

## Non-Technical Summary

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## INTRODUCTION

This document provides a Non-Technical Summary (NTS) of the Environmental Statement (ES) produced as part of the consent application process, for the offshore elements of the Seagreen offshore wind farms and transmission assets, known as the Seagreen Project. The ES is the formal report which presents the findings of an Environmental Impact Assessment (EIA), undertaken on behalf of Seagreen Wind Energy Limited (hereafter referred to as 'Seagreen'), into the potential impacts of the construction, operation and eventual decommissioning of the Seagreen Project.

This NTS starts with some information on the Applicant, the development goals and project approach, before providing detail on the project itself. This is followed by a summary of the EIA and licensing process. Summaries of the findings of the technical assessments reported in the ES are then provided, with a brief conclusion.



Offshore platform at Greater Gabbard Offshore Wind Farm  
Photo courtesy of GGOWL

## SEAGREEN WIND ENERGY LIMITED

Seagreen Wind Energy Limited is the parent company of Seagreen Alpha Wind Energy Limited (SAWEL) and Seagreen Bravo Wind Energy Limited (SBWEL), and is a joint venture between SSE Renewables Developments UK Limited (SSER) and Fluor Limited. Seagreen combines the established and extensive track record of renewable energy development, asset management and operations experience of one of the UK's leading energy companies, with the offshore project delivery expertise of one of the world's largest publicly owned contracting, engineering, procurement, construction and maintenance services companies.

## THE SEAGREEN PROJECT GOALS

The Seagreen Project is the first phase in the development of the Firth of Forth Round 3 Zone 2. This is one of the Round 3 offshore wind projects being promoted around Scotland and the UK with a view to making major contributions to national and international renewable and low-carbon energy generation targets. The Seagreen Project, at over 1 Gigawatt (GW) target capacity, constitutes one of the largest renewable energy projects in Scotland, and will produce enough clean, renewable energy to meet the equivalent of the annual energy consumption of up to 670,000 homes. The Seagreen Project, and the planned development of a further 2.5GW of capacity planned in subsequent development phases within the Zone, will contribute significantly to the Scottish Government's aim of cutting greenhouse gas emissions by 80% and achieving the equivalent of 100% of electricity demand from renewable sources by 2020. The Seagreen Project will also contribute as part of a wider economic aim to secure investment and opportunities for renewables and to make a significant contribution to the national economy. It will offset high-carbon means of generation, with a knock-on effect in reducing the growth in carbon emissions, and the consequent climatic effects of a greater proportion of atmospheric carbon. In addition, the generated power will contribute to national goals such as energy supply security for the UK.



## SEAGREEN PROJECT APPROACH

Seagreen is seeking to construct and operate two offshore wind farms, known as Seagreen Alpha (hereafter referred to as Project Alpha) and Seagreen Bravo (hereafter referred to as Project Bravo). Both offshore wind farms will accommodate up to 75 wind turbine generators with the potential to generate up to 525 Megawatts (MW) of power. In addition to the offshore wind farm infrastructure, supporting transmission infrastructure is also included as part of the Seagreen Project. The offshore Transmission Asset Project includes offshore platforms, high voltage export cable(s) and cable landfall up to Mean High Water Springs at Carnoustie. Seagreen is seeking to consent this element of the Seagreen Project but it will be operated and owned by a separate entity under the Offshore Transmission regime. The Offshore Transmission Owner (OFTO) will be appointed through tender, post construction of the Transmission Asset Project.

Major project decisions regarding offshore wind farm design and construction will not be taken until project consents have been received. A 'Rochdale Envelope' approach has therefore been adopted which means that consent for a range of design parameters and installation methods is being sought, within a broad site area, so that the offshore wind farm design and construction can be refined within the current options as more technical and economic certainty is obtained.

The final offshore wind farm design and construction arrangements will be derived from the elements included within the Rochdale Envelope, following more detailed geotechnical surveys for example, as part of the detailed engineering design process. The benefit of this approach is the flexibility to respond to different design and construction requirements, and to balance this against local environmental criteria as more information becomes available. The various options will have already been approved for use, and so the final design and construction arrangement detail can be varied to meet local conditions without need for a reapplication process, but will still be subject to the relevant licensing, mitigation and monitoring as required in consultation with Marine Scotland.

The Seagreen Project as a whole (including the various arrangements defined within the Rochdale Envelope) has been subject to an EIA, which examines the potential effects on physical, biological and human receptors, based on a worst case scenario which selects the design parameter and installation method with the greatest potential impacts for the environmental receptor in question. This will lead to consideration of effects which may never occur in actuality. This precautionary approach underpins the environmental assessment within the ES, with the expectation that any impacts predicted against this will, in reality, be less (and in many cases significantly less).

A collaborative approach has been taken with the other wind farm developers in the wider area, via the Forth and Tay Offshore Wind Developers Group (FTOWDG). The approach to data and knowledge sharing through this group has enabled robust data sets and common assessment methodologies to be developed and used in the impact assessment both for the Seagreen Project and for the assessment of cumulative impacts with other projects.

The whole consenting process is also subject to public consultation and detailed engagement with the various stakeholder groups, ranging from Marine Scotland and other statutory consultees, to local fishing groups and community representative bodies.



## SEAGREEN OFFSHORE WIND FARM PROJECT DETAILS

The Seagreen Project consists of three offshore elements:

1. **Project Alpha** Offshore Wind Farm (525MW);
2. **Project Bravo** Offshore Wind Farm (525MW); and
3. The **Transmission Asset Project** (infrastructure connecting the wind turbine generators with the National Grid, including the Export Cable Route corridor).

The offshore wind farms are located on relatively flat, uniform seabed to the east of the Angus coastline approximately 27km from the town of Arbroath (see Figure NTS 1 at the back of this document). Inshore of Seagreen's Firth of Forth Zone two other offshore wind farms are also proposed, Neart na Gaoithe and Inch Cape. A key part of this EIA has been to consider the cumulative impact of all of the proposed offshore wind developments in this region.

The final layouts of Project Alpha and Project Bravo are dependent upon a number of factors, including the choice of wind turbine generator, the final foundation and substructure design and any mitigation measures to reduce the predicted impacts of the offshore wind farms. The design parameters for Project Alpha and Project Bravo are very similar and are summarised in Table 1 below along with the key design parameters associated with the Transmission Asset Project.

Project Alpha and Project Bravo comprise the first of three phases of wind farm development within the Firth of Forth Zone. Seagreen was awarded the right to develop the Firth of Forth Zone by The Crown Estate and the target generation capacity for the Zone is 3.5GW.

The wind turbine generators are composed of a nacelle and rotor complete with three blades, which are mounted upon a cylindrical steel tower; this in turn is supported by a foundation fixed to the seabed. The maximum height of the wind turbine generators above the lowest predicted water level to the blade tip will be just under 210m in a vertical position and the minimum spacing between wind turbines generators will be 610m.

