind turbine.
	A vessel drags anchor over the exposed cable.
	A vessel drops anchor in an emergency over the exposed cable.
	A vessel engaged in fishing snags its gear on the exposed cable.
Operation and Maintenance	A vessel drags anchor over the cable.
	A vessel drops anchor in an emergency over the cable.
	A vessel engaged in fishing snags its gear on the cable.
	A vessel grounds due to reduced under keel clearance.
	Collision of a passing vessel with a vessel associated with maintenance works / monitoring of the cable.
	Interference with magnetic compass onboard passing vessels

The following impacts have been excluded from the assessment, as they may cause damage to the cable but do not impact on other users of the sea.

- A vessel founders (sinks) onto the cable – the cable may be damaged by a foundering vessel, but there is no impact to the vessel due to the existence of the cable.

- A vessel drops an object, e.g. container, onto the cable – the cable may be damaged by an object being dropped from a vessel (e.g. containers from a container ship), however the existence of the cable does not affect the risk to the vessel.

Decommissioning is assumed to have similar (or lesser) impacts than installation. The decommissioning of the cables may be subject to a separate assessment nearer the time, and therefore, has not been assessed in detail.

11.2 Assessment Methodology

The impact assessment process has been evaluated using the IMO FSA methodology (IMO, 2002). The FSA assigns each impact a "severity of consequence" and "frequency of occurrence" to evaluate the significance during the construction, operation and maintenance and decommissioning phases of the Proposed Development. The definitions used in the FSA to evaluate the consequence and frequency of impacts are presented in Table 11.2 and Table 11.3, respectively.

Table 11.2 Severity of Consequence

Severity	Definition
Catastrophic	▪ Total loss of a vessel or crew; and ▪ Extensive environmental damage.
Serious	▪ Loss of a crew member, or multiple serious injuries; ▪ Major damage to infrastructure or vessel; ▪ Major environmental damage; and ▪ Major national business, operation or reputation impacts.
Moderate	▪ Serious injury to person; ▪ Notable damage to infrastructure or vessel; ▪ Significant environmental damage; and ▪ Considerable business, operation, or reputation impact.
Minor	▪ Slight injury(s) to person; ▪ Minor damage to infrastructure or vessel; ▪ Minor environmental damage; and ▪ Minor business, operation, or reputation impact.
Negligible	▪ No injury to persons; ▪ No significant damage to infrastructure or vessel; ▪ No environmental damage; and ▪ No significant operational impacts.

Table 11.3 Frequency of Occurrence

Frequency	Definition
Frequent	Will occur on a regular basis during the project.
Reasonably Probable	Extremely likely to happen during the project span.
Remote	Likely to happen during the project span.
Extremely Unlikely	Unlikely to happen but not exceptional.
Negligible	Only likely to happen in exceptional circumstances.

The severity of consequence and frequency of occurrence rankings are then used to determine the level of significance for each impact during each of the three phases of the Proposed Development. The overall significance of impacts has been assessed as "Unacceptable", "Tolerable" or "Broadly Acceptable" with the definitions of these given in Table 11.5. The risk matrix used to assign significance is presented below.

Table 11.4 Risk Matrix

Frequency	Frequent	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	Reasonably Probable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Remote	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Extremely Unlikely	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Minor	Moderate	Serious	Catastrophic
		Severity				

Table 11.5 Significance Definitions

Significance	Definition
Unacceptable (High Risk)	Generally regarded as unacceptable whatever the level of benefit associated with the activity. Significant risk mitigation or design modification required to reduce to tolerable (ALARP).
Tolerable (Moderate Risk)	Typical of the risks from activities which people are prepared to tolerate to secure benefits. There is however an expectation that such risks are properly assessed, appropriate control measures are in place, residual risks are as low as reasonably practicable (ALARP) and that risks are periodically reviewed to monitor if further controls are appropriate.

Significance	Definition
Broadly Acceptable (Low Risk)	Generally regarded as acceptable and adequately controlled. At these risk levels the opportunity for further reduction is limited.

11.3 Embedded Mitigation

This section details the mitigation measures that are assumed to be in place, as part of the FSA process.

