BRIMS
TIDAL ARRAY

openhydro
a DCNS company

sse

Non-Technical Summary

Volume 1

May 2016

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1 INTRODUCTION

1.1 This Document

This is a Non-Technical Summary (NTS) of the Environmental Statement (ES) for the offshore components of the Brims Tidal Array Project (the Project), a development of up to 200 megawatts (MW) of generating capacity within the Pentland Firth proposed by Brims Tidal Array Limited (BTAL). The key driver for the Project is the development of renewable sources of energy, which is critical for combatting global climate change, and which contributes to improved energy sustainability and security of supply in Scotland. The Project will make a significant contribution to the Scottish target for 100% of Scotland's electricity demand to be generated from renewable sources by 2020.

This NTS presents a summary of the Project, the approach to the assessment and an overview of both the existing environmental conditions and the assessment conclusions. The document also provides quick reference to key contact details and instructions on how interested parties can get involved.

1.2 The Applicant

BTAL is a joint venture partnership between Scottish and Southern Energy Renewables Developments (UK) Limited (SSER) and OpenHydro Site Development Limited (OpenHydro).

SSER is a wholly owned subsidiary of the SSE Group and is responsible for the development of renewable energy projects on behalf of the generation part of the company. The overall SSE generation portfolio presently has an installed generation capacity of over 13GW, including almost 3.2GW of renewables, and supplies energy to some 10 million customers across the UK and Republic of Ireland. SSE defines its core purpose as providing the energy people need, in a reliable and sustainable way. SSER is one of the UK's leading offshore renewable energy developers, responsible for 6.6GW of development projects.

OpenHydro is an Irish tidal energy technology company whose business is the design and manufacture of tidal turbines for generating renewable energy from tidal streams. Founded in 2004, OpenHydro has developed an innovative turbine capable of producing electricity at competitive prices. In March 2013, a French industrial company, DCNS, secured a majority shareholding in OpenHydro. DCNS is a world leader in naval defence and an innovative player in energy. DCNS designs, builds and supports submarines and surface naval vessels and provides services for naval shipyards and bases. It also develops solutions in civil nuclear engineering and marine renewable energy.

OpenHydro is uniquely positioned in the tidal energy industry. It has a commercial scale tidal turbine with proven ability to generate electricity, the technical ability to connect successfully to a national grid and a method to deploy turbines quickly, safely and economically on the seabed. OpenHydro's achievements have been recognised through a number of prestigious international awards including, the Green Energy, Rushlight, Ocean Energy, and numerous Engineers Ireland awards. OpenHydro has the longest track record at the European Marine Energy Centre (EMEC) in Orkney. The company completed the installation of the first tidal turbine at this test facility in 2006 and in 2008 OpenHydro became the world's first company to connect a tidal turbine to the UK national grid. OpenHydro was also the first to successfully demonstrate a fast and economically viable deployment method for the installation of turbines at depth.

The sole purpose of BTAL is to progress the development of the Project at Brims Ness. In 2010, BTAL was awarded an Agreement for Lease (AfL) for the site by The Crown Estate (TCE) which provides it with exclusive rights to investigate the feasibility of developing a commercial scale tidal energy array on the site.

The development of the Project will entail an investment of hundreds of millions of pounds, a significant portion of which will benefit the local Orkney and regional Scottish economies. BTAL is working with local businesses to ensure that they are in a position to take advantage of this opportunity as the Project develops.

1.3 Project Background

In March 2010, TCE issued an AfL for a tidal energy array up to 200MW in capacity, located off the south coast of South Walls, Orkney, to Cantick Head Tidal Development Limited (CHTDL), a joint venture between OpenHydro and SSER. The AfL allows the holder exclusive rights to investigate the feasibility of developing the Project whilst seeking the necessary development consent(s) from the licensing authorities. Analysis and review of the detailed survey datasets led to the identification of site characteristics at the original Cantick Head AfL that were unfavourable for the development of a tidal energy array. On this basis, CHTDL initiated a consultation exercise with TCE in 2013 to identify a more suitable location. Following the collection of additional data from further site surveys and a stakeholder consultation process a revision was made to the boundary of the AfL area. As a result of this boundary change, and in order to ensure a name relevant to the Project location, the site name was revised from Cantick Head Tidal Development to Brims Tidal Array.

1.4 Project Overview

This application considers the following offshore components of the Project:

- All offshore aspects of the Project including tidal turbines and turbine support structures;
- Electrical infrastructure - inter-array and export cables, and subsea cable connection hubs; and
- Landfall for export cables (up to Mean High Water Springs (MHWS)).

In addition to the components described above, onshore infrastructure landward of the export cable landfall will also be required to connect the Project to the electricity transmission network. This infrastructure will be addressed in separate consent applications, and will briefly comprise:

- Cable landfall above Mean Low Water Springs (MLWS), and transition pit;
- Onshore underground cable route, from the landfall point of the tidal arrays export cables to the SHE-T substation;
- Temporary works including temporary compound and laydown areas to facilitate the cable landfall works;
- Possible road access improvements; and
- Onshore substation.

Network reinforcement works will also be required to connect the Project to the electricity transmission network. These will be the responsibility of SHE-T. The offshore tidal array will comprise up to 200 fully submerged tidal turbines with a maximum total installed capacity of 200MW. Electricity generated by the turbines will be transmitted to shore via a series of inter-array and export cables (see Figure 1).

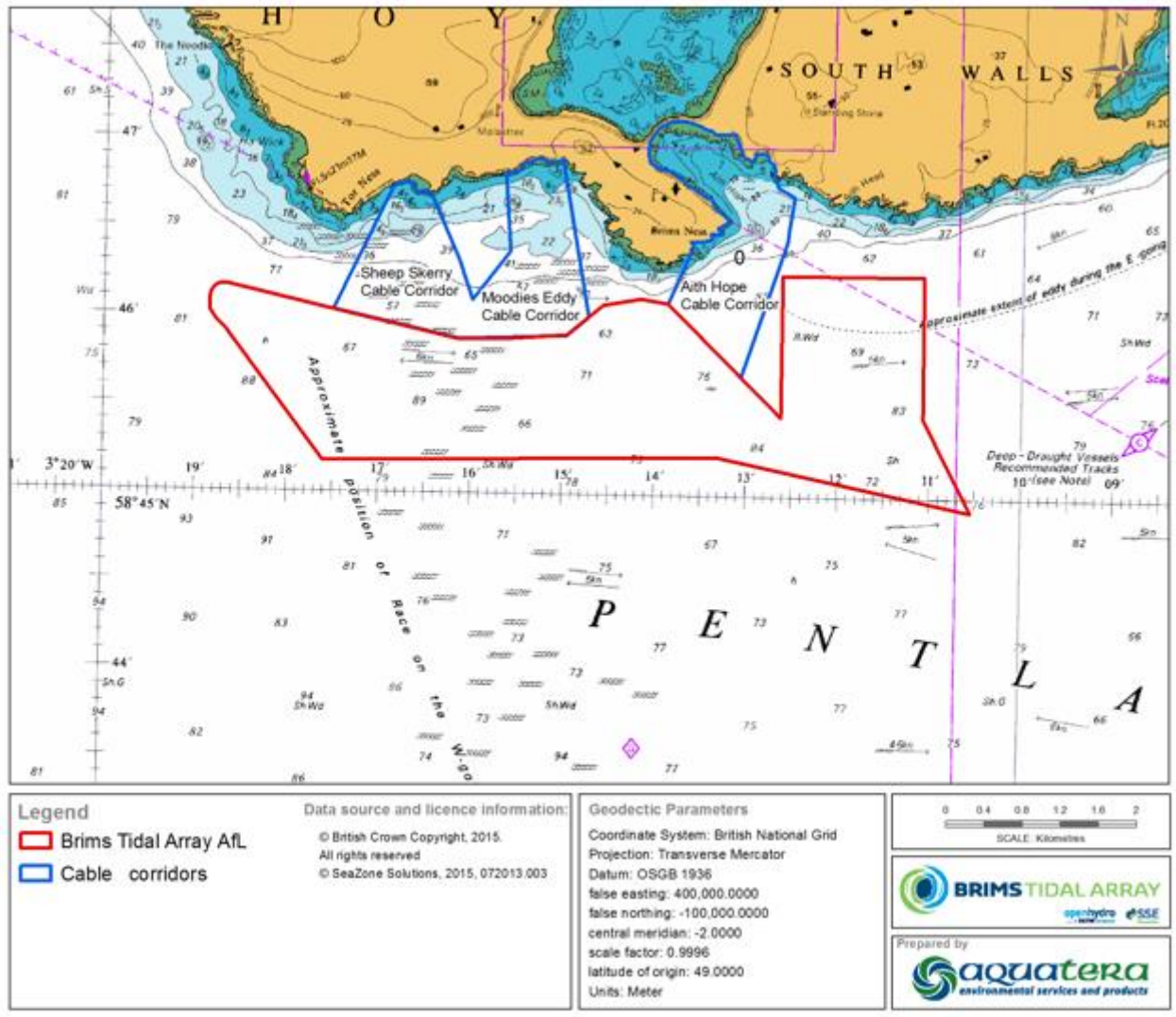


Figure 1: Brims Tidal Array Agreement for Lease (AfL) and export cable corridors

1.5 Regulatory Consent

In this application, BTAL is applying for both a Marine Licence and Section 36 consent through Marine Scotland, and wish to provide a robust ES which fully satisfies the Environmental Impact Assessment (EIA) Regulations for such an application for the offshore components up to MHWS. Planning permission will be sought for the cable landfall (above MHWS) which will consist of a buried transition pit where the marine cables are joined to terrestrial cables, an underground cable route to a substation, the substation and associated temporary works through the Orkney Islands Council (OIC) under the appropriate Town and Country Planning (Scotland) Act 1997.

The design and planning consent process for grid transmission system infrastructure is the responsibility of the transmission system operator Scottish Hydro Electric Transmission Limited (SHE-T). SHE-T are currently designing a grid connection upgrade for the Orkney Islands, as part of these upgrade works SHE-T will provide a grid connection point for

the Project. This grid connection will seek to integrate the Project onto the grid system, associated temporary works and onward connection to the wider grid network. The design of this grid upgrade work and the connection works associated with the Project is currently under way and will be subject to a full stakeholder consultation and planning permission process. The timing of the application for all onshore components will be dependent upon the confirmation of the grid connection point with SHE-T.

Potential effects of the offshore Project on sites of European conservation importance (Natura sites) have been assessed through a Habitats Regulations Appraisal (HRA). In Scotland, the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland), commonly known as the Habitats Regulations, implement the species protection requirements of the Habitats Directive in Scotland on land and inshore waters out to 12 nautical miles. Beyond 12 nautical miles, the Offshore Marine Conservation (Natural Habitats, &c.) (Amendment) Regulations 2009 (OMRs) implement the species protection requirements of the Habitats Directive.

Article 6(3) of the EC Habitats Directive requires that any plan (or project), which is not directly connected with or necessary to the management of a European site, but would be likely to have a significant effect on such a site, either individually or in combination with other plans or projects, shall be subject to an 'appropriate assessment' of its implications for the European site in view of the site's conservation objectives. This procedure is applied in Scotland through The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), and is known as the 'Habitats Regulations Appraisal'. Information to Inform a HRA is provided in Volume 3 'Supporting Documents'.

1.6 The Need for the Project

The key driver for the Project is the development of renewable sources of energy, which is critical for combatting global climate change, and which contributes to improved energy sustainability and security of supply in Scotland. In addition to combatting the impact that carbon emissions from fossil fuel consumption has on the environment, the development of renewable energy sources is also essential for reducing the UK and Scotland's increasing dependency on energy from imported fossil fuels.

The key drivers for moving towards providing energy from renewable sources include;

- Tackling climate change;
- Provision of a secure energy supply;
- Developing new infrastructure; and
- Provide economic opportunities.

As one of the first commercial scale tidal energy array projects to be installed in Scotland, knowledge and experience gained from this Project is essential for informing the continuing growth and development of the tidal energy industry. This growth will help to reduce Scotland's carbon emissions and will make a significant contribution towards achieving the targets for energy generation from renewable sources set out in the 2011 Renewable Energy Roadmap (DECC, 2011). The Brims Tidal Array Project will provide valuable support to the local Orkney and wider Scottish economies by creating new jobs, new infrastructure and by enhancing sustainable development of the region.

1.7 Consultation and Stakeholder Engagement

Consultation and engagement with stakeholders is a critical aspect of the EIA process. Since the award of the AfL in 2010, BTAL has consulted a wide range of stakeholders including statutory stakeholders, non-statutory stakeholders and members of the public. All consultation has been carried out in line with relevant legislation and guidance. BTAL is committed to the highest environmental standards and best practice throughout the entire Project lifecycle and as part of this, recognises the importance of early consultation that continues throughout the Project in order to integrate public and stakeholder concerns and opinions into the Project decision making process. Consequently, consultation with both statutory and non-statutory stakeholders has been an integral aspect of the EIA process since the commencement of the Project. The primary aim of the consultation process is to facilitate two way communications about the Project with all relevant stakeholders. This allows any environmental concerns to be identified at an early stage and the opportunity for the Project team to ensure that these concerns can be adequately addressed during the EIA process.

After the award of the AfL, a Project briefing note was issued in 2012 to key stakeholders and an Environmental Scoping Report was issued in August 2013. A Scoping Opinion was received from Marine Scotland in April 2014, containing responses from Marine Scotland Licensing Operations Team (MS LOT) and other stakeholders. This Scoping Opinion identified the main stakeholder concerns, and was used to inform the relevant Environmental Statement chapters. Further consultation on key issues raised during the scoping process, and on the baseline characterisation and methodology, has continued throughout the EIA process.

Further consultation took place with key stakeholders when the draft Project Description was submitted to MS-LOT in January 2015. The primary outcome of this exercise was a revision of the design envelope with surface piercing and floating turbines being removed from consideration for the EIA. Offshore surface piercing hubs were also removed meaning that the design envelope brought forward as part of this application consists of no surface piercing elements for the offshore Project. In addition, a section of the AfL was identified as having the potential to be used by a relatively high level of marine traffic, and is noted as an area in which no development will take place.

In 2015, two public exhibition events were held in Hoy and Kirkwall in compliance with Pre-Application Consultation (PAC) requirements. These events allowed BTAL to update interested parties on the Project and the EIA process and to collect further feedback from these stakeholders. These events and consultation activities have been supplemented with regular meetings with stakeholders; statutory, non-statutory and members of the local community. All feedback has been taken into account in order to inform the EIA.