Key parameters of the Seagreen Project are presented in Tables 1 and 2.





**Table 1. Key parameters of Project Alpha and Project Bravo**

Key Parameter	Project Alpha	Project Bravo
Number of wind turbine generators	Up to 75	Up to 75
Total maximum installed capacity	525MW	525MW
Area	197 square kilometres (km <sup>2</sup> )	194km <sup>2</sup>
Distance from shore (closest point)	27 kilometres (km)	38km
Wind turbine generator rotor diameter	122 metres (m) (minimum) to 167m (maximum)	122m – 167m
Wind turbine generator hub height above Lowest Astronomical Tide (LAT)	87.1m – 126m	87.1m – 126m
Maximum tip height of the wind turbine generator above LAT	148.1m – 209.7m	148.1m – 209.7m
Minimum blade clearance above LAT	26.1m – 42.7m	26.1m – 42.7m
Minimum separation distance between wind turbine generators	610m – 835m	610m – 835m
Colour of wind turbine generator	Pale matt grey/off-white colour and will include display lighting	Pale matt grey/off-white colour and will include display lighting
<b>Other infrastructure</b>		
Meteorological masts	Up to six (three in each offshore wind farm project) ranging from 87.1m to 209.7m above LAT	
Wave buoys	Up to six (three in each offshore wind farm project)	
Scour protection and cable protection	As required	

**Table 2. Key parameters of the Transmission Asset Project**

Key Parameter	
Number of offshore platforms (not to exceed five across all projects)	2 – 5
Number of export cables	2 – 6
Indicative total export cable length (all high voltage cables)	up to 530km





A number of different foundation and substructure designs are being considered for Project Alpha and Project Bravo (as part of the Rochdale Envelope approach) and the final choice will be based upon the size of wind turbine generator selected, in addition to ground conditions, water depth and environmental conditions at the site. The offshore wind farms may also include up to six meteorological masts (three in each wind farm), to collect data on wind speed and direction, and up to six wave buoys (three in each wind farm), to monitor wave height and wave direction. The wind turbine generators will be interconnected by a buried array cable network, which will also connect the wind turbine generators to offshore platforms. Up to five offshore platforms may be required across the Seagreen Project depending upon final electrical connection design requirements.

The electricity generated will be transmitted to shore by up to six export cables, which will come ashore at Carnoustie on the Angus coastline. The offshore cables will be buried in the seabed to a target depth of at least 0.5m and where this is not possible they will be laid on the seabed surface and protected, typically under concrete mattresses, by rock dumping or by placing of large bags filled with concrete grout.

The onshore cable route will run from the Mean Low Water Springs tidal limit via an onshore transition pit close to the landfall, to a connection point with the national electrical transmission network at Tealing. The onshore works will be subject to a separate consent application to be made to Angus Council in 2013.

The Crown Estate site lease is for 50 years and the Seagreen Project will have an operational life of 25 years. Towards the end of the operational life a decision will be made by the operating companies to proceed with decommissioning or to apply to the relevant regulatory authority at the time to repower the offshore wind farms. If repowering is desired for either offshore wind farm then an investigation would be undertaken in to the possible options and would be subject to a separate consenting process. A full Decommissioning Plan will be agreed with the Department of Energy and Climate Change (DECC) prior to construction and will include for the complete removal of all offshore structures above seabed level.

Regular servicing of the wind turbine generators will take place during the operational life of Project Alpha and Project Bravo. Maintenance operations staff will be required to manage and support all aspects of wind farm operation. The location of a support base for these activities will be influenced by the contractor chosen to do the work but it is currently expected that at least some of these activities might be based in local ports along the east coast of Scotland.



## THE NEED FOR RENEWABLE ENERGY

The central aim of the UK Government energy policy is to establish a portfolio of energy supplies that is diverse, sustainable and secure and is offered at competitive prices. Underpinning this policy goal is a commitment to reduction of carbon dioxide (CO<sub>2</sub>) emissions by 60% by 2050. The development of renewable energy plays a fundamental role in UK Government strategy for delivering reduced emissions. This is reflected in the UK government target that 20% of the UK's electricity supply should come from renewable sources by 2020.

The Scottish Government has gone much further than any other European Union country in support of renewable energy and has committed to generating an equivalent of 100% of electricity demand from renewable sources by 2020. Furthermore, the Scottish Government has made legally binding commitments through the Climate Change (Scotland) Act 2009, which sets a greenhouse gas emissions target, for a reduction of 80% from 1990 levels by the year 2050, in line with the UK Climate Change Act 2008.

The development of the Seagreen Project will help the UK and Scotland move towards its goals by reducing emissions of CO<sub>2</sub> by between 1.3 and 2.9 million tonnes of CO<sub>2</sub> per year depending on whether gas or coal is displaced and assuming an existing mix based on conventional fuels.

## REGULATORY CONSENTS

A number of regulatory consents are required for the construction and operation of the Seagreen Project. The consents process is being led by the Scottish Ministers, acting through Marine Scotland, which is the Scottish Governmental body with responsibility for marine planning and licensing functions.

Seagreen has applied for the following key consents:

- Consent under Section 36 of the Electricity Act 1989 to construct and operate the offshore wind farms, including all ancillary infrastructure; and
- Marine Licences under the Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010.

In addition to the above, an application will be made to the DECC for the implementation of safety zones under Section 95 of the Energy Act 2004 to ensure the safety of the offshore wind farm infrastructure, individuals working thereon, construction vessels and other vessels navigating in the area whilst works take place. The safety zones are likely to be up to 500m around all offshore structures during construction and decommissioning and a maximum of 50m around offshore wind farm structures may also be established during operation. Rolling safety zones around construction vessels will also be applied for during construction, also under the Energy Act 2004.

It is anticipated that any further secondary licences and permissions will be applied for as required prior to construction works occurring.



## PROGRAMME

The Seagreen Project is in the early stages of the development, an outline programme of key milestones is provided in Table 3.

**Table 3. Seagreen Project programme**

Programme Stage	Start	Finish
Consents / licences received	–	Q4 2014
Tendering and award of contracts	Q4 2013	Q4 2015
Installation of export cables	Q4 2015	Q4 2017
Offshore foundations / substructures installation	Q3 2016	Q3 2019
Array cable installation	Q3 2016	Q3 2019
Installation of turbines and offshore platforms	Q2 2017	Q3 2019
Commissioning and first generated output to National Grid	Q2 2017	Q3 2019
Project completion	Q4 2019	Q4 2019

## THE NEED FOR ENVIRONMENTAL IMPACT ASSESSMENT

The Seagreen Project is subject to an EIA, as required under the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000 and the Marine Works (Environmental Impact Assessment) Regulations 2007, as amended by the Marine Works (Environmental Impact Assessment) Regulations 2011. The ES for the Seagreen Project has been carried out in accordance with these regulations.

## THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

EIA is a tool for systematically examining and assessing the impacts and effects of a development on the environment. The resultant ES reports on the EIA and contains:

- a description of the development, including any alternatives considered;
- a description of the existing environment at the site and surrounding areas;
- a prediction of the potential impacts on the existing human, physical and natural environment at the site and assessment of subsequent effects;
- a description of mitigation measures to avoid or reduce such effects; and
- a Non-Technical Summary (this document).



## SCOPING AND CONSULTATION

A scoping exercise was carried out to identify the main issues that needed addressing as part of the EIA. Consultation was carried out as part of this process with over 100 statutory and non-statutory organisations and individuals representing key interests and user groups in North East Scotland and in Scotland as a whole. Consultation and liaison continued throughout the EIA and will be ongoing throughout the life of the Seagreen Project.



Seagreen Public Information Days, May 2012  
Photo courtesy of Seagreen

Public consultation and community engagement took place in the form of public information days, which were held in two stages and at various locations along the Angus coastline. The first round of exhibitions was held in January 2011 and introduced the Firth of Forth Zone and the phased approach to development to the local communities, and provided a high level overview of the development and EIA processes. The second round of public information days took place

in May 2012 and presented an update on Phase 1 of development (the Seagreen Project) and the offshore survey work which had informed the EIA. Members of the Seagreen team were available to answer questions at each of the public information days, the dates and locations of which are detailed in Tables 4 and 5.

**Table 4. Round 1 Public Information Days**

Location	Venue	Date	Time
Carnoustie	Leisure Centre	18th January 2011	12:00 – 20:00
Arbroath	Angus Business Centre	19th January 2011	12:00 – 20:00
Tealing	Community Hall	20th January 2011	12:00 – 20:00
Dundee	Discovery Point	25th January 2011	12:00 – 20:00
Montrose	The Park Hotel	26th January 2011	14:00 – 19:00

**Table 5. Round 2 Public Information Days**

Location	Venue	Date	Time
Montrose	The Park Hotel	14th May 2012	15:00 – 19:00
Arbroath	The Webster Memorial Theatre	15th May 2012	15:00 – 19:00
Carnoustie	Leisure Centre	16th May 2012	15:00 – 19:00
Dundee	Discovery Point	17th May 2012	15:00 – 19:00
Tealing	Community Hall	18th May 2012	15:00 – 19:00



## ORIGINAL DATA COLLECTION AND SURVEYS

Further to the findings of the scoping exercise and consultation with the statutory consultees, the following surveys and desk based studies have been undertaken as part of the EIA:

- geophysical and geotechnical surveys to understand the characteristics and features on the surface and subsurface of the seabed across the site;
- metocean survey (i.e. measurement of the wave, current and tidal conditions at the site);
- aerial and boat based bird surveys;
- aerial and boat based marine mammal surveys;
- marine biological survey including sampling and analysis of seabed sediments and the organisms living in the sediments and on the surface of the seabed, including the intertidal area;
- fish surveys as part of the marine biological sampling (see above);
- activity survey of local fishermen;
- landscape, seascape and visual impact assessment;
- marine traffic survey;
- Navigational Risk Assessment;
- archaeological assessment of geophysical data; and
- aviation assessment considering both civil and military aviation.

## IMPACT IDENTIFICATION AND EVALUATION

### Overview

The identification and evaluation of impacts has been carried out using a number of methods and techniques. This has included literature review, collation of new and existing data, data analysis, consultation, reference to relevant guidance and standards, as well as firsthand experience of similar developments. This EIA evaluates all potential changes to the existing environment, both positive and negative, as a result of activities associated with construction, operation and decommissioning of the Seagreen Project. For each EIA topic the assessment has considered the 'worst case' scenario from within the Rochdale Envelope. This means that the design option or the construction method with the greatest potential impact on the receptor in question has been assessed in order to ensure a robust precautionary approach.

Impacts have been evaluated with reference to definitive standards, accepted criteria, technical guidance or legislation where these are available, for each technical study. Where it has not been possible to quantify impacts, and where a qualitative or semi-qualitative assessment has been made, the assessment aims to set out in a logical way in the science based or evidence based reasoning that supports the assessment.



The significance criteria generally lead to a common outcome of classifying the significance of impacts as major, moderate, minor, or negligible. Impacts are also described according to whether they are considered to be adverse, neutral or beneficial.

Specific significance criteria for impacts have been developed, giving due regard to the following:

- magnitude of the impact (a function of spatial extent, duration, reversibility and likelihood);
- sensitivity and level of tolerance/recoverability of the receptor or species;
- impact nature (whether direct or indirect, reversible or irreversible);
- whether the impacts occur in isolation, are cumulative or are linked (i.e. potential inter-relationships between multiple impacts, from different aspects, to a single receptor);
- conservation or protected status of the receptor or species;
- confidence in the impact prediction; and
- the margins by which set values are exceeded.

Of these criteria, the sensitivity of the receptor and the magnitude of the impact are the most important measures. The definition of sensitivity and magnitude varies depending upon the parameter under question, and therefore these will be defined in detail within each relevant section of the ES technical chapters.

### Receptor value and sensitivity

Within the impact assessment the receptor’s sensitivity is identified, from negligible to high.

The sensitivity of the receptor is a function of its capacity to accommodate the proposed form of change and would reflect its capacity to recover if it is affected. In order to help define the degree of receptor value and sensitivity, the following guidance presented in Table 6 have been adopted for the purposes of the EIA.

**Table 6. Definition of terms relating to the sensitivity and value of generic receptors**

Value / Sensitivity	Value	Sensitivity
High	Nationally important / rare with limited potential for offsetting / compensation.	Feature / receptor has very limited capacity to accommodate the proposed form of change.
Medium	Regionally important / rare with limited potential for offsetting / compensation.	Feature / receptor has limited capacity to accommodate the proposed form of change.
Low	Locally important / rare	Feature / receptor has some tolerance to accommodate the proposed change.
Negligible	Not considered to be particularly important / rare	Feature / receptor is generally tolerant and can accommodate the proposed change.



## Impact magnitude

The impact assessment also defines the magnitude of the effect, from no change to substantial. In order to help define the level of impact magnitude, the following guidance (Table 7) has been used for the EIA.

**Table 7. Definition of terms relating to the magnitude of an impact**

Magnitude	Definition
High	Fundamental, permanent / irreversible changes, over the whole feature / asset, and / or fundamental alteration to key characteristics or features of the particular environmental asset's character or distinctiveness.
Medium	Considerable, permanent / irreversible changes, over the majority of the feature / asset, and / or discernible alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.  Impact certain or likely to occur.
Low	Discernible, temporary (throughout project duration) change, over a minority of the feature / asset, and / or limited but discernible alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.
Negligible	Discernible, temporary (for part of the project duration) change, or barely discernible change for any length of time, over a small area of the feature or asset, and/or slight alteration to key characteristics or features of the particular environmental aspect's character or distinctiveness.