11.3.1 Construction, Maintenance and Decommissioning Works

The mitigation measures assumed to be in place during or in advance of the construction, maintenance and decommissioning works are detailed below:

- Circulation of information via Notices to Mariners, Radio Navigational Warnings, Navigational Telex (NAVTEX), and/or broadcast warnings in advance of and during the offshore works. Information will also be circulated to local marinas in the area and notices will include a description of the work being carried out.
- Additional communication with Forth Ports will be undertaken when full details of construction works are known.
- Cable lay vessels (CLV) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability.
- Temporary aids to navigation will be deployed (if required) to guide vessels around any areas of installation activity.
- Guard vessel(s) will be employed to work alongside the installation vessel(s) during the construction period. The guard vessel(s) will alert third party vessels to the presence of the installation activity and provide assistance in the event of an emergency.
- Compliance with COLREGS (IMO, 1972) and SOLAS (IMO, 1974).
- Passing vessels will be requested to maintain a “safe” distance from installation vessels restricted in manoeuvrability, e.g. for a CLV with dynamic positioning a typical safe distance is 500m. This will be monitored by guard vessels.
- Where cable exposures exist that would result in significant risk, guard vessels will be used until the risk has been mitigated by burial and/or other protection methods.
- Liaison with Forth ports and local harbours.
- Liaison with operators of nearby offshore wind farms.
- A Fisheries Liaison Officer (FLO) will be in place.

11.3.2 Operation & Maintenance Phase

The mitigation measures assumed to be in place during the operation & maintenance phase are detailed below:

- The export cable will be clearly marked on nautical charts with associated note/warning.
- The export cable will be suitably protected, e.g., buried where feasible, to help protect against snaggings from fishing gear and risk from vessel anchors. Protection will be informed by a Cable Burial Risk Assessment (CBRA) which takes into account fishing and anchoring practices. It is anticipated that at least 80% of the cable will be buried. Alternative protection measures (rock placement, concrete mattresses or grout bags) will be used where burial is not feasible.
- In water depths of greater than 20m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20m, the water depth will not be affected by more than 1m. Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out.
- Compass deviation effects will be minimised through cable design and separation distance.

In addition, the embedded mitigation measures assumed for the construction phase will also be relevant for any maintenance works required during the operational phase (e.g. surveys, repairs, etc.)

11.4 Identified Impacts

This section outlines the impacts (summarised in Table 11.1) that have been considered as part of the FSA process.

11.4.1 Construction Impacts

11.4.1.1 Increased Collision Risk

There is an increased collision risk created during the construction phase for all passing traffic due to the presence of vessels associated with the construction of the SG1A ECR, including vessels involved in seabed preparations, cable installation and cable burial. The nature of cable installation, and other construction activities, requires large, slow moving vessels which will be restricted in their ability to manoeuvre. Therefore, these vessels may have limited capability in taking avoidance action from a passing vessel on a collision course, should such a situation arise. Due to their size and mobility in comparison, smaller vessels associated with the construction phase, e.g. tugs, guard vessels, are considered to pose a lesser risk of collision than that of the cable installation vessels.

The collision risk is likely to be greater in higher density shipping areas. The highest density areas for the Seagreen 1A cable are associated with cargo vessels and tankers transiting to ports within the Firth of Forth.

It is expected that the majority of vessels in the area will be aware of the installation work before encountering the installation vessels through embedded mitigation such as circulation of information through Notices to Mariners, etc. AIS broadcast, marking and lighting of construction vessels, and the presence of guard vessels will also raise awareness of the construction work to passing vessels. Communication with Forth Ports when a detailed construction plan is available should help to minimise collision risk associated with the navigational approach channels.

It is anticipated that the offshore SG1A ECR installation and associated works will take place between Q2 of 2023 and Q2 of 2024. The seabed preparation and cable installation operations are expected to take 4 weeks per operation, while the landfall works including HDD could take up to 2 months. Cable pull in, placement of external protection and post-lay survey are expected to take one week each.

The frequency of this impact is considered to be **Extremely Unlikely**, taking into account all embedded mitigation. Since vessel collision could lead to significant damage to one of the vessels involved, and potential injury to crew members, the severity is ranked as **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.1.2 Disruption to Vessel Routeing/Timetables

Installation of the cables may also cause disruption to vessel routeing/timetables. The risk of a collision between two third-party vessels may also be increased as a result of route deviation.