2 PROJECT DETAILS

2.1 Project Description

The offshore tidal array will comprise between 100 and 200 fully submerged tidal turbines with a maximum total installed capacity of 200MW. Electricity generated by the turbines will be transmitted to shore via a series of inter-array and export cables. Exact turbine locations will be defined based on tidal flow, water depths, seabed slope and sediment conditions; the optimum turbine locations may vary depending on the technology to be installed. An indicative turbine layout is shown in Figure 2. This layout is for illustrative purposes and will be refined during the detailed design phase. The total number of turbines installed will depend on the rating of the selected turbine.

Inter-array and export cables will be used to transmit electricity generated by the turbines to shore. The total number of inter-array cables required will depend on the number of turbines required for a 200MW array. Subsea cable connection hubs will be used to collect inter-array cables for connection into the export cables. It is expected that a maximum of 8 subsea cable connection hubs will be required; each hub will be connected to the onshore substation via up to two export cables (i.e. up to 16 export cables in total). The width of the export cable corridor from the AfL area to the cable landfall will depend on the total number of cables required to transmit electricity to shore. The worst case affected area for each cable will be up to 5m, including any cable protection required, resulting in a total affected width of 80m. Spacing will be required between each cable, and as a result the width of the cable corridor will exceed 80m, and will be dependent on the depth of water at each location. The proposed location of the export cable corridors are illustrated in Figure 1.

The export cables will come ashore at one of three possible landfalls; Sheep Skerry, Moodies Eddy or Aith Hope (Figure 1). The final landfall location will be confirmed during detailed design phase post consent determination.

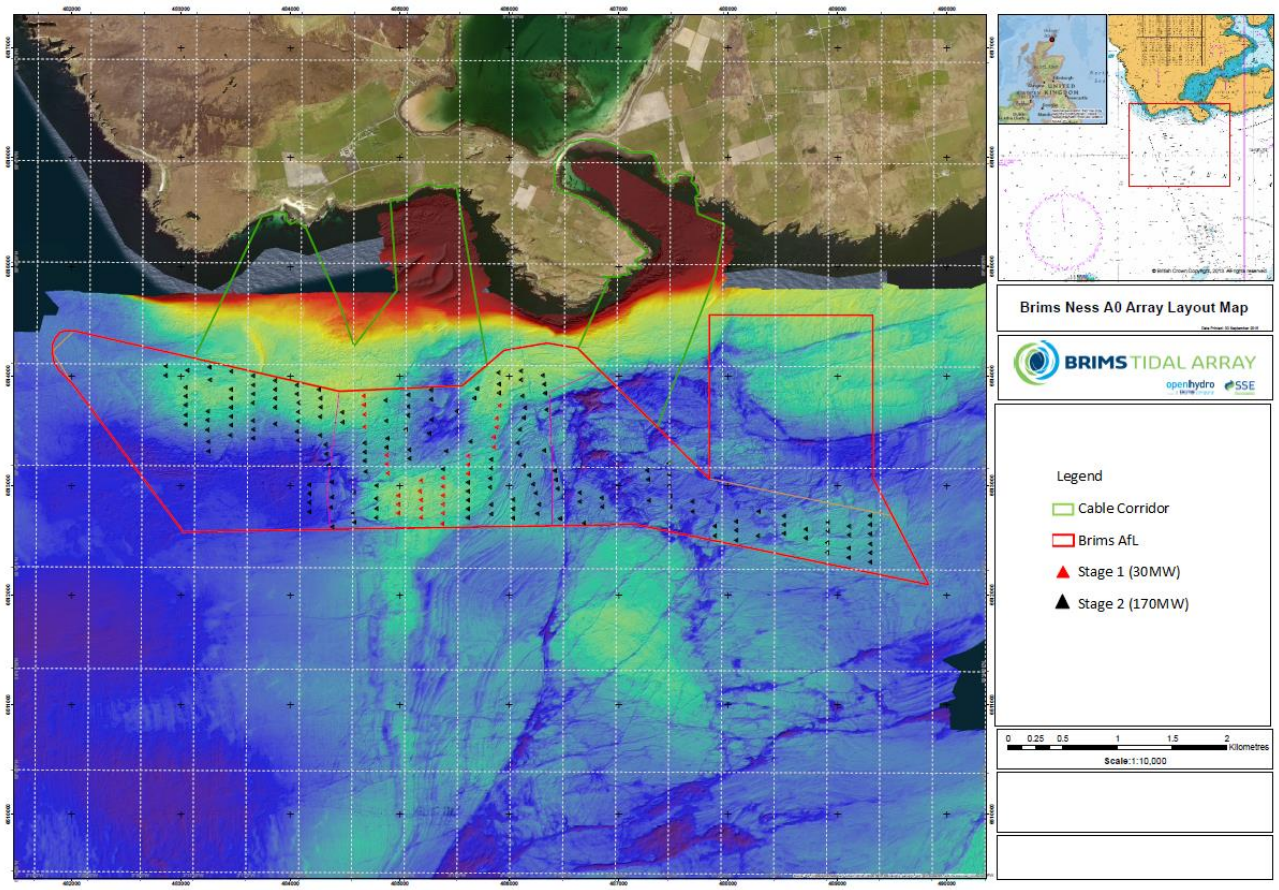


Figure 2: Indicative turbine layout

2.2 Project Staging

The Project will be constructed in two stages, with Stage 1 construction commencing in 2019 (Figure 3). The build out programme will be confirmed post consent determination during detailed design. These timelines are indicative and will be subject to weather and other constraints.

Figure 3: Breakdown of each stage of the Project

The capacity of Stage1 of the Project will be up to 30MW. Devices installed in Stage 1 will have individual capacities of at least 1MW, resulting in an array size of up to 30 devices. A monitoring plan for the Project will be developed, informed by the results of the environmental impact assessment, lessons learned from monitoring programs of similar tidal projects and

close consultation with relevant stakeholders. There is a review period proposed for approximately one year post Stage 1. During this period, there will be an opportunity for the Project, in consultation with relevant stakeholders, to further develop the monitoring strategy using an adaptive management approach. This will enable refinement of monitoring techniques and desired outcomes to ensure the monitoring strategy for the Project is informed by the best available data and seeks to answer any specific issues/knowledge gaps that remain. Monitoring results will be presented to Marine Scotland and relevant stakeholders on a regular basis. Stage 2 (A, B and C) will follow this review period in 2020 where the remaining 170MW is proposed to be installed over a three year period.

2.3 Project Technology

The preferred technology for this Project is the OpenHydro Open-Centre Turbine which is a shrouded, horizontal axis turbine (Figure 4). Alternative turbine technology options are also being considered for the Project. The other type of device design being considered is the unshrouded horizontal axis turbine, which typically has three blades with a fixed or variable pitch which rotate around a nacelle (Figure 4).

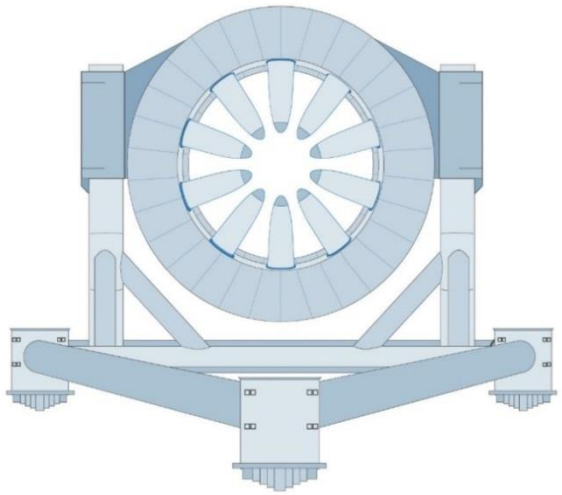
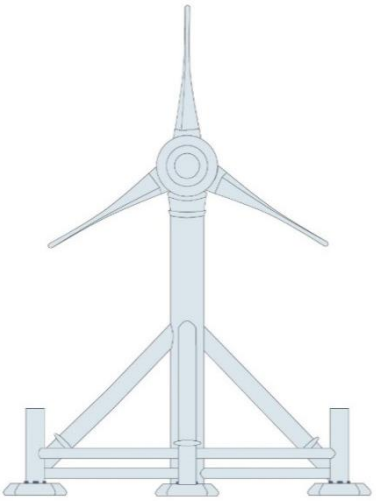
Shrouded seabed mounted	Unshrouded seabed mounted
	

Figure 4: Turbine types

All device types will be seabed-mounted and will have minimum clearance from the uppermost point to sea surface at lowest astronomical tide (LAT) of 30m. Turbines will have a minimum clearance from the bottom of the rotor to the seabed of 4m.

All turbines have a design life of between 20 and 25 years. Table 1 describes the turbine specifications relevant to the Project.

Table 1: Turbine specification parameters relevant to the Project

Turbine parameters relevant to Project	Project parameters for the impact assessment
Rated power output	At least 1MW
Rotor diameter	13m – 23m
No. of rotors per device	All devices are single rotor
No. of blades per rotor	3 to 10
Total Swept area	115m^2 – 415m^2
RPM range	3 – 21rpm
Cut-in flow speed	0.5 – 1m/s
Cut-out flow speed	3.5 – 5m/s
Min clearance between top of turbine and sea surface at LAT	30m minimum clearance
Min clearance between bottom of rotor and seabed	4m
Yaw system	Present on some unshrouded turbines
Blade pitching	Some turbines have independent blade pitching functions. Where blade pitching is included, this ranges from 0-10 degrees
Design life	20 - 25 years

2.4 Turbine Support Structures

The design of the Turbine Support Structures (TSS) varies according to the different turbines being considered and method of attachment to the seabed. A summary of options that will be considered are listed below and shown in Figure 5:

Gravity base structure - These are steel or concrete (or a combination of both) structures that use their own weight to attach to the seabed. The gravity base structures considered for this Project comprise either a three-point structure constructed from steel with ballast fill material in the sub-sea base or a combination of steel and concrete with a flat bottom that sits on the seabed.

Drilled pin pile tripod - This method of attachment involves placing a braced steel tripod structure onto three pin piles which have been fixed in place with high strength grout. The tripod structure is then grouted onto the pin piles. The pin piles will have a diameter in the order of 1.3m with a depth of 5m.

Drilled monopile - These are single cylindrical steel structures (piles) that are drilled into the seabed. The diameter of the hole required for the monopile will vary depending on turbine type but is expected to range between 2.5m to 3m diameter and up to 12m deep. The height of the monopile, including the transition piece, ranges from 14m to 23.5m, depending on selected height of the turbine axis. The footprint for the monopile will range from 5m^2 to 7m^2.

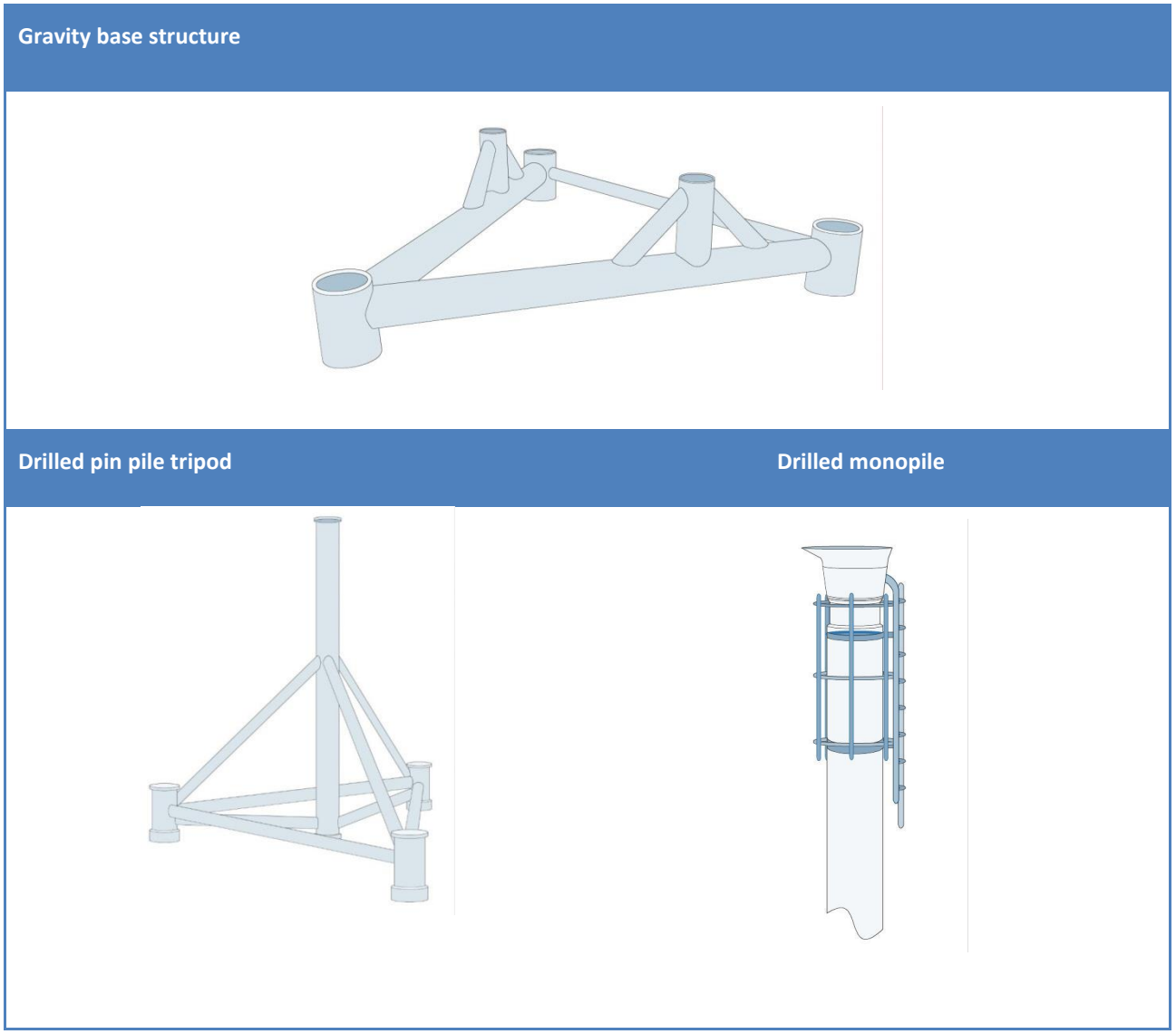


Figure 5: Turbine support structures (TSSs)

2.5 Electrical Infrastructure

Each turbine will require its own inter-array cable to transfer electricity to the export cable. The final configuration of the inter-array cables within the AfL will be subject to detailed design and procurement and will depend on final turbine layout and options for using subsea hubs. Cables may also be bundled to reduce the overall footprint of the inter-array cables. It has been assumed for the purpose of the EIA that as a worst case (assuming cable protection with footprint width of 5m) inter-array cables will occupy approximately 0.36km^2 (3%) of the remaining seabed within the turbine deployment area that is not occupied by the TSSs.