## Impact significance

Following the identification of receptor value and sensitivity and magnitude of the effect, it is possible to calculate the significance of the impact following the impact assessment matrix as presented in Table 8.

**Table 8. Significance of an impact resulting from each combination of receptor sensitivity and the magnitude of the effect upon it**

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

The significance of the impact(s) identified can then be defined according to the terminology in Table 9. This methodology provides a consistent framework for considering and evaluating impacts.



**Table 9. Terminology for classifying environmental impact**

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

Major and moderate impacts are considered to be ‘significant’ for the purposes of the EIA Regulations. Some of the ES technical chapters (such as commercial fisheries, shipping and navigation and military and civil aviation) have assessed impacts as either ‘not significant’ or ‘significant’ in accordance with the guidance provided for those specific technical assessments, as described in those ES technical chapters.

## SUMMARY OF ENVIRONMENTAL IMPACTS

### Introduction

The following sections summarise the potential environmental impacts associated with the Seagreen Project, as detailed in the ES.

The coloured boxes below detail the environmental topics that have been assessed within the ES:

#### PHYSICAL ENVIRONMENT

- Physical Environment
- Water and Sediment Quality

#### BIOLOGICAL ENVIRONMENT

- Natural Fish and Shellfish Resource
- Marine Mammals
- Nature Conservation Designations
- Ornithology
- Benthic Ecology and Intertidal Ecology

#### HUMAN ENVIRONMENT

- Archaeology and Cultural Heritage
- Military and Civil Aviation
- Socio-economics, Tourism and Recreation
- Other Marine Users and Activities
- Commercial Fisheries
- Shipping and Navigation
- Seascape, Landscape & Visual Amenity



## Physical Environment

An assessment was undertaken to investigate the potential changes that the offshore wind farms and export cables would have on the local waves, currents, sediment distribution, sediment transport regime and features of the seabed. Project Alpha, Project Bravo and the Transmission Asset Project will have some localised impact in the immediate vicinity of any infrastructure, but will not have any significant impact further away from the sites. There is potential for localised scour around the base of each foundation structure, although the detailed design will take this into account.

Changes due to the presence of the offshore structures are considered to be less significant than those experienced due to the natural variation in both the seabed and shoreline, and as such the potential impacts are considered to be low. Mitigation measures have been suggested which are likely to reduce all effects to negligible, except for the potential use of a conical gravity base structure design option, for which the effect remains low but not significant.

No significant cumulative impacts were anticipated with other projects.

## Water and Sediment Quality

To inform the EIA process, data was collected at locations across the Firth of Forth Zone and the Export Cable Route corridor, measuring seawater temperature and salinity, turbidity, water levels, wave height, wave direction, current speed and direction. Further surveys gathered information on seabed geology and water depth, and presence of contaminants within the seabed sediments. Desk based reviews of sensitive features were also undertaken, including nearby designated bathing waters (at both Carnoustie and Arbroath West Links) and Shellfish Waters (Elie to Fife Ness). The survey data showed an increase in suspended sediments in the water column to coincide with storm events. Arsenic was the only contaminant found at high levels in the sediments; this metal is known to be present naturally in sediments from the Firth of Forth area.

Impacts associated with the deterioration of water quality due to re-suspension of sediments or contaminants are assessed to be not significant, as sediment re-suspension will be constrained to the immediate area of disturbance and will settle quickly back to normal levels.

The greatest impacts to water quality could occur during construction, as a result of potential pollution from vessels and construction activities. The significance for associated impacts is assessed to be not significant for Project Alpha and Project Bravo. Due to the nearby sensitive features along the coastline to the Transmission Asset Project area, the magnitude of associated impacts are greater than those for the offshore wind farms, however they are still assessed as not significant. Seagreen commits to preparation, planning and management of the construction and operation of the development to mitigate these impacts.

The introduction of non-native species into the area is identified as a potential impact, through the movement of vessels from contaminated areas. A risk assessment will be conducted based on the movements of the installation and maintenance vessels to be used (home port and recent operations) and measures agreed with regulators will be adopted to mitigate this risk. The impact significance is therefore assessed as not significant.

Overall, no impacts were assessed to be significant, and no cumulative impacts were anticipated with other projects.



## Nature Conservation Designations

There are numerous nature conservation designations that exist along the east coast of Scotland. The characteristics of the species and habitats for which each site has been designated determines the potential for the Seagreen Project to affect them. For example a site that has been designated for seabirds that forage over long distances will have more chance of being affected by the Seagreen Project than a site that has been designated for a species of plant.

Designated sites with the potential to be affected by the Seagreen Project have been identified, including those which have been designated at international, national, regional and local levels. The impacts of the Seagreen Project, as well as cumulative impacts, with other projects, on the features of nature conservation designations are assessed within the relevant chapters of this ES. Those designated under EC Directives and international agreements have been identified in this ES. Seagreen will present a Habitat Regulations Appraisal (HRA) with specific data interpretation to support an Appropriate Assessment in a separate report. This will be submitted to Marine Scotland during the consent determination period of the Seagreen Project.

Image © Shutterstock





## Ornithology

An intensive programme of 24 boat based monthly surveys was conducted between December 2009 and November 2011. The surveys, which were conducted using the MV Clupea, covered the entire Zone, including the Project Alpha and Project Bravo sites, and were combined with the marine mammal surveys. Data collected during boat based surveys were supplemented by previously



MV Clupea – Boat used by Seagreen for baseline surveys  
Photo courtesy of Seagreen

undertaken aerial surveys which were also used to describe the bird use of the Seagreen Project sites and the surrounding area.

Boat based surveys identified approximately 24,000 individual birds within Project Alpha and 39 different species. Slightly fewer birds were identified within Project Bravo (20,000 individuals and 37 species). Guillemots, kittiwakes and gannets were the species identified in the highest numbers, within both offshore wind farm sites.

Data from the aerial surveys identified that there is a relatively high number of birds and species using the Phase 1 area. This was expected, as although the area is located a long way offshore it contains suitable habitat for the prey species (mainly sandeels) of seabirds, especially those in the auk family, such as guillemots, puffins and razorbill.

Impacts covering a range of potentially sensitive species were assessed. Indirect effects upon birds from potential construction noise impacts on prey, the key fish species being herring and sandeel, based on the worst case installation methodology of impact piling, are predicted to have a significant effect on four species of bird; kittiwake, guillemot, razorbill and puffin.

Great black-backed gull is the only species for which collision risk with the wind turbine generator blades during operation is predicted to have a major significant impact. This is the case for both the Project Alpha and Project Bravo sites individually and in combination. The impact upon birds of the construction and operation of the Transmission Asset Project has been assessed as not significant for all sensitive species identified.