This will most likely affect busier areas of shipping where vessels are transiting on regular routes with a time schedule. The proposed SG1A ECR is routed through the Forth Ports limits and cable installation works could cause disruption to vessels approaching ports within the Forth Ports Limits (such as Grangemouth, Leith and Rosyth), and pilot vessels associated with Forth Ports.

Through circulation of information, the vast majority of vessels should be aware of the cable work in advance, allowing routes to be planned with minimal impact on schedules. Liaison with the Forth Ports will help minimise impacts associated with areas where sea room is limited.

The frequency of this impact is considered to be **Reasonably Probable**, however due to the temporary nature of the works, the severity is considered to be **Minor**, resulting in an overall ranking of **Tolerable**, taking into account all planned embedded mitigation.

11.4.1.3 Disruption to Fishing & Recreational Activities

From the baseline assessment, it can be seen that regular fishing and recreational activity is observed within the vicinity of the cable route. Installation vessels, and vessels associated with the HDD works, therefore may cause a disruption to both local fishermen and recreational boaters along the entire cable route. It is noted that recreational craft and small fishing vessels close to shore are likely under-represented by the AIS data.

This impact is likely to be along the length of the cable for fishermen and mainly in nearshore waters for recreational users. It is expected that embedded mitigation such as presence of guard vessels and promulgation of information will notify sea users of construction works. It is noted that recreational vessels may be less aware of construction works than commercial vessels. The appointment of a Fisheries Liaison Officer (FLO) will aid in ensuring local fishermen are made aware of construction works.

The frequency of this impact is considered to be **Reasonably Probable** and the severity **Minor**, resulting in an overall ranking of **Tolerable**, taking into account all embedded mitigation.

11.4.1.4 Disruption to Military Exercises

The SG1A ECR intersects a number of Ministry of Defence (MOD) practice and exercise areas (PEXA). These areas are operated under a clear range procedure, that is, no firing will take place unless the area is considered to be clear of all shipping. Therefore, no firing is expected to be undertaken while there is construction work ongoing within the area.

Assuming embedded mitigation measures (e.g. circulation of information) are in place preceding any installation works, it is likely the installation work timetable will be taken into consideration by the MoD if any exercises were scheduled to take place within the area.

The frequency of this impact is considered to be **Extremely Unlikely** and the severity **Minor**, resulting in an overall ranking of **Broadly Acceptable**, taking into account all embedded mitigation.

11.4.1.5 Disruption to Aggregate / Maintenance Dredging

There are currently no licensed aggregate extraction areas for Scotland. A review of the AIS data also confirmed that there was no dredging activity within the study area, although dredgers were noted to transit through the area.

Leith approach channel is maintained at a dredged depth of 6.71m below Admiralty chart datum. Maintenance dredging of this approach channel could therefore be disrupted by construction activity. However, the channel is 3nm from the cable route and there should therefore be sufficient room to navigate around the construction works.

It is assumed that embedded measures (i.e. promulgation of information) are in place preceding any construction works.

The frequency of this impact is considered to be **Extremely Unlikely** and the severity **Minor**, resulting in an overall ranking of **Broadly Acceptable**, taking into account all embedded mitigation.

11.4.1.6 Cable Installation vessel Allides with Wind Turbine

Given the proximity of the cable route to nearby wind farms, there is the potential for a cable installation vessel to allide with a wind turbine. Neart na Gaoithe is the closest consented wind farm site in proximity to the proposed SG1A ECR, located 200m to the south. . Neart na Gaoithe is currently under construction and is expected to be fully operational in 2023. It is noted that the wind turbines may not be located at the edge of the site boundary, and the distance between the cable route and the turbines may be slightly larger.

The Inch Cape development area is located 600m north of the proposed cable corridor. The Inch Cape Offshore Wind Farm is consented with no further timescales available.

Due to the distance of the proposed cable from the wind farm site boundaries, there may be a risk that an installation vessel allides with an existing wind turbine depending on project timescales. This could be a powered collision, e.g. due to navigational error or equipment failure, or a drifting collision, due to the vessel losing power.