The inter-array cables will be surface laid. This is necessary to provide flexibility for the cables to be picked up during maintenance. The cables will be anchored to the seabed to hold them in position during operation. The cables may include

armour protection (possible double armour or interlocking armoured shells as used in the oil and gas industry) to provide mechanical protection and add additional weight to the cables which will help to hold the cables in position.

In the case of a subsea connection hub, it is anticipated that up to 16 export cables (4 for Stage 1) may be required to connect the tidal array to shore. In this case, each cable will have a voltage of at least 33kV, but potentially up to 132kV, and a diameter up to a maximum of 500mm. The primary purpose of the subsea hub is to reduce the number of cables coming ashore by combining the output from a number of inter-array cables into a smaller number of export cables, potentially with the additional function of increasing the transmission voltage to reduce transmission losses from the export cable.

The export cables will be buried where seabed conditions are favourable. However, as much of the seabed within the AfL area and along proposed export cable routes comprises hard rock substrate this may be limited. Where the cables cannot be buried cable protection may be required along the length of the export cables (from the AfL to landfall). This will also ensure cable stability in sections where the cables run perpendicular to the tidal flow.

Cable protection measures could include rock placement, concrete mattresses or grout bags. The maximum width of the area of seabed affected by each export cable (including cable protection) will be 5m. For 16 cables, the total width of the area of seabed directly affected by the cables will be 80m. The affected area for Stage 1 will be up to 20m. For operational reasons, a space will be required between each subsequent cable. The required spacing will be dependent on the water depth at each location. As a result, the corridor width associated with the cables will be significantly wider than the cable affected area.

The export cables will be brought to shore at one of three possible landfall locations (Sheep Skerry, Moodies Eddy or Aith Hope) as shown in Figure 1. The final landfall location will be confirmed during detailed design phase post consent determination. The indicative cable corridors illustrated in Figure 1 provide access to each of the landfall locations.

2.6 Cable Landfall

The export cables will be brought to shore using either traditional beach landing Open Cut Trench technique or Horizontal Direction Drill (HDD) techniques. The size of the cable landfall at each of the three possible locations will depend on the number of export cables to be brought ashore and the selected landfall technique (Open cut trench or HDD).

2.7 Offshore Installation

The approach to turbine installation reflects operating conditions associated with the high tidal flow and impermeable (hard rock) seabed conditions present within the AfL area. For most turbines the TSSs will need to be installed prior to turbine installation. Other turbines will be installed as single units with the turbine already attached to the TSS. Once the TSSs are in place (for those that don't have turbines pre-attached), the turbines will be transported to the AfL either on a dedicated deployment barge or heavy lift vessel. Turbines with built in buoyancy will be towed to site using standard working class tug vessels.

Once the turbines are at site they will be lowered (or pulled down for buoyant turbines) by a winch to the top of the TSSs. ROVs or subsea cameras will then be used to guide the turbines into place for attachment to the TSSs. The turbines will then be mechanically secured in place. Turbines that are to be installed as a single unit (already attached to the TSS) will

be assembled on dry land (e.g. port facility) before being loaded onto the deployment vessel and transported to the AfL area. Once at the AfL the entire turbine unit will be lowered into position on the seabed using three specialised deck mounted heavy lift winches. A specially designed steel recovery frame and lifting system can also be used to assist with the positioning of the single unit turbine structures on the seabed.

Some of the TSSs and turbines will be installed using a Dynamic Positioning (DP) construction vessel with a 250 to 400 tonne capacity heave compensated crane or an equivalent stable platform (moored barge). A jack up barge may also be required depending on site conditions, TSS and precise method of installation. Where turbines and TSSs are to be installed as a single unit, installation will be carried out using a purpose built twin hulled three point heavy lift deployment barge. Other smaller vessels e.g. tugs, vessels carrying ROVs, crew transfer vessels, dive boats and RIBs will also be required to support the installation operations.

2.8 Operation and Maintenance

The array will have an operational life of up to 25 years. The turbines will be controlled remotely via an onshore control system. It is planned that the turbines will be monitored continually throughout their operational life.

Maintenance will be required for all turbines. It is likely that this will need to be undertaken every 5 to 10 years depending on the turbine technology and tidal conditions in the AfL area. Maintenance could involve a planned complete overhaul of the turbines, which would require the removal of the turbine from the sea, or detailed inspections with the replacement of key components where necessary.

For some turbines it will be necessary to carry out regular inspections e.g. every two years using ROVs. Minor or preventative maintenance activities may also need to be carried out for some turbines every couple of years to replace consumable and short life components. In addition to planned maintenance of the turbines, regular inspections of the export cables using drop down cameras and inspection class ROVs will also be required. For all turbines, major maintenance overhauls will take place onshore (e.g. turbines will be removed from the water). Depending on the work required, major maintenance work will be carried out at the quayside or at a specialised workshop/facility.

2.9 Decommissioning and Repowering

It is the intention of BTAL to re-power the Project at the end of the consent period. However, this would only be carried out with full agreement from all relevant parties and once the necessary consents are in place. A detailed decommissioning plan will be submitted to the Department of Energy and Climate Change (DECC) for approval in line with the Energy Act (2004).

The decommissioning process is the reverse of the installation procedure and requires the same plant and machinery. Removed turbines would be disposed of in line with all local regulations and any parts and materials which could be salvaged would be recycled. Monopile and pinpile foundations will be cut off at the seabed. Where the installation is to be repowered the export cables would be left *in situ* and re-used.

2.10 Design Envelope

In accordance with the established principles of the Project design envelope (referred to throughout this Project ES as the design envelope) and advice provided by MS-LOT in the EIA Scoping Opinion and subsequent consultations on the Project

Description in 2015, BTAL has taken a design envelope approach to this EIA. The basis of the design envelope is to apply a “worst case” approach to the assessment of the different impacts associated with the Project.

Applying a design envelope approach to the EIA allows for the evolution of specific elements of the Project design such as turbine technology, site design, layout and electrical infrastructure to continue beyond submission of the Marine Licence application. This flexibility is important at this stage of development in the tidal technology industry as it will allow technology improvements to be applied at the time of construction and enable the most economically efficient technology to be used while retaining full compliance with environmental consenting regulations

The purpose of the design envelope is to define a series of realistic design parameters that encompass all possible technological, engineering and design options that will be considered for the Project. The realistic design parameters must encompass all technology options and potential environmental impacts in sufficient detail to allow for a robust EIA. This ensures that the maximum potential benefits and adverse effects of the Project have been fully assessed whilst preserving sufficient design flexibility. The design envelope approach also allows for alternatives to be considered and documented as part of the impact assessment.

The approach will require that the impact assessment encompasses all potential technologies under consideration by the applicant, and may therefore require that impacts from a number of different scenarios are assessed separately, depending on the receptor. The approach allows BTAL to maintain the necessary level of flexibility at the consenting stage, while ensuring that the assessment made in the EIA is robust and reflective of the worst case impact under any development scenario.

In finalising the design envelope, BTAL considered comments made by Marine Scotland and their statutory advisors in the Scoping Opinion received in 2013 as well as comments made in a review of the draft Project Description that was submitted for their review in early 2015.

3 ENVIRONMENTAL IMPACT ASSESSMENT

3.1 EIA Scope and Approach

An EIA is required to support the consent applications associated with the Project. It supports decision making for joint Marine Licence and Section 36 consent applications. The EIA process represents an assessment of the potential impacts of the Project on the environment. The focus and direction of the EIA is shaped by the content of the Scoping Report and guided by advice received through the formal Scoping Opinion.

Separate impact assessments have been carried out for each phase of the Project as follows:

- Construction and installation;
- Operations and maintenance; and
- Decommissioning.

EIA is a well-defined process which sets out how environmental impacts should be captured and considered throughout the Project from the very early stages of discussion through to the construction stage. The purpose of the EIA process is to:

- Characterise the existing environment;
- Further investigate environmental parameters which may be subject to potentially significant effects;
- Determine importance and sensitivity of particular receptors;
- Assess the magnitude of effects that may arise due to the Project;
- Determine impact significance, based on sensitivity of receptor and magnitude of effect;
- Assess the significance of cumulative impacts;
- Identify mitigation and monitoring measures; and
- Support decision making for consent determination.

3.2 Geology and Hydrology

The geology and hydrology impact assessment was informed by a detailed technical desk study augmented by the review of technical multibeam echo-sounder (MBES) survey data, sidescan sonar survey data collected during site surveys. The underlying geology of the AfL area and potential cable landfalls is Middle Devonian sediments consisting of the Caithness Flagstone group and the overlying Eday Sandstone group. These are characterised by fine to medium grained sandstones, siltstones and mudstones. There is a section of Hoy Lava which is designated as a Local Nature Conservation Site (LNCS) at Melsetter Coast. The Sheep Skerry landfall is located within this designated site. The littoral zone is characterised by mixed boulder and cobble beaches and wave cut platform slabs, backed by cliffs. Soils are brown earth, gley soils and podzols. The study site is also outside the 1:200 year flood envelope.

Open cut trenching and horizontal directional drilling (HDD) for the landfall will involve impacts on geology, soils, hydrology and coastal geomorphology within the study site. Open cut trenching could be undertaken at Sheep Skerry or Aith Hope. Other potential landfalls would necessarily involve HDD. There are no watercourses flowing into the sea within the study site, and no private water supplies, so no direct or indirect impacts on watercourses or private water supplies are

anticipated.

Impacts on the Melsetter coast LNCS due to trenching are not expected to be significant as there would be only localised damage to the bedrock and superficial geology and if fracturing of the nearby sections occurs it will be very localised and unlikely to cause noticeable damage to features of geological interest, such as the Hoy Lavas. In addition, general mitigation measures to implement best practice measures for pollution control and prevention will keep any potential pollution impacts from becoming significant.

If the Sheep Skerry corridor is to be utilised as a landfall corridor, the laval outcrop would be avoided as it would be impractical to bring export cables to shore at this location, and a median path is likely to be selected which follows a relatively gentle path through the rippled sand avoiding rocky outcrops. The Sheep Skerry corridor is potentially of medium sensitivity, however as this site is likely to be avoided, the magnitude of impacts is likely to be low and impact significance is assessed as minor.

Figure 6: Hoy sandstone boulders at storm beach, Sheep Skerry

3.3 Physical Processes

The assessment of impacts on physical processes was informed by results of a series of metocean, geophysical and benthic surveys. The baseline conditions represent the ranges and interactions of naturally occurring physical properties (e.g. geology, bathymetry, bedforms), physical processes (e.g. water levels, tidal currents, waves, wave-current interactions, sediment transport) and morphological responses (e.g. erosion, accretion) across the seabed and shoreline

prior to the installation of the BTAL development. Accordingly, the potential effects of natural dynamism and climate change are also considered as part of the baseline conditions.

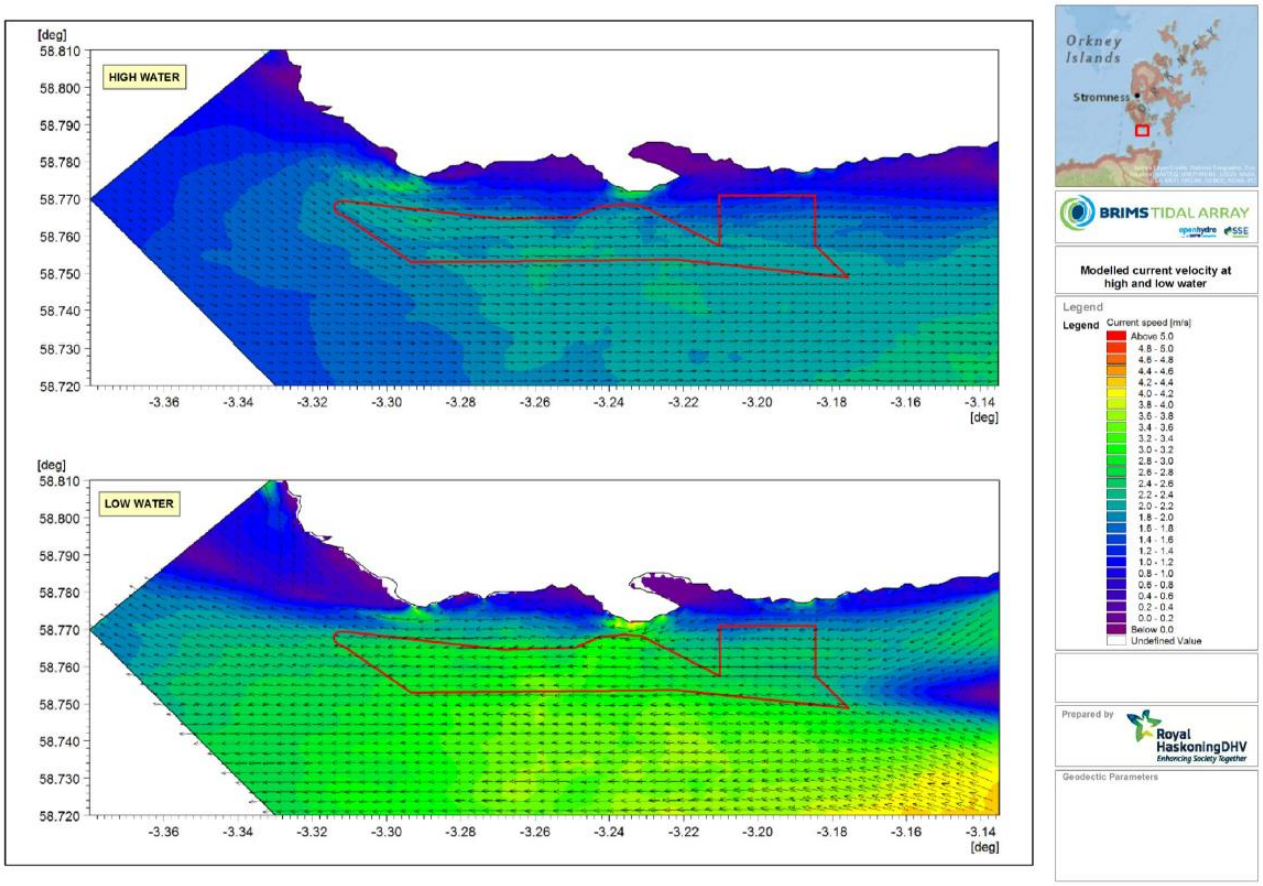


Figure 7: Modelled current velocity at high and low water

The key sensitivities in terms of the baseline conditions relate principally to the areas of more mobile sediment, such as sands and gravels, where processes of erosion, sediment transport and deposition may become affected by any changes to the baseline tidal or wave regimes. In most locations within the AfL and cable corridors, the seabed is sparsely covered or entirely devoid of such sediments and, due to this, the baseline conditions are relatively insensitive to potential changes of this nature. There are, however, some seabed and shoreline areas with patches or more distinct deposits of sands or gravels, including the particularly sensitive sand dune systems at The Ayre and Melberry. Due to this, the impacts assessment has considered the potential effects of changes to the baseline conditions on these areas as a keen focus.