The Seagreen Project may also impact cumulatively, with neighbouring offshore wind farms to produce significant collision and displacement impacts to kittiwake, gannet, guillemot, razorbill, puffin, herring gull, lesser black-backed gull and great black-backed gull.

All of the impact assessments upon birds are considered to be very precautionary and use a worst case scenario approach, which identifies the worst possible level of impacts that could occur. In reality the impacts are expected to be less severe. Seagreen is committed to working with Marine Scotland and the Statutory Nature Conservation Bodies to reduce these impacts.



Photo courtesy of [www.naturespicsonline.com](http://www.naturespicsonline.com)



## Benthic Ecology and Intertidal Ecology

A number of surveys were carried out to characterise the environment of the Seagreen Project sites with regard to the marine plants and animals which live on the seabed. Surveys included seabed trawls, towed video trawls and grab sampling.



The Project Alpha and Project Bravo sites were found to be typical of the region and contained large areas of featureless, sediment dominated seabed with patchy communities of worms and shellfish.

The only species of conservation importance found to be living within the Project Alpha and Project Bravo sites was the long lived ocean quahog. However, only young specimens of this species were identified within the sites and they were found in very small numbers. The Ross worm, a common and widely distributed species, which is of high conservation value when found growing in reef structures, was present across the site. However, there was no evidence that these worms were forming reef structures.

A slightly more diverse range of species and habitats were found along the Export Cable Route corridor. These ranged from sediment habitats similar to those within the Project Alpha and Project Bravo sites, to rocky habitats closer to the shore. No further species of conservation importance were identified.

A survey of the landfall location at Carnoustie indicated it to be typical of a sand beach with few species present. Of those identified the majority were worms or marine snails.

The direct impact on habitats and species through the installation of substructures/ foundations, subsea cables and associated infrastructure, are considered to be of short term duration and not significant. Indirect impacts from sediment disturbance and deposition resulting from construction activities are also considered to be not significant due to the natural levels of suspended sediment movements and the tolerance of the bottom living community to such disturbances and impacts.

Following construction there is the potential for scour to occur around the foundation structures. The scoured areas and foundations are expected to be readily colonised by species from adjacent areas and may cause a localised increase in biodiversity providing feeding opportunities and refuge habitats for a range of species.

Overall, no impacts were assessed to be significant, and no cumulative impacts were anticipated with other projects.





## Natural Fish and Shellfish Resource

All fish caught during the benthic survey trawls were identified and their physical dimensions recorded. The findings of this survey were supplemented with landings data which is collected by Marine Scotland. The lesser sandeel was the most numerous species caught within the seabed trawls, followed by dab, goby, pogue and butterfish.

The landings data indicate that nephrops (also known as Norway lobster and langoustine), are numerous within the Project Alpha and Project Bravo sites, as are commercially important shellfish such as scallops, crab and lobster.

The main potential impact on fish and shellfish in the area of the Seagreen Project is considered to be the potential noise generated from construction activities, in particular from pile driving. Sound sensitive species such as herring are likely to be particularly vulnerable to this impact. The Seagreen Project areas overlap with a herring spawning ground and significant impacts are predicted for both Project Alpha and Project Bravo individually and on a cumulative basis. Impacts to all other fish and shellfish species are predicted to be not significant.



Impacts predicted as a result of potential disturbance of sensitive fish species by electro-magnetic field effects from the Project Alpha and Project Bravo array cables and from the high voltage cables in the Transmission Asset Project are assessed as not significant.

## Marine Mammals

Along with birds, marine mammals are key ecological receptors of consideration within the ES. Marine mammal activity at the Seagreen Project has been assessed using boat based and aerial surveys, existing published data sources and a series of technical analysis tools. A collaborative approach to assessment has been taken with the other wind farm developers in the Forth and Tay region, via the FTOWDG.

The assessment identifies key marine mammal species with potential to be affected by the Seagreen Project, as harbour porpoise, bottlenose dolphin, harbour seal and grey seal. Harbour seal and grey seal are of particular importance to the region due to the proximity of internationally designated haul out and breeding sites.

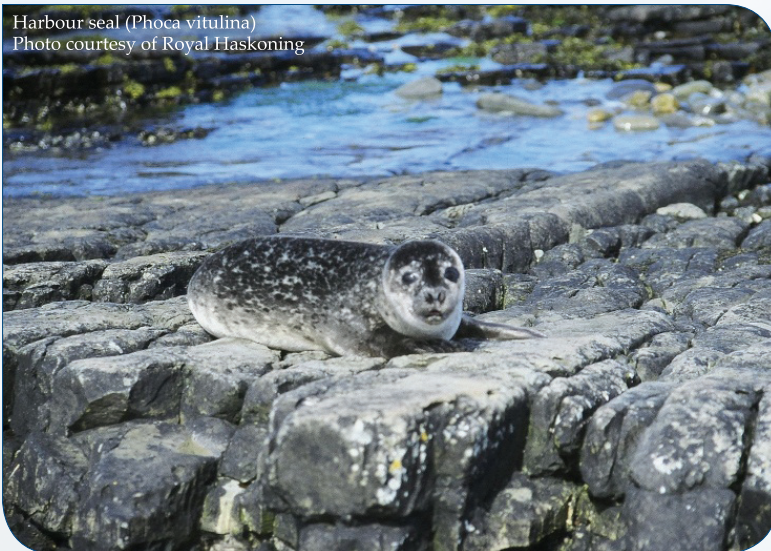
Numbers of harbour seal in the region (and across much of Scotland) have been declining over the last decade. This means that the existing population for the assessment is potentially sensitive to relatively low impact. By contrast, numbers of grey seal are increasing in the region, providing a significantly more robust population.



All whales and dolphins in UK waters are European Protected Species and are therefore internationally important. Bottlenose dolphin present within the area are from the wider population of the east coast of Scotland. The remaining species of whale and dolphin are from larger and wider ranging populations, set in context at a North Sea or European scale.

The potential impacts of underwater noise which have been assessed, include; lethal doses and physical non-auditory injury; auditory injury; and changes to behaviour. One foundation design option uses a piled jacket structure and noise impacts from pile driving have the greatest potential to cause a significant effect. Underwater noise modelling has been carried out to calculate the ranges and areas of potential impact. The approach adopted varies between species in order to achieve the most robust assessment possible. However, in much of the assessment of likely effects there is some degree of uncertainty, which is due to the current limited level of understanding of the biological effects of noise on marine mammals.

Underwater noise from pile driving during the construction of Project Alpha and Project Bravo has the potential to cause significant impacts on harbour seal, however, not significant impacts are predicted on all other species. No significant impacts are predicted to result from the Transmission Asset Project.



Harbour seal (*Phoca vitulina*)  
Photo courtesy of Royal Haskoning

The cumulative assessment of the Seagreen Project concludes that significant impacts may occur for harbour seal, however, similar to the individual project assessments, impacts for all other species are assessed as not significant. All other impacts on marine mammals during all phases of the Seagreen Project are not predicted to be significant.