The risk will be mitigated by good communication between the Seagreen project team and the wind farm developers, installation vessels following best practise guidelines, guard vessels, etc.

The frequency of this impact is considered to be **Remote**, taking into account all embedded mitigation. Since vessel collision could lead to significant damage to the vessel and potential injury to crew members, the severity is ranked as **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.1.7 Anchor Dragging onto Exposed Cable

There is a risk that an anchored vessel will lose its holding ground and subsequently drag anchor over the cable. Significant anchoring activity was found in designated anchorage areas, one of which intersects the cable route. The closest vessel at anchor was located approximately 240m north of the proposed cable corridor.

A decision has not yet been made on whether the cable installation will be simultaneous lay and burial or post-lay burial. Should the latter option be chosen, there may be a period of time (estimated to be up to 100 days) after laying when the cables are exposed and not protected through burial or other means such as rock placement. This period represents a potentially higher risk of interaction from vessel anchors with the exposed cable.

While exposed any vessel anchor could interact with the cables. If an anchor becomes snagged on the cables, there could be a risk of injury in trying to free it. If the anchor cannot be freed the safest action is to slip it, and not attempt to raise or cut the cable. Smaller vessels may be at risk of losing stability and capsizing in the worst case.

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of this impact is considered to be **Remote** due to the potential for the cables to be exposed, but taking into account all embedded mitigation measures. The severity is considered to be **Serious**. This results in an overall ranking of **Tolerable**, taking into account all embedded mitigation.

11.4.1.8 Emergency Anchoring onto Exposed Cable

If a passing vessel suffers engine failure, there is a possibility that it may drop anchor to avoid drifting into an emergency situation such as a collision or grounding. This is more likely to occur in areas closer to the coast or to other hazards (e.g. offshore developments) where there is a higher risk of grounding or collision. In open waters where depths are deeper and anchoring may not be feasible, the vessel is more likely to attempt to either fix the problem or await assistance.

The maritime incident data showed that the most frequent incident type to be recorded was machinery failure, which could lead to emergency anchoring.

During the period where the cables may be exposed, any anchor could interact with the cable. If the anchor fouls the cable, there could be a risk of trying to free it. Smaller vessels may be at risk of losing stability and capsizing in the worst case. If the anchor cannot be freed it should be slipped, and no attempt made to raise or cut the cable.

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of this impact is considered to be **Remote** due to the potential for the cable to be exposed, but taking into account all embedded mitigation measures (in particular, guard vessels). The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.1.9 Fishing Gear Snagging onto Exposed Cable

Fishing vessels carrying demersal gear that interacts with the seabed when deployed are at risk of snagging on subsea cables. Demersal gear types identified in the baseline assessment include demersal otter trawlers, beam trawlers and boat dredges, which together contributed 67% of gear types recorded on AIS in the area. The highest risk area of snagging is waters outside the Forth Ports limits where vessels were recorded actively engaged in fishing operations (e.g. significant demersal trawling activity across cable route). It is also noted that there is likely to be significant activity from small fishing vessels in coastal waters, which may be under-represented in the AIS data.

There is higher risk of snagging from demersal gear if the cable is exposed. Consequences of snagging could range from damage to gear and the cable, loss of stability due to lines being put under strain and in the worst case, capsize of the vessel, men overboard and risk of injury or fatality. For example, a risk of capsize could occur if the vessel attempted to free its gear by raising the cable rather than releasing the gear.

It is expected that mitigation including having a FLO in place and circulation of information (e.g. via Kingfisher and local communications) will help ensure fishermen are aware of the exposed cable and avoid fishing directly over it. In addition, guard vessels will be used in any areas where cable exposures are considered to present significant risk to fishing gear snagging.

The frequency of this impact is considered to be **Remote** during the period that the cable is left exposed, but taking into account all embedded mitigation, and the severity **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.2 Operations & Maintenance

11.4.2.1 Anchor Dragging

Anchoring activity in proximity to the marine cable route has been described previously under the description of this impact during the construction phase. Once the cable is protected, either through burial and/or other protection measures, larger vessels (e.g. cargo vessels and tankers) are more likely to threaten the cable as their anchors are able to penetrate deeper into the seabed. The anchors of smaller vessels (e.g. fishing and recreational craft) are unlikely to penetrate as deep.