The assessment concluded the principal effects on the baseline physical processes environment are of negligible or minor significance only. These are associated with changes that potentially could affect the shoreline geomorphology and/or the seabed geomorphology. Within this context, those potential negligible or minor significance effects arising from the worst case assessments associated with the Project is associated with wake and physical blockage effects on the tidal and wave regimes (although resulting in impacts of negligible significance (no discernible change) on the seabed or shoreline geomorphology) during the operation and maintenance phase; and footprint effects of the installed infrastructure, resulting

in minor significance on the areas of seabed geomorphology that is directly covered (but no change elsewhere) during the operational phase only.

3.4 Coastal and Terrestrial Ecology

This assessment covers the potential impacts associated with the cable landfall construction, operation and decommissioning on the coastal and onshore environment including intertidal habitats, terrestrial habitats, protected fauna and terrestrial birds up to and above MHWS. The three potential cable landfalls have been assessed separately. A number of surveys were undertaken to inform this assessment including intertidal, Stage 1 habitats, protected species and breeding bird surveys.

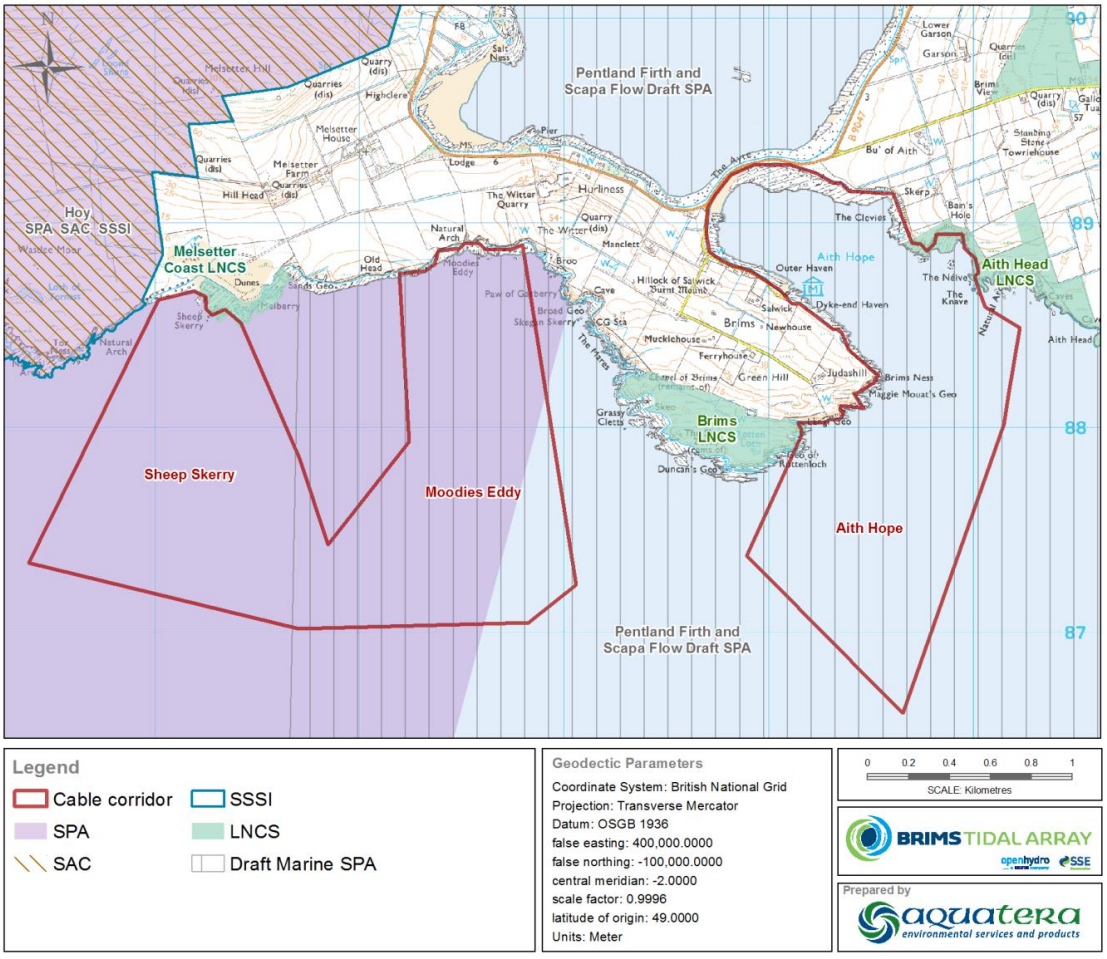


Figure 8: Designated sites

Figure 8 shows the designated sites in the vicinity of the Project. The Sheep Skerry landfall Area of Search (AoS) is within 100m of Hoy Special Protection Area (SPA), which is designated for important populations of breeding birds. Aith Hope AoS is adjacent to fields used by wintering Greenland barnacle geese from Switha SPA. The Aith Hope AoS also lies partially within Aith Head LNCS which is listed for important habitats, a hawkweed and breeding birds of prey. Brims LNCS

is also adjacent to Aith Hope AoS which is listed for important habitats and breeding birds, and is the area of highest ornithological interest in the study site. There are no LNCSs with habitat or wildlife interests near the Sheep Skerry or Moodies Eddy landfalls that could be affected by the cable landfall installation activities.

If cable landfall works occur outside of the bird breeding season, there would be no potential for any impact on breeding birds. If works are due to take place during the breeding season, a pre-construction checking survey will be undertaken to ensure no breeding birds are present prior to cable landfall works commencing. Appointment of an Ecological Clerk of Works (ECoW) will ensure that appropriate measures are implemented to supervise works and to safeguard the interests of any breeding birds present. The implementation of these mitigation measures will ensure that significant impacts to breeding birds will be avoided.

No significant residual effects are anticipated to any terrestrial habitats as a result of the cable landfall installation activities. Although there are two UK Biodiversity Action Plan (UK BAP) and Orkney Local Biodiversity Action Plan (LBAP) priority terrestrial habitats that could be affected by the Project, neither is considered to be particularly valued examples of habitats that are present elsewhere in Orkney. Implementation of mitigation to reinstate the habitat following guidance will take place after completion of the works therefore no significant impacts are anticipated.

The UK BAP-listed 'under-boulder communities' biotope LR.MLR.BF.Fser.Bo, was recorded at a single location within the Sheep Skerry cable landfall AoS and at four locations within the Aith Hope cable landfall AoS. If the cable landfall location is selected to fall within any of these areas of LR.MLR.BF.Fser.Bo habitat, a very localised area would potentially be affected by cable installation activities. Implementation of mitigation to reinstate the habitat following guidance will take place after completion of the works therefore no significant impacts are anticipated. Otter are likely to use the entire coastline within the study site and may be impacted by disturbance resulting from construction activities. Implementation of mitigation measures will ensure that any significant impacts on otter are avoided.

Cable landfall installation activities during the months of October to April have the potential to cause noise and visual disturbance to Greenland barnacle geese from Switha SPA that forage in fields in South Walls immediately adjacent to the Aith Hope export cable corridor AoS. However, the likelihood is that works would be scheduled to occur during the summer months when weather is more favourable avoiding any potential impacts on wintering barnacle geese. If a cable landfall location on South Walls is used, construction activities will be timed to have commenced before the arrival of Greenland barnacle geese in mid-October so that the geese are more likely to select foraging fields elsewhere in South Walls. Any noise and visual disturbance from the construction activities underway may influence the choice of foraging fields at the beginning of the season and may influence the preferred foraging fields for the rest of the season. The implementation of this mitigation measure will ensure that significant impacts to foraging Greenland barnacle geese will be avoided. There is no suitable foraging habitat for wintering Greenland barnacle geese at Sheep Skerry or Moodies Eddy potential cable landfall sites therefore there is no potential for any impacts due to cable landfall installation activities.

3.5 Benthic Ecology

The assessment of impacts on benthic ecology was informed by a number of benthic surveys. The findings of these surveys found that the seabed habitats and species present in the AfL area are typical of strong tidally swept areas, consisting of a hard rocky substrate colonised by a range of algae, bryozoans, hydroids, soft corals and sponges. The seabed in the cable corridors exhibits a progression from kelp/seaweed communities on bedrock and/or medium to fine sediment

communities in shallow water to circalittoral mixed sediment dominated by robust fauna in deeper water. The likely distribution of the various biotopes present in the area, estimated using a combination of seabed video and bathymetric survey data, is shown in Figure 9.

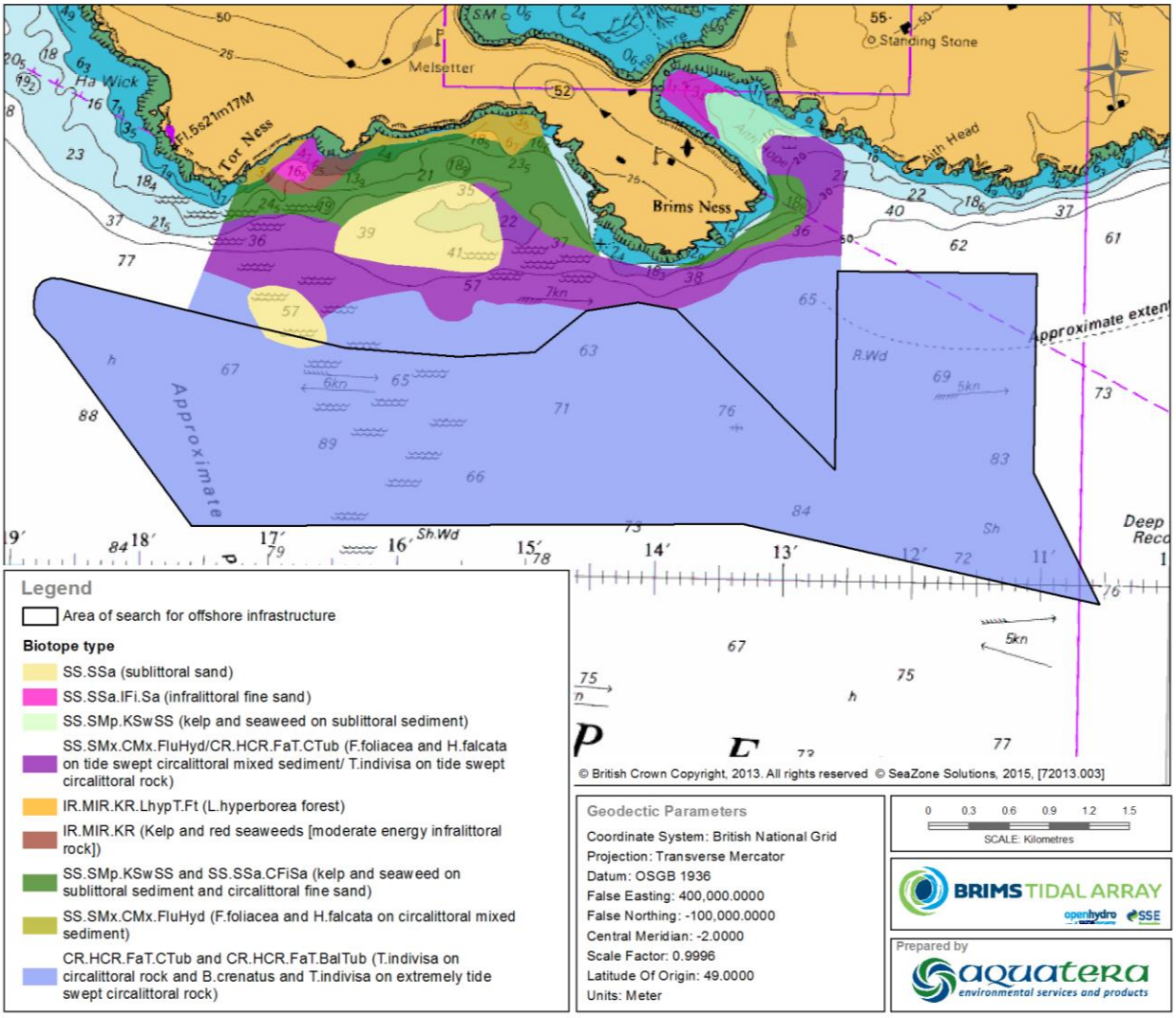


Figure 9: Designated biotopes in AfL and cable corridors

There are currently no protected areas located within 50km of the AfL area or cable corridors. The seabed present in the AfL area and the deeper sections of the cable corridors could be classified according to the EU Habitats Directive Annex I as a Rocky Reef habitat. However, the common species making up the community present and its widespread occurrence across the Pentland Firth makes it unlikely that the AfL area would be formally designated as a protected area. The cable corridors contain kelp and seaweed communities on sublittoral sediment, a biotope that is classified as a Priority Marine Feature (PMF) by the Scottish Government and the AfL area can be classified as a Tide Swept Channel priority habitat under the UK BAP. For the purposes of this assessment the benthic communities present within the AfL and cable corridor areas are therefore assessed as having medium sensitivity.