Cumulative and in-combination impacts (with Inch Cape and Neart na Gaoithe and other projects identified during consultation) of underwater noise from pile driving are assessed as significant for harbour seal, grey seal and harbour porpoise. Significant cumulative impacts are also predicted on harbour seal, grey seal and bottlenose dolphin through changes in prey resources during construction.

All of the impact assessments upon marine mammals are considered to be a precautionary. The engineering parameters used to determine the worst case noise outputs are at this stage based on limited engineering studies and are conservative. Following further detailed design, engineering parameters will be refined and impacts are expected to be less severe than predicted within the assessment. Seagreen is committed to working with Marine Scotland and the Statutory Nature Conservation Bodies to reduce these impacts.



## Commercial Fisheries

Early engagement with local fishermen through public consultation meetings and regular dialogue, has resulted in a high level of understanding of the fishing activity within the Seagreen Project site and the surrounding area. This has been supplemented with fisheries landings and effort data which has been provided by the Marine Management Organisation.

The main fisheries within the Seagreen Project are dredging for scallops, trawling or netting for haddock, and trawling for squid. Of these, the scallop fishery is the most valuable. There are also important crab and lobster fisheries using fixed gear nearer shore within the Export Cable Route corridor. A Navigational Risk Assessment has been completed in tandem with the EIA process that considered safety issues for fishing vessels. Fishing activity is expected to be excluded from certain areas, or access restricted, during construction and operation of both Project Alpha and Project Bravo.

Due to potential increased steaming time to fishing grounds, displacement of fishing activity or navigational conflict with other vessels there are predicated impacts on both the squid and scallop fisheries, however these are considered not significant. Within the Export Cable Route corridor, during both the construction and operation phases, a significant impact is predicted on the crab and lobster fishery that uses static gear whilst a not significant impact is predicted on the scallop, squid and nephrops fisheries that use mobile gear.

Safety issues for fishing vessels will be managed and reduced to within acceptable levels by the application of safety zones where construction activity takes place. However, until the appropriate post construction measures have been completed (e.g. cable protection installed) the safety risks to fishing vessels are considered to be outside of acceptable limits.

Cumulatively, it is predicted that the Seagreen Project will produce a significant impact to the scallop, squid, nephrops and the crab and lobster fisheries during construction and to the squid and scallop fisheries during operation. In line with the natural fish and shellfish resource assessment, a significant impact on herring has been assessed at both project and cumulative level during construction. Significant cumulative impacts have also been assessed with regards to safety, displacement and interference with fishing vessels.

A regional Fisheries Working Group is proposed to facilitate future engagement with the fishing industry and seek to address the cumulative impacts which have been identified and are associated with offshore wind farm development in the region.



Fishing Vessel Natalie B H1074 –  
Observed in Project Alpha during the shipping radar survey  
Photo courtesy Anatec



## Shipping and Navigation

In support of the shipping and navigation assessment a Navigational Risk Assessment was undertaken. This involved the collection of data on use of the area by shipping, a hazard identification workshop and consultation with shipping operators.



Shipping activity was recorded using vessel Automatic Identification System transmission. Radar track data was also recorded for a summer and winter period from two site specific, vessel based surveys.

Risk of vessel collision is predicted to increase as a result of construction related activities; however, with temporary closures and exclusions zones the risk is assessed as being acceptable and not significant. Although

some significant risks were predicted during the operational phase, most of these relate to an indicative worst case shipping and navigation layout plan in which a gap was left between the Project Alpha and Project Bravo layouts. After the application of appropriate mitigation, including vessel tracking, warning notices, publication of locational data on charts, no significant residual risks are predicted.

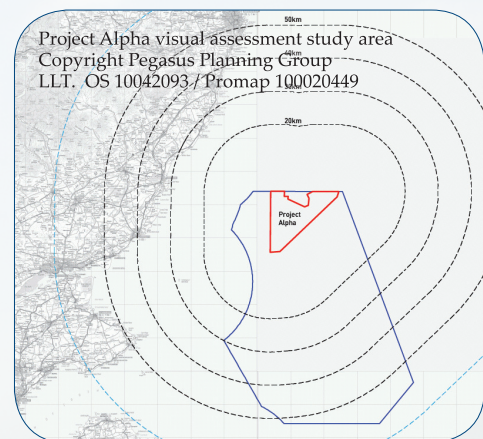
## Seascape, Landscape and Visual Amenity

A number of potential visual impacts on the seascape of the Angus coastline have been identified. During the construction phase of Project Alpha and Project Bravo impacts on seascape character and landscape character are predicted, associated with the high intensity lighting required for night time working.

However, it should be noted that impacts from lighting during construction of the offshore wind farms will be temporary and located at least 27km from the shore. These have therefore been assessed as not significant.

Installation of the export cables will have a significant impact as the works move progressively towards the shore. However, it is expected that export cabling works will take a maximum of nine months and the effect is considered to be temporary.

Potential impacts on seascape character, visual amenity, residential receptors, marine receptors and on night time receptors are predicted during the operational phase of the Project Alpha. The potential operational impacts predicted for Project Bravo are restricted to visual amenity for recreational vessels and the Bell Rock lighthouse. For Project Alpha two significant impacts on seascape character have been assessed and two significant impacts on visual amenity have been assessed. No significant impacts are assessed for Project Bravo.





Project Alpha, Project Bravo and the Transmission Asset Project are likely to create a number of cumulative impacts for seascape landscape and visual amenity, these include:

- impacts on seascape character;
- impacts on visual amenity;
- impacts on residential receptors;
- impacts on recognised vantage points and tourist attractions;
- impacts on marine receptors;
- impacts on recreational walking and cycle routes; and
- night time impacts.

Following best practice, installation works may result in some reduction of visual impacts in the construction phase but ultimately, when the Seagreen Project is constructed, there will be visible structures in a seascape which previously had none. Whether the impacts are adverse or beneficial is dependent upon the viewer's perspective.

The Seagreen Project is also predicted to combine with a number of other onshore and offshore wind farms as well as other projects to produce a number of cumulative and in-combination impacts. The majority of these impacts are not significant, however, cumulative significant offshore impacts on four seascape character units and two viewpoints have been assessed with neighbouring wind farm sites.

The effects of the Seagreen Project on seascape, landscape and visual amenity are fully reversible upon the decommissioning and removal of the project infrastructure.

## Archaeology and Cultural Heritage

An archaeological assessment was undertaken to determine the potential for submerged artefacts, wrecks and coastal remains, through a desk based study and interpretation of geophysical and geotechnical data. A number of wrecks were identified within the study area and other geophysical anomalies were recorded that could be of archaeological potential.