Embedded mitigation includes marking cables on nautical charts which will alert mariners to the presence of the cable. Following the installation and charting of the cable, it is expected that vessels will not plan to anchor in its immediate proximity. Cable protection has been confirmed with target burial depths between 1m and 3m. This has been informed by a Cable Burial Risk Assessment (CBRA) and it is assumed that the target burial is higher where the risk from larger vessels dragging anchor is considered to be significant. The aim is to achieve a minimum of 80% burial of the SG1A ECR with 20% of external protection. Protection methods such as rock placement will be added where sufficient burial is not possible.

The frequency of this impact is considered to be **Extremely Unlikely**, assuming the cable is marked on navigational charts and suitably protected through burial and/or other protection measures. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.2.2 Emergency Anchoring

This impact has already been described under the construction phase.

As with anchor dragging, larger anchors (e.g. cargo vessels, tankers) pose the biggest threat to the buried cable, as they are capable of penetrating deeper into the seabed, and can cause greater damage than smaller anchors (fishing and recreational vessels) if contact is made. The identified target burial depths of 1m to 3m mitigates the risk from vessel anchors.

The frequency of this impact is considered to be **Extremely Unlikely** as, even in an emergency, Masters should consult charts before dropping anchor, and therefore avoid anchoring directly over the cables. Additionally, this takes into account the planned protection informed by the CBRA. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

11.4.2.3 Fishing Gear Snagging

Once the cable is installed, the depiction of the cable on nautical and Kingfisher charts (embedded mitigation measures) may discourage fishing in the cable's vicinity; however evidence shows this is not always the case with installed cables as often it is assumed they are adequately protected against over-trawling. The planned cable protection is assumed to provide effective mitigation.

The frequency of this impact is considered to be **Extremely Unlikely** assuming the cables are marked on navigational charts and suitably protected via burial (target depths between 1m and 3m) or other protection measures, and the severity **Serious**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

11.4.2.4 Vessel Grounding due to Reduced Under Keel Clearance

This impact refers to a vessel grounding due to reduced under keel clearance associated with alternative protection methods in areas where cable burial is not feasible (e.g. due to pipeline crossings or hard seabeds). This could lead to subsequent capsize, injury, loss of life, oil spill, etc. In general, the higher risk areas are coastal waters where water depths are shallower.

Six areas of the proposed cable have been identified that may require alternative protection measures such as rock placement, concrete mattresses or grout bags. These include one pipeline crossing, the exit point for the HDD section of cable, and areas where seabed conditions are unfavourable for cable burial. The maximum height of cable protection will be 1m. The average draught of vessels crossing the cable route was 5.6m, with a maximum draught of 20.8m. Within shallower waters (less than 20m depth), the maximum draught was 9.6m. The charted water depth at the location where the existing pipeline crosses the proposed cable route is approximately 19m. The largest vessel in this area was a 180m tanker with a draught of 9.6m, giving a clearance of between 9m and 10m based on chart datum (i.e. relative to lowest astronomical tide).

Within the Forth port limits, where water depths are shallower, larger vessels will be under pilotage (or carry a Pilotage Exemption Certificate) and should therefore be familiar with the area. In water depths of greater than 20m, the cable and protection will not reduce water depth by more than 5%. In water depths of less than 20m, the water depth will not be affected by more than 1m. Following cable lay, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a review of impacts at those areas and consultation with the MCA will be carried out.

The frequency of this impact is considered to be **Extremely Unlikely**, and the severity **Serious** resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

11.4.2.5 Increased Collision Risk (Passing Vessel with Repair/Maintenance/Survey Vessel)

There may be a requirement to undertake inspection surveys or unplanned repair works on the proposed cable, which could result in an increased collision risk of survey / maintenance vessels with passing traffic.

Assuming circulation of any intended works is undertaken in advance, the risk is not considered to be significant. It is noted that maintenance/monitoring work is expected to be less disruptive and span a shorter period than cable installation (during the construction period).

The frequency of this temporary impact is considered to be **Extremely Unlikely** given the short duration of maintenance works. The severity is considered to be **Serious**, resulting in an overall ranking of **Tolerable**.