The maximum area of seabed potentially impacted by the full Project is approximately 1km^2 accounting for around 10% of the AfL area. The magnitude of this impact is therefore considered low. Rock cuttings created during the installation of monopile or drilled pin TSSs will disperse rapidly. The magnitude of this potential impact on benthic communities is therefore considered negligible. Installation of cables (seabed installation and landfall construction) will generate relatively localised, short-lived plumes of suspended sediments; the magnitude of this impact is low. Seabed scour in the bedrock-dominated AfL area will be very localised around the seabed infrastructure therefore the magnitude of this impact is negligible. The magnitude of potential seabed scour impacts around export cables routed through areas of mobile surface sediments is considered as having a low magnitude. Colonisation of seabed infrastructure will occur on non-treated surfaces and the magnitude of this potentially positive impact was considered low. Based on the current understanding of effects from electromagnetic fields (EMFs) and heat generated by operational cables the potential impact on benthic communities is considered to be low.

In summary, based on the worst case scenario, the significance of the potential impacts to benthic ecology arising from the Project is considered as being minor. No cumulative impacts on benthic ecology from other nearby projects are anticipated.

3.6 Fish Ecology

The fish ecology assessment considered impacts on important fish habitat, in particular key spawning and nursery grounds (shown in Figure 10) which are essential for sustaining fish populations, and potential impacts on individual fish species, their migration routes and their contribution to local biodiversity and wider food webs. The HRA considers the potential for likely significant effects on Natura sites designated for their migratory fish interests.

The principal pelagic species found in the region are typical of the wider North Sea including herring, sprat and mackerel. Herring and sprat spawn within the Project site and nursery grounds of herring, sprat and mackerel coincide with the Project site. The main issues for pelagic fish are considered to be noise and suspended sediment concentration levels. Demersal species found in the region include anglerfish, blue whiting, cod, European hake, lemon sole, ling, saithe, sandeel and whiting. Sandeel and lemon sole spawn in the Project site and there are high intensity nursery grounds of anglerfish and blue whiting and low intensity nursery grounds of cod, European hake, ling, sandeel and whiting. Nursery grounds of unidentified intensity for lemon sole and saithe also overlap with the Project site. Diadromous species expected to transit the Project site on an occasional basis include Atlantic salmon, sea trout and European eel. The migratory behaviour of diadromous species means that they are likely to be sensitive to certain effects associated with the Project, specifically noise generated during construction and operation and EMF generated by subsea cables.

All impacts on fish were assessed to be not significant. Impacts during construction and installation resulting in substratum loss focused on the spawning and nursery grounds of sensitive species and their habitat preferences. No areas were considered to be of the highest favourability for fish and due to suitable habitat in the wider area, the impacts were assessed as being of negligible residual significance and therefore not significant. Impacts on fish as a result of noise emitted from vessels and turbines that could result in injury and/or disturbance are not predicted to be significant. Due to the relatively small scale of the Project and the dynamic nature of the marine environment within the Project site any suspended sediment or drill cuttings released during TSS installation would be quickly dispersed and smothering impacts are therefore not considered significant. Due to the small footprint of the Project, Project level mitigation in the form of cable protection and rapid attenuation of EMF with distance, the residual significance of disturbance of sensitive fish species as a result of EMF was assessed as negligible and the impact was considered not significant.

The assessment of collision risk with turbines was based on Project specific Collision Risk Modelling (CRM). The assessment concluded that the impacts would be of minor residual significance and therefore not significant.

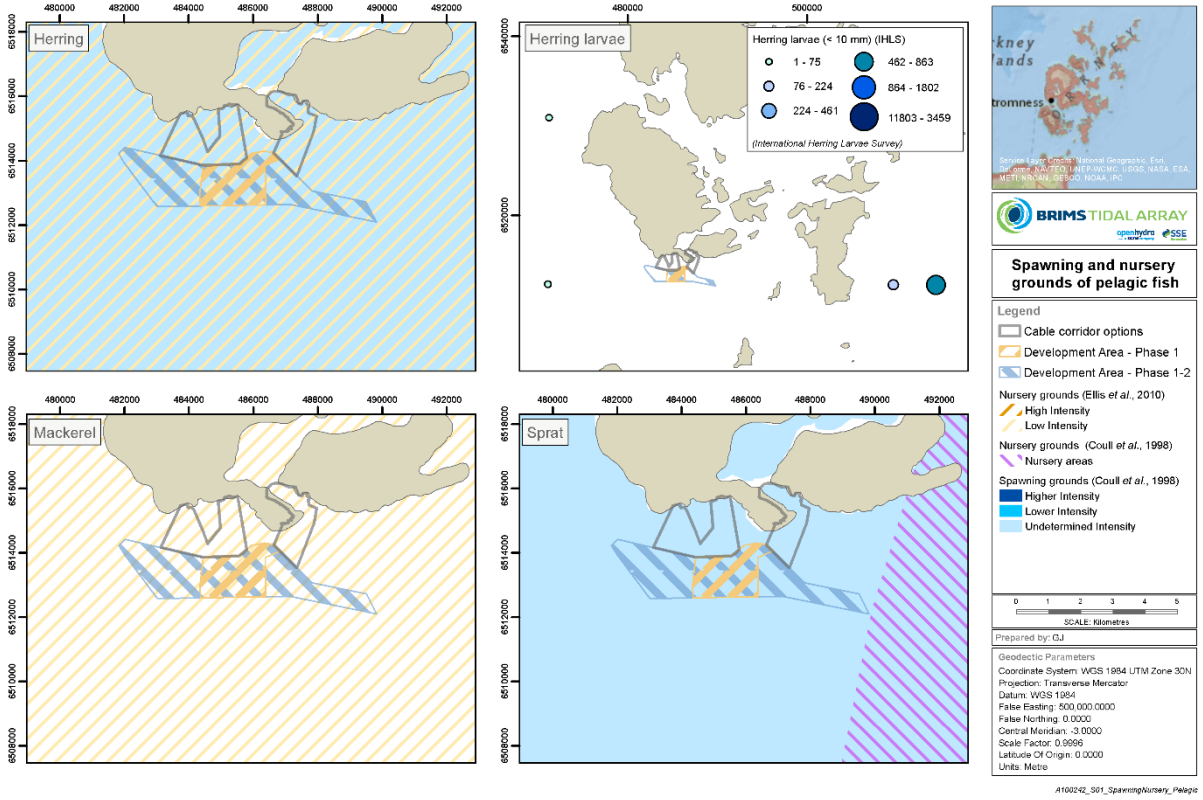


Figure 10: Spawning and nursery grounds of pelagic fish, including herring larvae abundance 2008-2012

The physical presence of the turbines resulting in a physical barrier was assessed in relation to sensitive migrating fish species. Due to the small cross sectional area taken up by a 200 device array, coupled with swimming patterns of migratory species from recent research, the residual significance was assessed as minor and the impact was considered not significant.

Changes in habitat as a result of the introduction of novel substrata within the AfL and cable corridor was found to have a potentially positive impact on fish species due to the creation of favourable habitat. The residual significance was assessed as minor positive and the impact was considered positive. Impacts due to accidental spillage of pollutants from either vessels or turbines, and also during drilling operations, was assessed in relation to fish sensitivity to pollutants and the likelihood of such events. No significant impacts were identified. Mitigation measures identified for this impact in relation to vessels include standard measures to prevent the risk and minimise the impact should a spill occur, and in relation to turbines the use of low toxicity and biodegradable fluids wherever possible.

3.7 Marine Mammals and Basking Shark

The impact assessment on marine mammals and basking shark was informed by site specific surveys of the AfL area undertaken from March 2012 to March 2014. These surveys provided site characterisation data for marine mammals and basking shark. The survey data was supplemented by desk based studies of available information. Key species that occur in the study site are: grey seal, harbour (common) seal, harbour porpoise, white-beaked dolphin, minke whale and basking shark. Harbour porpoise was the most frequently sighted species during the site-specific surveys.

The following potential impacts were assessed as being not significant:

- Underwater noise during construction, O&M, and decommissioning;
- Collision with vessels during construction, O&M, and decommissioning;
- Disturbance at haul out sites during construction, O&M, and decommissioning;
- Indirect effect as a result of changes to prey resource during construction, O&M, and decommissioning;
- Accidental contamination from vessels or devices during construction, O&M, and decommissioning; and
- Disturbance to navigation from EMFs emitted from the export or inter-array cables.

The following impacts were found to be potentially significant:

- Grey seal and harbour seal potential collision risk with tidal turbines for Stage 1 (interim total of 30 turbines) as well as Stages 1&2 (combined total of 200 turbines).

BTAL will agree mitigation and monitoring measures with relevant stakeholders pre-construction once the final details of the Project design are known. This will be done through the development of a Project Environmental Management Plan (PEMP) which is likely to include the following components, of relevance to marine mammals:

- Marine Mammal Management Plan (MMMP);
- Pollution Control Plan; and
- Vessel Management Plan (VMP).

The HRA considers the potential for likely significant effects on Natura sites designated for their marine mammal interests.

Figure 11: Grey seals and harbour seals

3.8 Ornithology

The ornithology assessment considers impacts on seabird communities and was informed by site specific surveys. Baseline data collection was undertaken through monthly boat-based surveys for a period of two years to establish the composition and abundance of the seabird communities present in and around the offshore Project site. In addition desk-based research, statistical analysis and quantitative collision risk modelling provided a solid basis for impact assessment.

Analysis of baseline data identified that the area is of moderate importance to a range of seabird species, predominantly during the breeding season.

The potential impacts on seabird communities by all phases of the Project have been assessed based on extensive consultation with Marine Scotland and Scottish Natural Heritage, relevant EIA guidelines, published research and collision risk modelling. Based on this impact assessment it is considered that the risks over the lifetime of the Project are acceptable or tolerable with appropriate mitigation in the context of EIA guidelines.

Assessment conclusions take into account the mitigation embedded within the Project design, including the minimum under water sea surface clearance of 30m, which results in a substantial reduction of the potential for underwater collision risk for diving seabirds. Further embedded mitigation relates to the removal of surface-piercing structures of any kind which eliminates the potential of displacement of seabirds due to the presence of structures at the sea surface.

Predicted impacts on seabirds through direct habitat loss and indirect effects through changes to habitats and associated prey species are not considered to be significance due to the very small changes in baseline conditions of the benthic habitat. The potential for disturbance and accidental contamination impacts on seabirds across all Project phases are minimised through a range of mitigation and good practice vessel management measures. Potential collision impacts on three mid-water diving seabird species (common guillemot, razorbill and puffin) are of sufficiently small magnitude to avoid adverse effects at the regional population level. Through Project design, the potential for collision impacts on two seabed-foraging diving seabird species (black guillemot and shag) is avoided entirely, as the seabed depth in the turbine deployment area is greater than that targeted by these species when foraging.

Further consultation with licensing authority and stakeholders is anticipated to finalise the mitigation strategy and ensure potential impacts on seabird communities are minimised.

Figure 12: Common guillemot, shag and puffin

3.9 Shipping and Navigation

The Navigation Risk Assessment (NRA) for the Project was carried out by Anatec Limited. The assessment followed the Maritime and Coastguard Agency (MCA) and Department of Energy and Climate Change (DECC) Guidance for such assessments. This included extensive baseline data collection to obtain information on the vessel activities in the vicinity of the Project (an example of which is shown in Figure 13), including 28 days of seasonally-weighted maritime survey data, additional surveying during geophysical work, longer-term AIS data, desk-based research and consultation with local stakeholders/experts.

This identified that the area is transited by an average of one to two vessels per day, comprising a mixture of cargo ships, passenger ferries (Scrabster-Stromness), fishing vessels, occasional yachts and tankers to/from Scapa Flow.

The potential hazards to this vessel activity posed by all phases of the Project have been assessed based on consultation, a Hazard Review Workshop involving a cross-section of local stakeholders and quantitative risk modelling. Based on this assessment it is considered that the risks over the life of the Project are broadly acceptable or tolerable with appropriate mitigation, which will include chart depiction, information circulation and a nominated guard vessel being present during installation. This conclusion takes into account the mitigation embedded within the Project design, including the planned minimum device clearance of 30m below the water level at LAT (approximately chart datum) which means that only very deep-draught vessels would need to consider altering their passage and only in extreme wave conditions. Furthermore, the potential hazard to vessels was reduced further with the relocating of four turbines previously planned for the south eastern corner of the AfL area. Consultation with the harbour authority highlighted that this region of the AfL area conflicted with the approach to the shipping channel into Scapa Flow.

Further consultation with licensing authority and stakeholders is planned to finalise the mitigation strategy and ensure navigational risks are minimised.

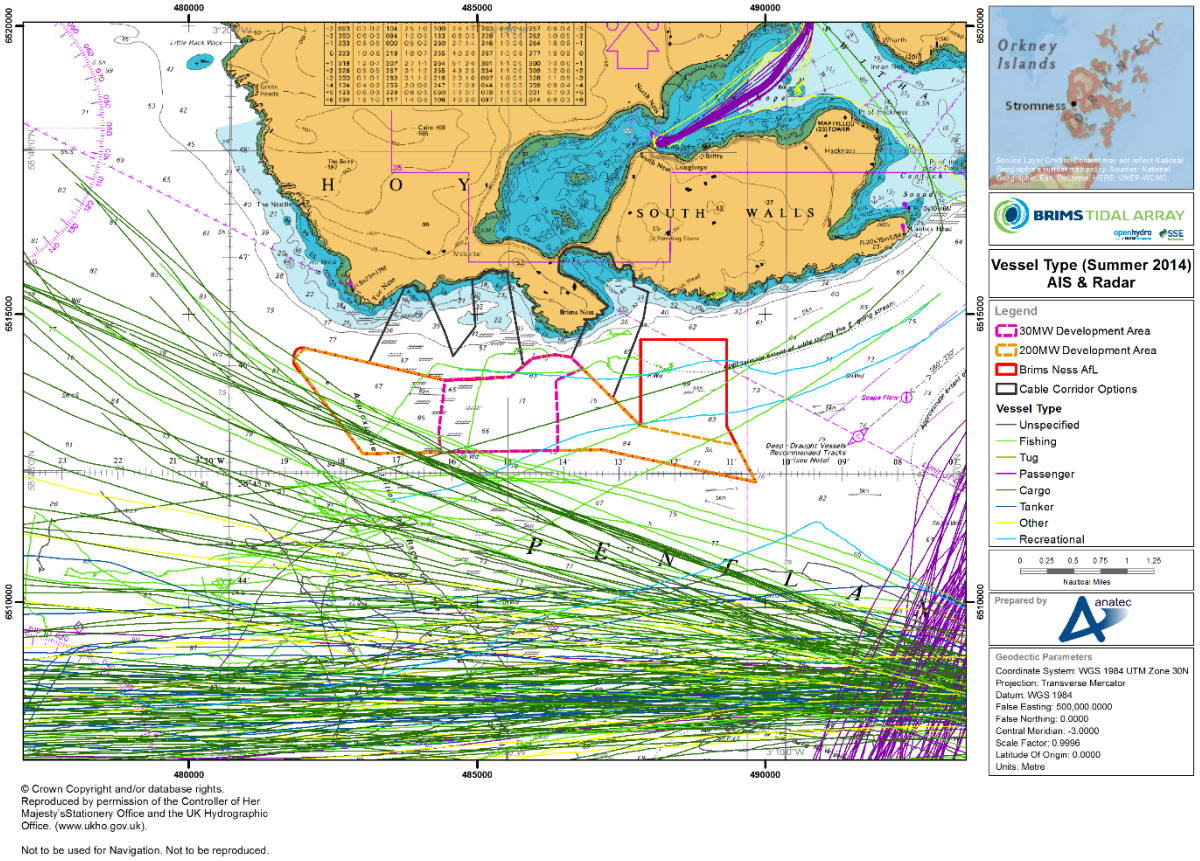


Figure 13: Summer 2014 vessel movements

3.10 Commercial Fisheries

Information was obtained from a number of sources to inform the assessment of impacts on commercial fisheries including information obtained from interview-based data from a Marine Scotland study (shown in Figure 14) and local fishermen through consultation meetings. A review of this information indicates that the most targeted commercial fisheries species in the vicinity of the Project site are shellfish, in particular crab and lobster landed using creels / pots. This fishing gear is mainly deployed in waters adjacent to the coast rather than in the AfL area. Consultation also indicated that trawl and dredge gear is used by local fishermen in Scapa Flow and the waters off the south coast of Hoy, however not in the AfL or cable route due to the incompatibility of these gears with the seabed sediments.