As archaeological and cultural heritage features are finite, any impacts upon them would be permanent and significant. However, it is expected that all impacts can be mitigated. All sites of cultural heritage interest included in the assessment will be avoided where possible. A protocol will be agreed with Historic Scotland and the Aberdeenshire Council Heritage Advisor, to mitigate construction effects in the event of any unexpected archaeological discoveries during installation. Infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities impacting the identified locations of cultural heritage interest.

Overall, no impacts were assessed to be significant, and no cumulative impacts were anticipated with other projects.





## Military and Civil Aviation

There is the potential for infrastructure in Project Alpha and Project Bravo to impact upon both military and civilian radar services, increasing the risk to aviation traffic. Technical measures will be agreed and put in place to ensure that these are mitigated and that there are no residual impacts.

Seagreen is committed to working with the relevant stakeholders to establish appropriate mitigation and on the basis that it can be agreed, the impacts will be acceptable and not significant.

There are no impacts upon military and civil aviation resulting from the development of the Transmission Asset Project. There is a potential cumulative impact to military aviation as a result of the Seagreen Project in combination with other wind farms, however on the basis that mitigation can be agreed, the impacts will be acceptable and not significant.

## Socio-economics, Tourism and Recreation

Given the scale of the Seagreen Project, there are expected to be significant beneficial impacts upon the Scottish economy during construction, including direct impacts upon employment, with a large number of full time jobs created in construction and subsequent operation.

Whilst it is not possible to be definitive at this stage, the Seagreen Project has the potential to encourage the establishment of manufacturing or pre-assembly facilities, as well as research and support facilities, by wind turbine generator manufacturers and installers in Scotland and the wider Forth and Tay region.

In addition, port, transport and other support facilities will be required during the construction period. Beneficial impacts are expected to continue during the operation period, with support and port facilities needed by operators for maintenance and related activities.

Effects are predicted on tourism and recreation due to the visibility of the offshore wind farms from the shoreline, this is however assessed as not significant.

## Other Marine Users and Activities

There are relatively few other industries operating within the region that the Seagreen Project has the potential to interact with or impact upon. There is no active oil and gas activity, no aggregate dredging, no overlap with pipelines or cables and limited overlap with disposal sites, other wind farms and military practice areas. Industries with which there are potential impacts (i.e. fisheries and shipping) are considered in their own right within the topic specific technical chapters of this ES. Hence there are no pathways for significant impacts from the Seagreen Project to other users and activities and no cumulative impacts are anticipated with other projects.



## CONCLUSION

The project will make a significant contribution to national targets for renewable energy, as noted in the introductory sections of this NTS.

Overall, given the successful implementation of the stated mitigation measures committed to by Seagreen, combined with ongoing dialogue with interested stakeholders and the regulatory authorities, it is predicted that the Seagreen Project will not have any long term impacts that are unacceptable. The precautionary nature of the assessment approach, based on worst case scenarios, also means that, in reality, any impacts are likely to be less than predicted.

## FURTHER INFORMATION

Copies of the Environmental Statement may be obtained from Seagreen (tel +44 (0) 141 224 7038 or email [info@seagreenwindenergy.com](mailto:info@seagreenwindenergy.com)) at a charge of £350 per hard copy and £10 for a copy on DVD. Copies of this short non-technical summary are available free of charge.

Any representations to the application should be made by email to: The Scottish Government, Marine Scotland Licensing Operations Team mailbox at [seagreenphaseone@scotland.gsi.gov.uk](mailto:seagreenphaseone@scotland.gsi.gov.uk) or by post to: The Scottish Government, Marine Scotland, Marine Laboratory, PO Box 101, 375 Victoria Road, Aberdeen, AB11 9DB, identifying the proposal and specifying the grounds for representation.

The ES can be viewed during the statutory consultation period at the following locations:

### SEAGREEN WIND ENERGY LIMITED

C/o SSE Renewables  
1 Waterloo Street  
Glasgow  
G2 6AY

### SCOTTISH GOVERNMENT LIBRARY

Victoria Quay  
Edinburgh  
EH6 6QQ

### DUNDEE CENTRAL LIBRARY

The Wellgate  
Dundee  
DD1 1DB

### ANGUS PLANNING OFFICE

Planning and  
Transport Division  
County Buildings  
Market Street  
Forfar  
DD8 3LG