11.4.2.6 Magnetic Compass Interference

The static magnetic fields created by HVAC cables can interact with the earth's natural magnetic field, which can result in interference with magnetic navigational equipment, particularly in shallow waters. MCA guidance states that a deviation of three degrees will be accepted for 95% of the cable route and a five degree deviation accepted for the remaining 5%.

The vast majority of commercial traffic uses Global Positioning System (GPS) and non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by Electromagnetic Interference (EMI). Therefore, it is considered unlikely that any created interference will have a significant impact on vessel navigation. However, magnetic compasses still serve as an essential means of navigation in the event of power loss or as a secondary source, and some smaller craft (fishing or leisure) may rely on it as their sole means of navigation, especially in bad visibility or at night. The important factors that affect the resultant deviation are:

- Water depth;
- Burial depth;
- Spacing or separation of the two cables in a pair; and/or
- Cable route alignment relative to the earth's magnetic field.

The SG1A ECR will be buried wherever possible, to a depth between 1m and 3m. Where cables are buried to a depth of up to 1m, the predicted magnetic field strength at the seabed is expected to be below the earth's magnetic field (assumed to be 50 µT) (Moray Firth Offshore Renewables Limited, 2012)

The frequency of this impact is considered to be **Reasonably Probable**, with severity **Minor**, resulting in an overall ranking of **Tolerable**, taking into account embedded mitigation.

11.4.3 Decommissioning

The requirement to decommission is a condition of The Crown Estate lease and is also incorporated in the statutory consenting process through the provisions of the Energy Act 2004. Under the statutory and licensing processes, the appointed Offshore Transmission Owner (OFTO) will be required to prepare a detailed decommissioning programme and set aside funds for the purposes of decommissioning. The decommissioning programme will consider the latest technological developments, legislation and environmental requirements at the time that the work is due to be carried out.

11.5 Additional Mitigation

Additional mitigation measures that could be implemented during the construction and operational phases include:

- Minimising the period of time the cable is left exposed, if post-lay burial is chosen.
- Targeted circulation of information about the project to regular commercial operators prior to offshore work commencing.
- Circulation of information to local sailing clubs located to increase the likelihood of local sailors being made aware of temporary installation work.
- Circulation of information to wind farm developers likely to be impacted by cable installation works.
- A Post-lay compass deviation survey to determine the magnitude of compass deviation.

It is noted that additional mitigation identified for the construction phase may also be implemented in the decommissioning phase.

11.6 Residual Effects

No impacts identified during construction, operation or decommissioning were assessed to be **Unacceptable**. The additional mitigation measures presented above will reduce impacts assessed as **Tolerable** to ALARP, however the rankings remain the same.

12 Collision Frequency Assessment

12.1 Introduction

The vessel-to-vessel collision frequency for the construction of the Seagreen 1A export cable was estimated using Anatec's COLLRISK model. COLLRISK is referenced by the International Oil and Gas Producers Association (IOGP) in the Risk Assessment Data Directory under "Best practice collision risk modelling for passing vessels" (IOGP, 2010).

Firstly, the baseline frequency was assessed taking into account the baseline shipping identified from the AIS vessel traffic (see Section 10). The additional traffic associated with the cable installation was then simulated and added to the model to estimate the revised frequency, i.e. baseline plus cable installation vessel. The total collision frequency for the cable installation vessel was then calculated.

12.2 Assessment Overview

The speed of cable installation depends on the installation method:

- Solo cable lay with post-lay burial. Lay speed 1000m/hour. Bury with jetting ROV 200m – 400m per hour dependent on ground conditions.
- Simultaneous lay and bury (plough). 100m-200m/hour.

In order to assess the worst case collision frequency, the minimum speed of 100m per hour was used. For operations with faster speeds, the collision frequency would be smaller.

12.3 Results

The maximum duration of the cable installation was estimated based on a lay speed of 100m per hour over a length of approximately 102km, giving a duration of 1,045 hours (44 days) for the operation. It is noted that this is the worst case speed and in reality, the operation is expected to be faster.