To ensure the safety of all personnel involved in the installation of the Turbine Support Structures (TSSs), turbines and cables it will be necessary to implement safety zones of up to 500m radius during installation. These will be implemented in accordance with the Department for Energy and Climate Change (DECC) guidance and will be installed on a rolling basis around areas where installation activities are taking place. Given that fishing vessels will not be permitted within the safety zones, there will be temporary displacement of fishermen from fishing grounds within the Project site where safety zones are in place. This impact is most likely to affect fishing activity in the cable route corridor, where fishing intensity is greatest, during the construction period. However, due to the temporary nature and the geographical confinement of the

impact the loss of access to fishing grounds was assessed to be not significant. Once the export cables and associated cable protection measures are installed it will be possible for lobster and crab potting activities to resume within the export cable corridor and there will be no long-term exclusion of fishing from this area.

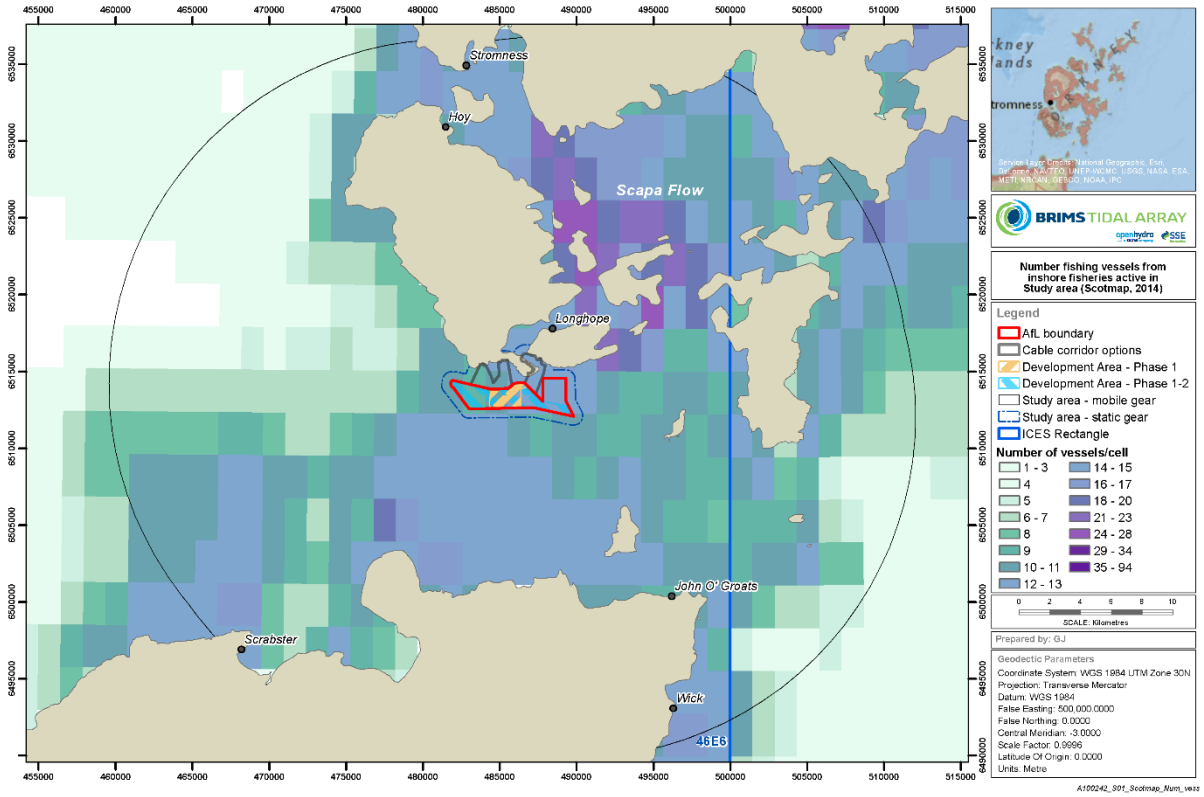


Figure 14: Inshore fisheries vessel numbers

There is potential for local fishermen to be impacted due to long-term displacement within the AfL area. During operation of the tidal array it will not be possible for fishermen to continue to safely deploy crab and lobster pots within the tidal array. It is likely that the area of seabed occupied by the final array layout will occupy a smaller footprint within the AfL area (2.9km^2 during Stage 1 and 8.5km^2 during Stage 1 and 2), however restrictions on crab and lobster potting could cover the entire AfL area (11.1km^2). It is anticipated that local fishermen will avoid a larger area depending on the length of the creel lines. As fishing effort in the AfL is low this impact is not considered significant.

The assessment also considered impacts on the fishermen who utilise the AfL and cable route corridor for transiting to fishing grounds. Transit restrictions are only expected during the construction period when vessels will be required to avoid safety zones. However as few vessels transit the Project site the impact was not considered significant. During the operational period there will be adequate under keel clearance to allow fishing vessels to safely transit the area.

The potential change in abundance of target species was also assessed as an impact of the Project. The main species considered are crab and lobster as these are the key target species for local fishermen. It was concluded that there would be a short-term loss of habitat during the construction period of the Project, however increased habitat availability during the operational phase could increase target species abundance. The impact was therefore assessed as not significant.

In order to reduce the potential impacts on local fishermen, BTAL plans to work with all those involved in the fishing industry to ensure minimal impact to anyone working in the area. BTAL will continue consultation and liaison with the local fishing industry through the appointed Fisheries Liaison Officer (FLO). All consultation will be carried out in accordance with the Fishing Liaison with Offshore Wind and Wet Renewables (FLOWW) Best Practice Guidance for Offshore Renewable Energy Developments. Consultation will be continued throughout the installation phase and during operation as necessary.

3.11 Seascape, Landscape and Visual Impact Assessment

The seascape, landscape and visual impact assessment examined the potential effects of the Project on onshore and offshore character, and on visual amenity, within a study site of 10km radius from the Project boundary (Figure 15). The assessment addressed the potential landscape, seascape and visual effects for the Project including all three landfall options. The assessment considered the sensitivity of the landscape/seascape or the viewer, and the magnitude of change predicted to occur.

Extensive consultation regarding the Project design removed surface piercing generation technologies and surface piercing offshore hubs from the Project description. There are therefore no permanent visible structures associated with the Project. The assessment focused on the worst case scenario for the Project. In this case, with the absence of permanent visual structures, the construction stage was deemed to be the most likely to generate significant effects.

The seascape and landscape of the study site was considered in terms of its existing character, as represented by seascape and landscape character areas, and by nationally and locally protected landscapes. It was considered that impacts on the seascape and landscape caused by vessel presence during construction activities would be temporary and would be most impacting at the cable landfall due to the use of a 50m high jack-up barge. However, due to the temporary nature of the landfall works this would not be significant.

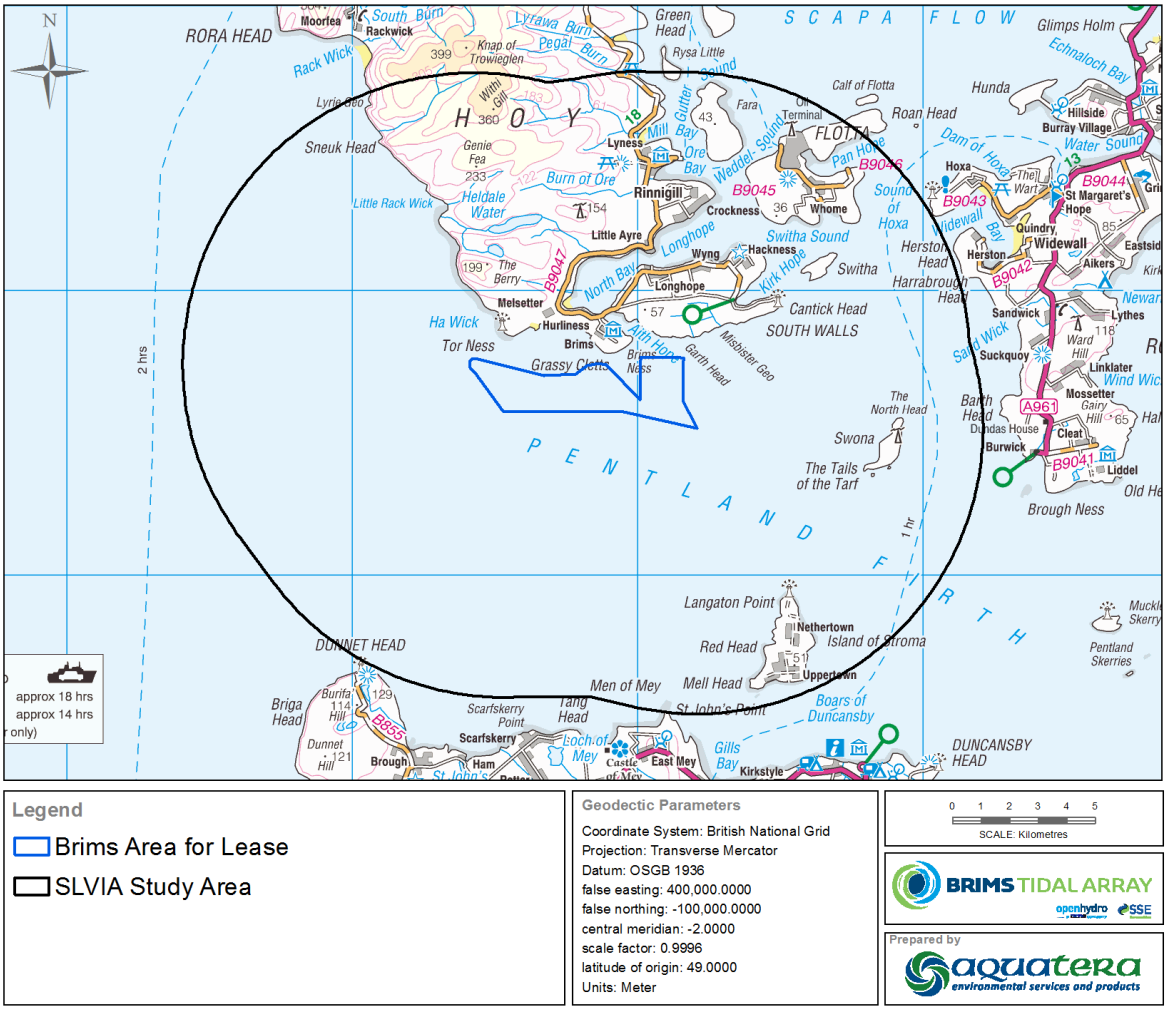


Figure 15: SLVIA study area

The visual assessment considered the current conditions from specific viewpoints in and around the 10km study site. Fourteen viewpoints were selected as they were representative of the coastline, had amenity value and/or were used by the public and also had views of the Project. Viewpoint locations were agreed during consultation.

The assessment concluded that, during construction, the visual impact on the area would be temporary and therefore not significant. Due to there being no permanent visible structures associated with the Project there are no residual effects from the Project. The Project was not considered to have significant residual cumulative impacts in conjunction with the agreed list of additional existing or planned projects.

3.12 Marine Archaeology and Cultural Heritage

The impact assessment of archaeological impacts was informed by a desk based study of available information and analysis of relevant site specific survey data. Fifteen potential shipwreck sites (the positions of fourteen of which are unverified), one non-sub contact (a sonar contact detected during wartime submarine searches that are not submarines) and one geophysical anomaly were identified by desk-based assessment (shown in Figure 16). Site-specific surveys

carried out across the Project site provided additional seabed survey data. Four multi-beam echosounder (MBES), three side scan sonar (SSS) and two magnetic anomalies were observed during the assessment of the geophysical data. Three of these anomalies were in the same location to the south east of the Moodies Eddy export cable corridor and may represent the remains of the *Canadian*, a shipwreck which would be considered of medium importance (sensitivity) if found. No evidence of paleo-landscape features were observed in the sub-bottom profiler data. No confirmed aircraft crash sites were found within the Project site, although seven aircraft are reported to have crashed in this part of the Pentland Firth and it remains a possibility that one or more of them may be within the Project site.

The assessment concluded that no sites with statutory designations, no aircraft and no submerged landscape deposits have been identified that will be impacted. There is a low potential for the Project to impact on unknown, unrecorded vessels that may have sunk in the Project site as the seabed and tidal conditions are not conducive to good preservation of submerged cultural heritage.