### ARBROATH LIBRARY

Hill Terrace  
Arbroath  
DD11 1AH

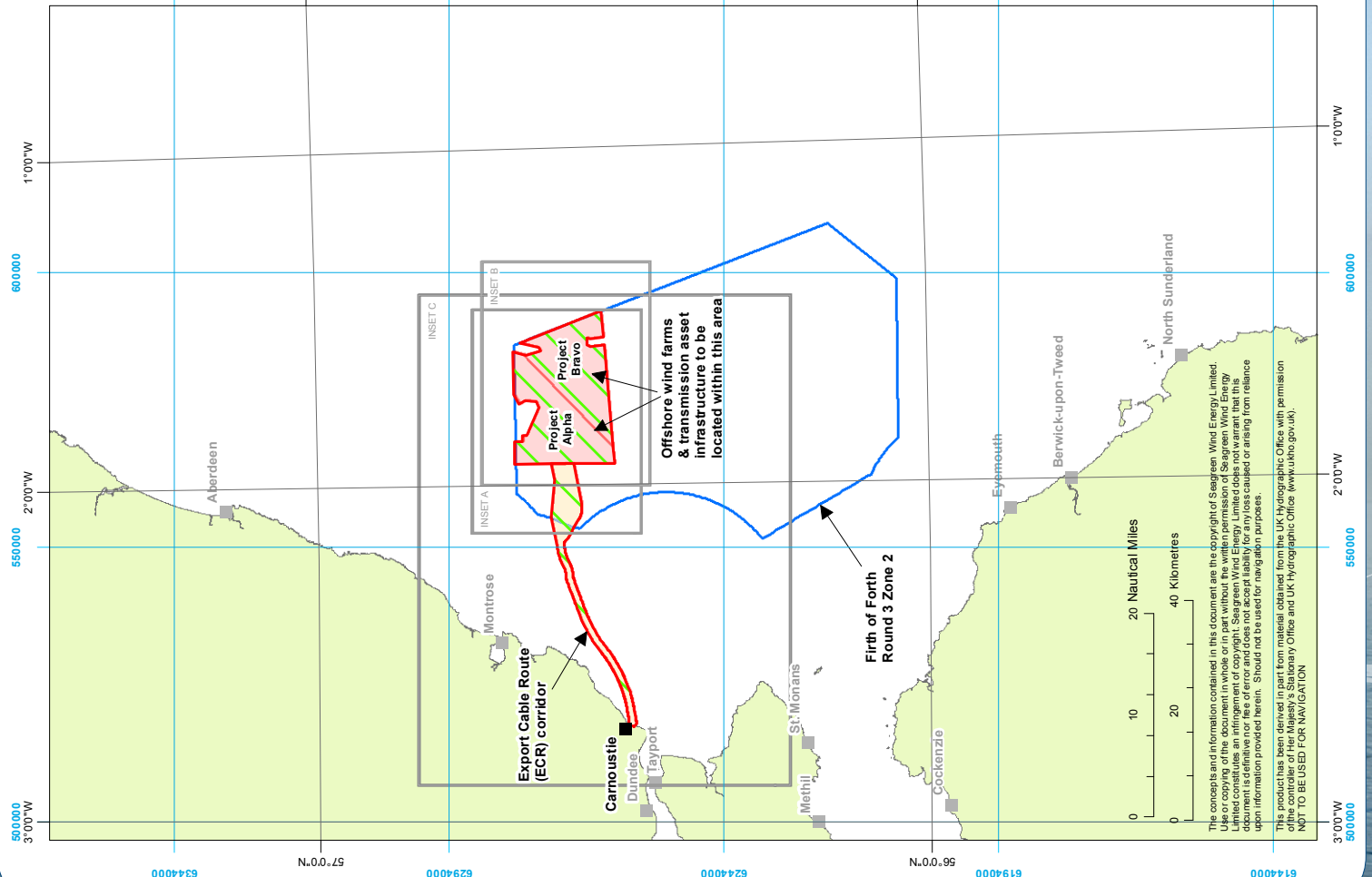
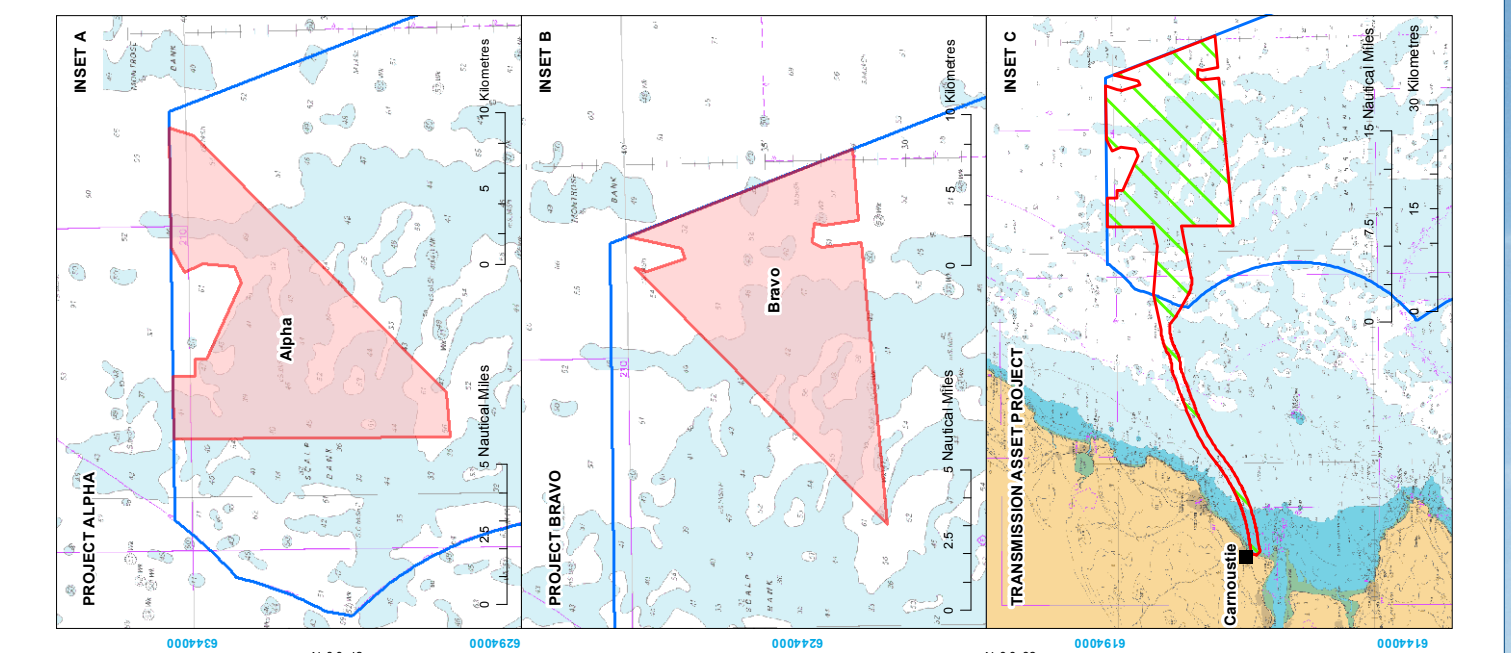
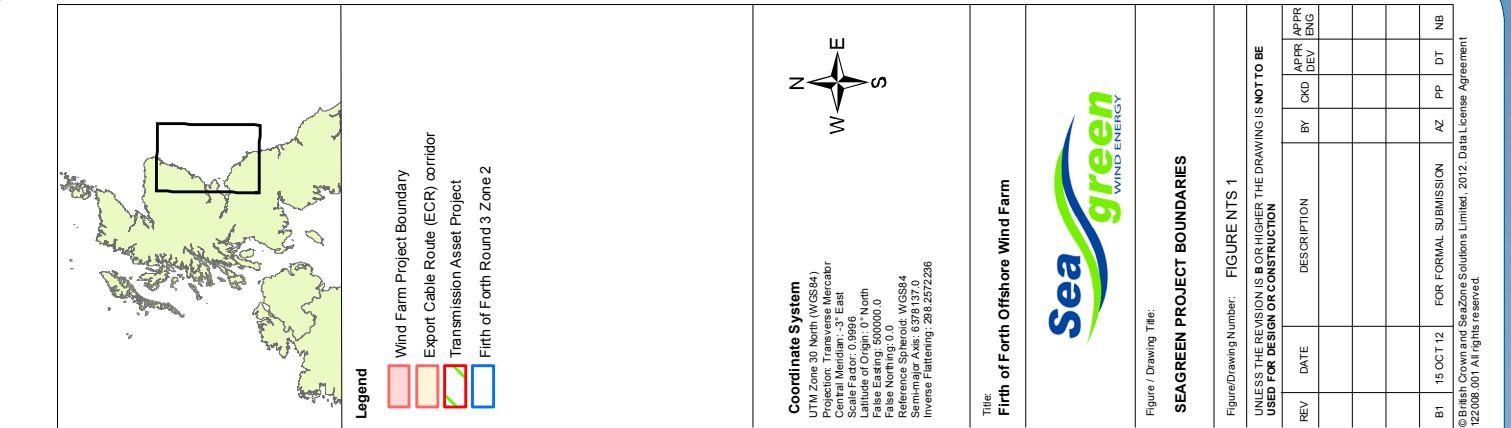
### CARNOUSTIE LIBRARY

21 High Street  
Carnoustie  
DD7 6AN

### MONTROSE LIBRARY

214 High Street  
Montrose  
DD10 8PH









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