Table 12.1 presents the vessel to vessel collision frequency for the cable installation vessel with third party vessels. This is presented for the entire operation, and on an annual-equivalent basis (i.e. assuming that the installation vessel is operating continuously for one year).

Table 12.1 Vessel to Vessel Collision Frequency – Cable Lay

Operation	Collision Frequency	
	Cable Lay Operation	Annual
Cable Lay	5.4×10^{-5}	4.6×10^{-4}

The operational collision risk for the cable lay operation (approximately 1,045 hours) is estimated to be 5.4 x 10^{-5}. If the cable lay vessel was continuously operating in the area, the annual collision frequency is estimated at 4.6 x 10^{-4}, or one incident every 2,200 years. It is noted that vessels should be aware of the cable installation due to circulation of information and the presence of a guard vessel(s), and therefore are likely to be operating with greater caution during this time; however, this was not taken into consideration in the risk modelling.

13 Cumulative Impacts

This section describes cumulative and in-combination developments potentially relevant to the Seagreen 1A export cable, including the expected cumulative impacts.

13.1 Neart na Gaoithe

Neart na Gaoithe is the closest wind farm site in proximity to the proposed SG1A ECR, located 200m to the south. Construction of Neart na Gaoithe began in August 2020 and is expected to be fully operational in 2023. The Neart na Gaoithe proposed cable corridor is located approximately 1.6nm south of the SG1A ECR.

An operations and maintenance base for the Neart na Gaoithe wind farm will be located at Eyemouth Harbour, 30nm to the south-east of Cockenzie.

Due to the location of Neart na Gaoithe, any vessel carrying out operations on the wind farm may be impacted by construction works for the Seagreen 1A cable. The presence of the wind farm also prevents third party vessels from deviating to the south of the cable route to avoid construction works. This could cause an increase in collision risk and/or disruption to vessel routeing, as well as disruption to fishing and recreational activity, due to the close proximity of the two developments. It is noted that construction vessels associated with the SG1A ECR may require to pass fairly close to the wind farm site. However, good coordination with the wind farm developer will mitigate any risks.

If both operators follow best practice guidelines then the cumulative impacts are expected to remain Tolerable.

13.2 Inch Cape

The Inch Cape development area is located 600m north of the proposed cable corridor. The proposed SG1A ECR is adjacent to the consented (but not yet constructed) Inch Cape Offshore Wind Farm cable corridor route.

Inch Cape Offshore Limited (ICOL) is currently finalising its assessment for the location of its operations and maintenance base at a local port on the East Coast.

Timescales for the construction of the Inch Cape offshore wind farm are not currently available. If the construction period for the wind farm overlaps with construction on the SG1A ECR, this could lead to increased collision risk, as well as disruption to commercial shipping, fishing and recreational activities, particularly if construction on the two export cable routes overlaps.

If the Inch Cape offshore wind farm is constructed prior to construction works for the SG1A ECR, due to the location of Inch Cape, any vessel carrying out operations on the wind farm may be impacted by construction works for the Seagreen 1A cable. The presence of the wind farm prevents vessels from deviating to the north of the cable route to avoid construction works. This could cause an increase in collision risk and/or disruption to commercial shipping, fishing and recreational activities. It is noted that construction vessels associated with the Seagreen 1A cable may require to pass fairly close to the wind farm site. However, good coordination with the wind farm developer will mitigate any risks.

If both operators follow best practice guidelines then the cumulative impacts are expected to remain Tolerable.

13.3 Berwick Bank & Marr Bank

Berwick Bank Offshore Wind Farm and Marr Bank Offshore Wind Farm are two distinct projects in the early stages of development, both being taken forward by SSE Renewables. The proposals are located next to one another and are over 40km off the coast of East Lothian.

There are no confirmed construction dates as yet as this will be required to go through the consenting process which is likely to be post the SG1A ECR application. Berwick Bank site boundary intersects the proposed SG1A ECR and the Marr Bank site boundary is located approximately 7nm south.

As the construction works for the developments are not anticipated to overlap, there are not expected to be any cumulative impacts associated with these offshore wind farms.

14 References

i Admiralty Sailing Directions, North Sea (West), 10th Edition, 2016

ii Scotland's National Marine Plan, The Scottish Government, 2015

Seagreen WIND ENERGY 1A