Significant potential impacts on the marine historic environment were predicted during the construction and installation phase. Drilled monopile TSS, drilled pin pile tripod TSS, the excavation of trenches for the burial of the export cable route or at landfall and the use of either long or short HDD could have a direct destructive impact on marine cultural heritage as a result of the penetration or removal of marine cultural heritage. Gravity base structures, cable armouring and cable protection through rock placement, concrete mattresses and grout bags could have a direct destructive impact on marine cultural heritage as a result of compression of any remains. No significant impacts were predicted for the subsequent operations, maintenance and decommissioning phases.

Avoidance of known sites incorporated into the Project Design is considered the primary strategy to eliminate or minimise impacts on the marine historic environment. The assessment concluded that if all known sites of interest are avoided during the construction phase through Project design e.g. placement of TSSs and location of inter-array cables and export cable routes during the construction phase, the potential impact will be not significant. In addition, a written scheme of investigation will be produced, to include cross-referencing with construction and environmental management plans, and inductions on any marine historic environment assets to avoid.

Implementation of the suggested management and mitigation strategies will eliminate, reduce or manage any significant impacts to an acceptable level, resulting in no significant residual impacts. The instigation of a reporting protocol for the accidental discovery of cultural remains is recommended to minimise impact on unknown sites.

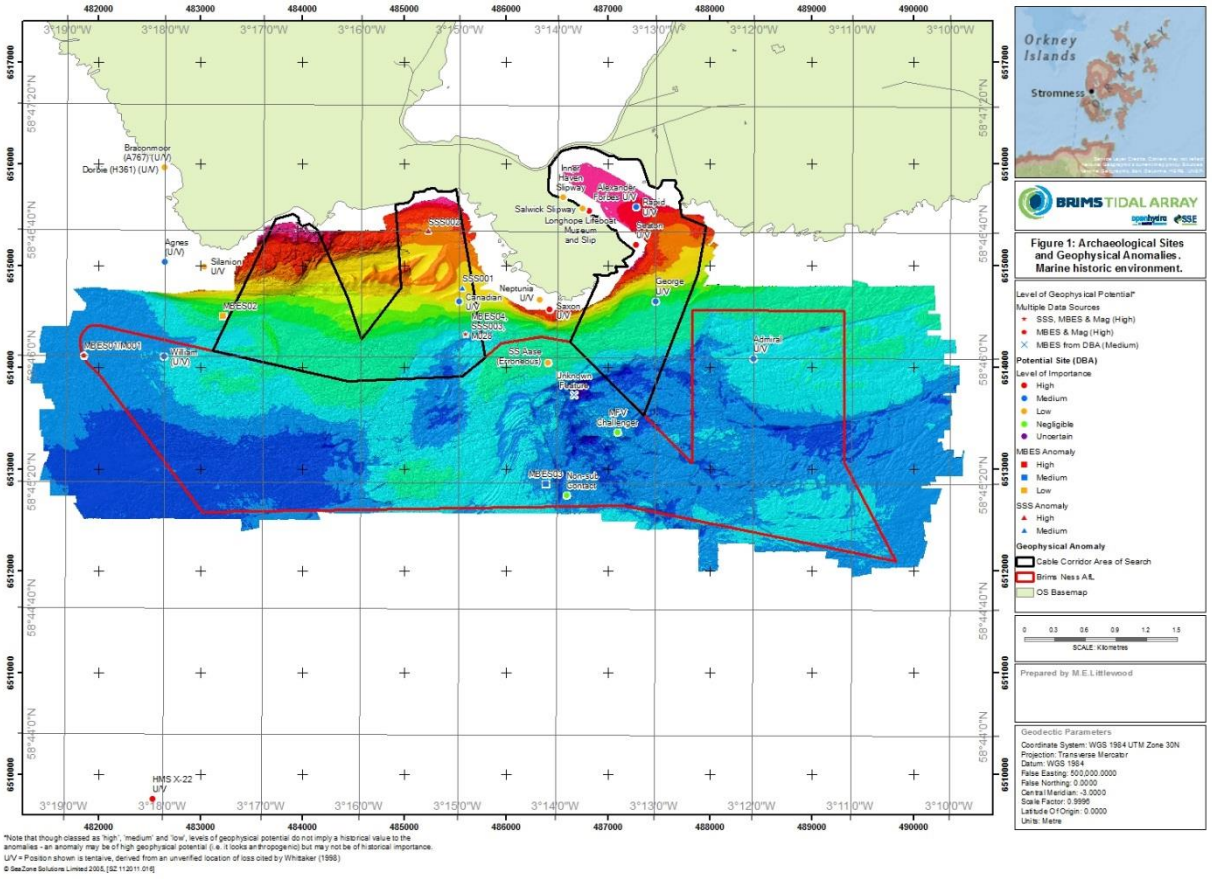


Figure 16: Archaeological sites and geophysical anomalies

3.13 Socio-economics

The location of the construction and operational bases have not been defined at this stage of the Project. Locations for these activities will be finalised during the detailed design phase of the Project, therefore locality of any positive or negative impacts are not yet known and the potential impacts have to be discussed over a wider area. For the purposes of this study the impacts on a national, regional and local scale have been assessed (shown in Figure 17). The national area is considered as Scotland, the regional study site covers Caithness and the Orkney mainland and the local area is defined as Hoy.

The Project has the potential to have significant positive benefits for Scotland as a whole, as well as benefits to the location where construction and operational based are located. Scotland has for a number of years supported the development of marine renewables. The benefits that this industry will bring to the country are mostly socio-economic, which is the driver for the on-going government support. Caithness and Orkney are both taking a proactive approach to the development of the industry and have invested in local infrastructure to support its growth.

Employment is a key factor in gaining socio-economic benefits from this type of Project and although the actual numbers of jobs that the Project will create will not be known until the Project is more fully developed the estimates show that around

180 construction jobs for Stage 1 and up to 1000 for the Stage 2 developments may be created. The operation and maintenance phase is estimated to require between 20 – 100 jobs for the 25 year life span of the Project. During a consultation carried out for this subject all stakeholders in Orkney and Caithness welcomed this opportunity and described it as an advantage. The Project could also bring new business to the local economies. Gross Value Added (GVA) (which is a measure in economics of the value of goods and services produced in an area, industry or sector of an economy) estimates for the Project are around £50m locally for Stage 1 and £280m for Stage 2.

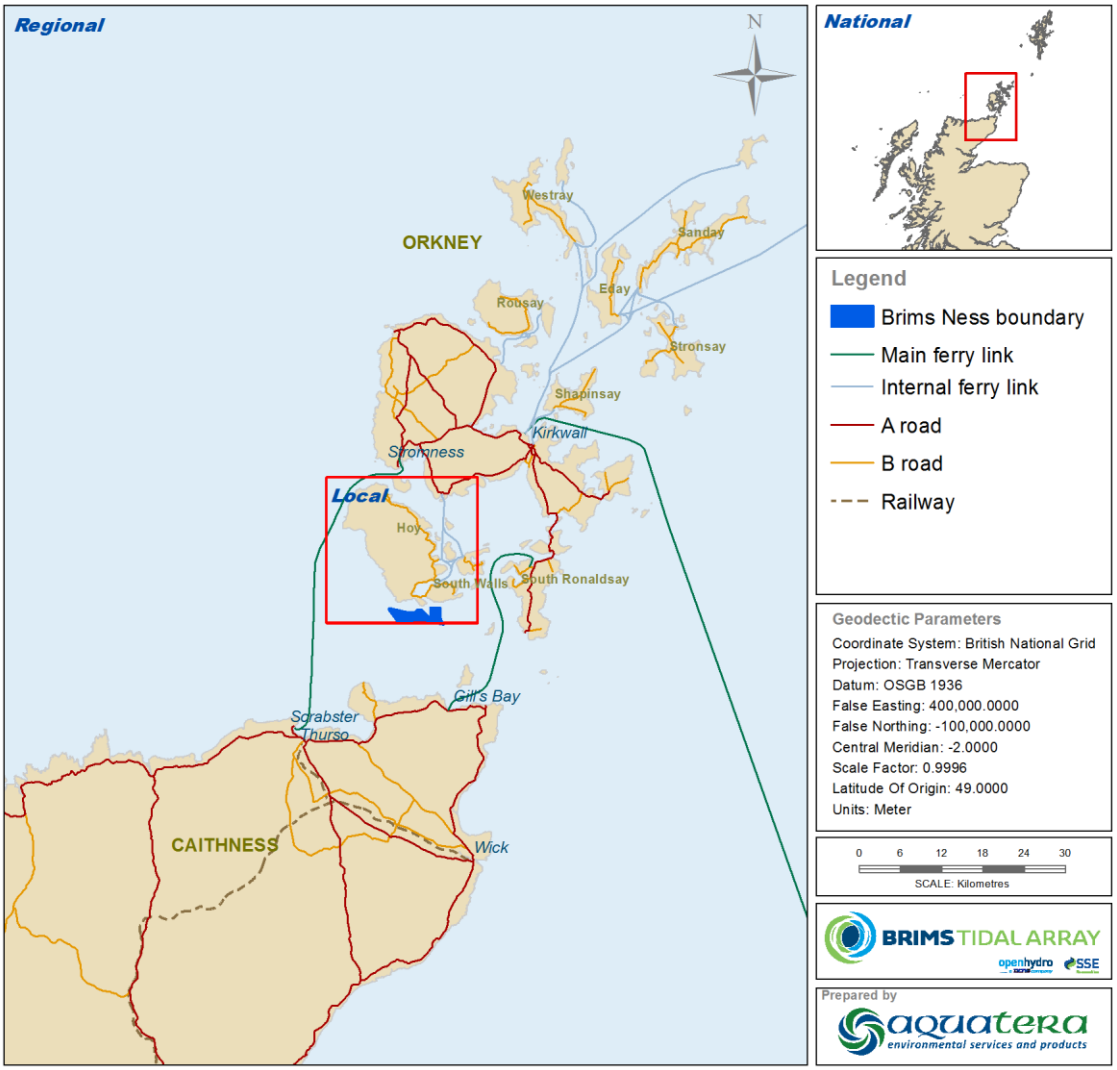


Figure 17: Regional study site

There will also be some wider effects on services such as housing, education and roads infrastructure. The benefits of improvements to these services were assessed as being positive.

The only potentially negative impacts identified within the assessment were associated with conflicts arising from use of the pier and laydown areas by the Project which would be mitigated by good port management. There could also be some minor issues with capacity on ferries if Lyness is used as the construction or operation and maintenance base. This issue

could be mitigated by additional ferries or increased timetable options which Orkney Islands Council (OIC) and Orkney Ferries have indicated they are willing to consider.

Regionally, port improvements in Caithness carried out in 2012 were geared towards attracting more renewable projects. Equally OIC has completed upgrades to three of their major ports (Hatston, Lyness and Stromness) to attract projects to the islands. The local supply chain and development agencies have invested in improvements to support the industry. To date this has mostly been developed around the European Marine Energy Centre (EMEC) and the marine energy developers coming to their facilities. The medium to longer term objectives have always been towards commercialisation of the marine energy industry and the local communities are expecting to benefit from this initial investment.

The key findings of the socio-economic assessment are:

- The majority of socio-economic impacts from the Project are positive. This is true nationally, regionally and locally;
- The impacts will be more significant in the more rural areas but the majority are positive impacts;
- The consultees within the assessment were all supportive of the Project and some were willing to consider using their resources to help mitigate any issues;
- The positive comments received all assume that the construction or operations base will come to their locality;
- The Project fits into the national aspirations as well as regional and local economic development strategies;
- There would be a lasting benefit from the Project in whichever area the operations and maintenance base is located and these benefits will be more significant in the more rural and remote areas; and
- There will be significant business opportunities for the supply chain from the Project.

3.14 Recreation and Tourism

This section considers two separate but related topics: the potential impacts on recreational interests in the onshore and offshore area relevant to the Project and the potential impacts on tourism in Orkney with particular focus on the local area of Hoy. Hoy is Orkney's second largest island with a population of approximately 400, the majority of whom live in the low-lying south of the island around the villages of Lyness and Longhope on South Walls. The island is visited by tourists regularly during the spring and summer months. The 2013 tourism survey indicated that about 8% of the total visitors to Orkney visited Hoy (11,425 visitors), 37% (4,284) of whom stayed overnight and 63% (7,141) visited for the day.

Aith Hope is a popular beach spot for locals and the annual Boxing Day swim occurs here. There are also beaches visited by locals and tourists at Kirk Bay and at the Melsetter Dunes. Walking is also popular and there are coastal paths to Tor Ness and around the Brims Ness peninsula, as well as along the southern coast of South Walls.

The waters around Orkney are regularly utilised for various types of recreation; particularly sailing, diving, angling, sea kayaking, surfing, kite boarding, power boating and other boat based activities. Sailing, diving and angling are important contributors to the local economy and draw large numbers of visitors to the islands throughout the year.

There are numerous piers and slipways throughout the study site used by those engaged in offshore recreational activities. According to local sailors, there are anchorages in Kirk Bay as well as Aith Hope. The Aith Hope anchorage has moorings for local fishing boats in the summer and is also used as an occasional anchorage for yachts crossing the Pentland Firth

as it is well sheltered except in south east winds. Despite this, the study site is not in an area of high recreational vessel activity.

Scuba diving is a popular activity in the Project Study Area. In particular Scapa Flow is recognised as one of the top five dive sites around the world. The scuttled German fleet from the First World War attracts many visitors from all around the world every year. Most recreational diving in Orkney occurs in Scapa Flow around these wreck sites, as shown in Figure 18. Consultation with a local operator also confirmed that no recreational diving is likely to take place in the Project site. Kayaking and canoeing are popular activities in the Study Area, and there are a number of clubs in the region: Orkney Sea Kayaking Association, Kirkwall Kayak Club, Caithness Kayak Club, East Sutherland Kayak Club and the Pentland Canoe Club.

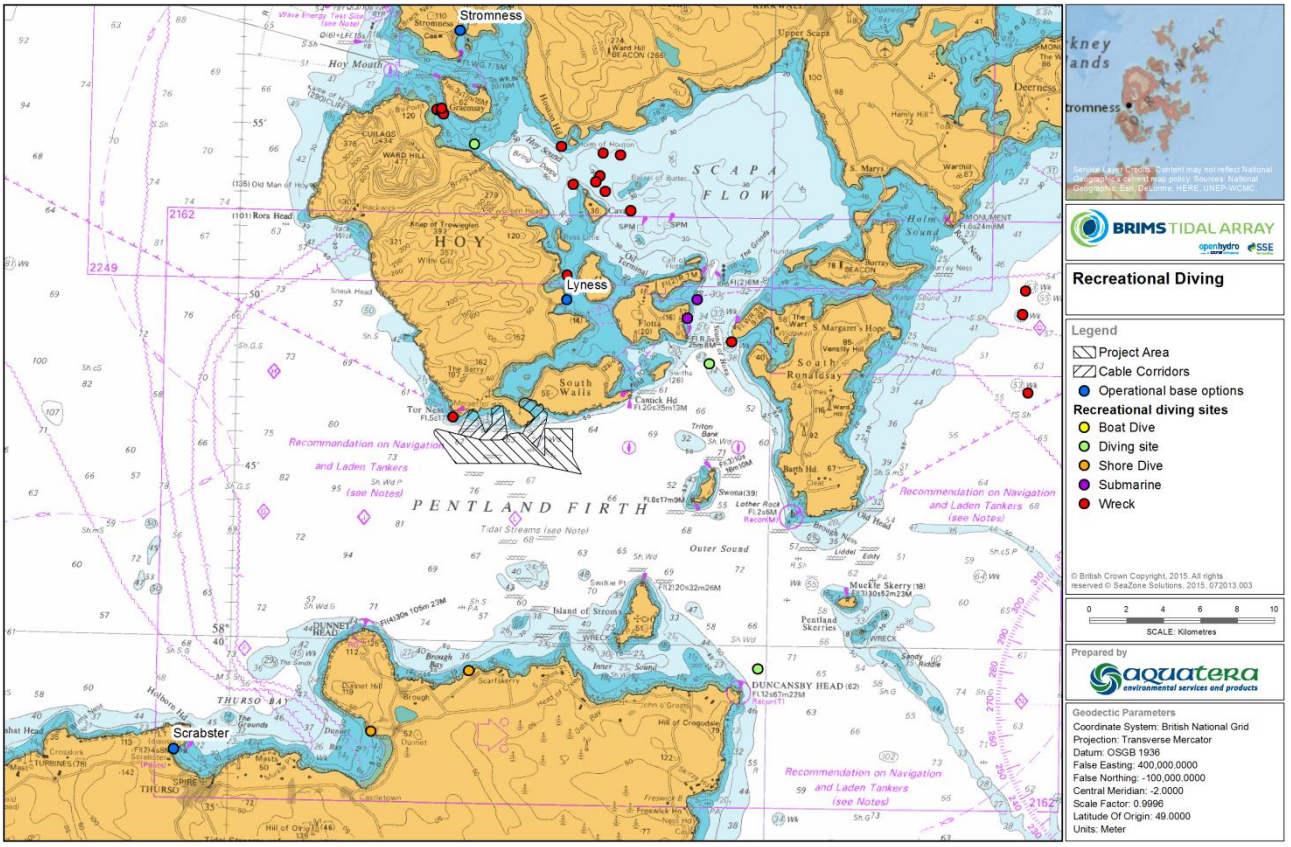


Figure 18: Dive sites within the study site

Recreational angling in the study site includes fishing for cod, pollack, ling and mackerel. Conger eel is fished among the wrecks. Skate is also found in the area and is the target of some chartered fishing.

Impacts on offshore recreational activity are likely to be limited to the construction phases of the Project and are considered low or negligible. There may be some exclusions during the construction phase of the operation that would require recreational vessels to avoid the site but due to the limited numbers of vessels that this will affect the impact will be negligible.

Impacts on onshore recreational activity is likely to be limited to noise during the construction phases, however this is expected to be minor or negligible due to the low noise levels anticipated, temporary nature and low recreational use of the coastal area.

3.15 Overview of Onshore Impacts

As explained in Section 1.6 this ES covers all infrastructure up to MHWS. A separate ES will be prepared to cover the onshore elements of the Project (above MLWS) and a planning application will be submitted to the Orkney Islands Council in due course. This will be supported by an EIA.

The onshore elements of the Project include the cable landfall (works above Mean High Water Spring), onshore cable route and construction and operation of a local onshore substation. There will also be a requirement for temporary construction compounds and storage areas for equipment required for the Onshore Project. There may also be a need to upgrade local roads or improve road junctions in certain locations in order for heavy plant and equipment to gain access to the landfall and/or local substation site.

The location and design of the onshore elements of the Project is dependent upon the design and planning consent process for transmission system upgrades for the Orkney Islands. These upgrades are the responsibility of SHE-T. Once the grid connection point for the Project is confirmed, a full EIA will be undertaken to accompany the planning application for the onshore elements of the Project.

In preparation of this ES, and in particular through the Scoping and ongoing consultation exercises, work has been carried out to identify potential impacts of the onshore elements of the Project that are likely to require more detailed assessment as part of the onshore EIA. These are discussed within the relevant technical chapters.

No significant impacts have been identified and most potential impacts from the onshore elements are likely to occur during the construction phase, e.g. construction at the cable landfall, installation of the onshore cable, construction of the local substation and road upgrades (if required). The majority of these potential impacts, such as the generation of noise, dust and traffic disruption and the impact of these on the environment, local population and visitors will be short-term and temporary in nature and are unlikely to be significant. However, these impacts will still be assessed in detail in order to confirm that significant impacts will not occur.

Where construction activities could have longer term impacts such as habitat loss or direct impacts on the local landscape, ecology or features of archaeological or cultural heritage importance desk studies and surveys may be required to determine the potential for significant impacts to occur. Consultation will also be carried out as part of the assessment process and where necessary to inform the Project of appropriate mitigation strategies which will be put in place to ensure that significant impacts do not occur.

Potential longer term impacts from the operation of the Project, including impacts on the local landscape and land uses, material assets and local recreation and tourism in the area, will also be assessed.

BTAL will continue to consult will all stakeholders throughout all phases of the Project to ensure that, where possible, key issues / concerns are addressed as part of the EIA process, and that potential impacts associated with the onshore elements of the Project are kept to a minimum.

3.16 Cumulative and In-combination Impacts

Cumulative and in-combination impacts have been considered throughout the EIA process and have been considered for all phases of the Project. Cumulative impacts are those arising from interactions with similar projects i.e. other marine renewable developments while in-combination impacts are considered to be those arising as a result of interactions between the Project and other onshore projects, for example pier developments or oil and gas developments.

The general principle for the cumulative impact assessment was as follows:

- Identification of a list of projects and proposals to be considered in the Project Cumulative and In-Combination Impacts Assessment (CIA);
- Identification of a list of relevant receptors;
- Initial screening of potential cumulative and in-combination impacts; and
- Where potential cumulative and in-combination impacts are identified, assessment of significance of cumulative and in-combination effect.

BTAL in consultation with Marine Scotland has identified a list of 12 other plans and projects which in concurrence with the development of the Project may result in cumulative or in-combination impacts. The list agreed with Marine Scotland was as follows:

- EMEC Billia Croo Wave Energy test site (W1);
- EMEC Scapa Flow (W2);
- Lashy Sound Tidal Array (T1);
- Westray South Tidal Array (T2);
- EMEC Fall of Warness Tidal Test Site (T3);
- EMEC Shapinsay Sound (T4);
- MeyGen Inner Sound (T6);
- Beatrice Offshore Windfarm (OW1);
- Beatrice Demonstrator Offshore Windfarm (OW1);
- Moray Firth Offshore Windfarm (OW1);
- Hywind Pilot Park Project (OW2); and
- Orkney to Caithness Interconnector (C1).

These projects are shown in Figure 19 and referred to using the codes in the list above.

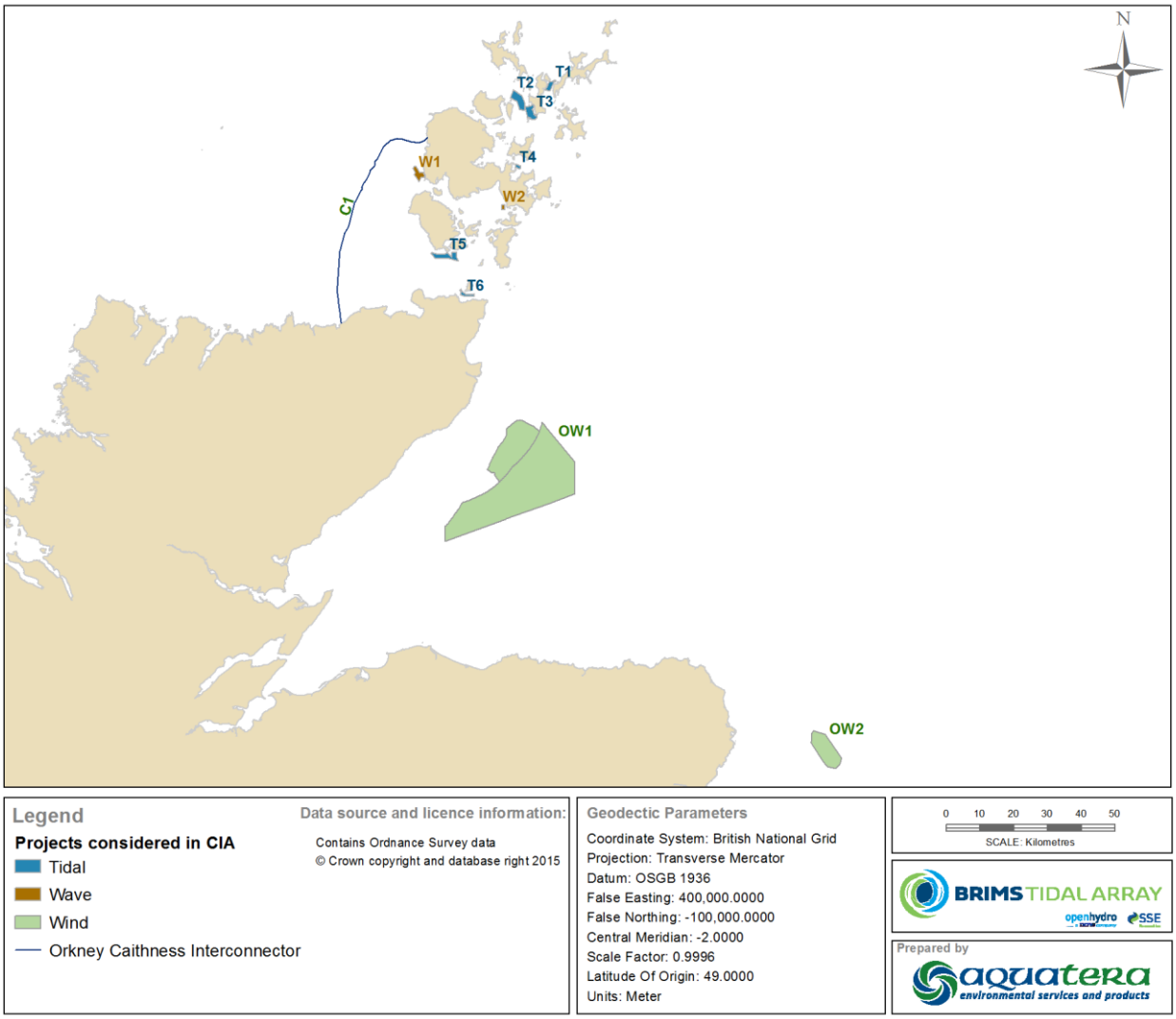


Figure 19: Location of Projects considered in the Cumulative Impact Assessment

The CIA concluded that, for many of the EIA topics considered, that there were no cumulative or in-combination impacts resulting from the BTAL Project in combination with the projects listed above. No cumulative or in-combination impacts were identified for the following topics:

- Geology;
- Physical Processes;
- Coastal and Terrestrial Ecology;
- Benthic Ecology;
- Fish Ecology; and
- Ornithology.

Uncertainty in schedules for decommissioning of the BTAL Project, as well as the other projects listed above, mean that is not possible to determine the cumulative or in-combination impacts associated with decommissioning.

The only area where potentially significant cumulative impacts were identified and assessed as being potentially significant was the cumulative collision risk with operational tidal turbines for all species of marine mammal and basking shark arising from a number of the tidal energy projects proposed in the region namely: MeyGen Inner Sound tidal array; Lashy Sound tidal array and Westray South tidal array, however these will be addressed by appropriate mitigation and monitoring.

3.17 Environmental Mitigation, Monitoring and Management

A Project Environmental Management Plan (PEMP) will be developed in consultation with the Licensing Authority, statutory consultees and relevant stakeholders post-consent. Mitigation and monitoring measures identified throughout the ES are also collated into a Project Commitments Register which will sit within the PEMP. It is proposed to establish a group to oversee the development of the PEMP, review its implementation and act as the 'adaptive management group' for the Project. The decision to create such a group sits with MS-LOT, should consent be granted, and will form part of the conditions of the Section 36 consent. The Brims Tidal Array Environmental Steering Group (ESG) would likely include (as a minimum) representatives from BTAL, Marine Scotland, SNH and Scottish Environment Protection Agency (SEPA) as well as nominated specialist advisors. The PEMP will be developed by BTAL in consultation with the ESG. Ultimate approval will come from the licensing authority, Marine Scotland. The PEMP will be a working document. Any amendments will be made in consultation with the ESG, stakeholders and ultimately approved by the licensing authority.

Following consent, a proposed structure and outline PEMP will be produced by BTAL and issued to the ESG. It is proposed that an overarching PEMP will be produced which will then be used in conjunction with a series of Environmental Management Documents which contain environmental and health and safety management controls, licence/consent conditions and supporting information in relation to specific requirements.

Where the EIA has identified potentially significant impacts that cannot be avoided, mitigation measures have been proposed. Such measures should remove, reduce or manage the effect to a point where the residual significance of that impact is reduced to an acceptable level. Mitigation measures have also been recommended in some cases where impacts have been assessed as being not significant in order to ensure that the impacts remain so.

These measures will be incorporated into the PEMP and relevant EMPs as appropriate. Further monitoring measures will be developed post-consent in consultation with the ESG and stakeholders based upon the best available technology and environmental understanding. Any guidance regarding the good/best practice approaches available will be adopted and implemented as appropriate and as agreed with the ESG and the Licensing Authority. BTAL is committed to strategic environmental research and sits on the Steering Group of the Offshore Renewables Joint Industry Programme for Ocean Energy.

4 COPIES OF THE ENVIRONMENTAL STATEMENT

Additional copies of the Environmental Statement can be provided to third parties, subject to printing costs, details of which are available on request. However, to minimise the use of paper, BTAL requests that where possible, consultees refer to the information in electronic format. DVD copies can be requested from BTAL for a nominal charge at the following address:

Brims Tidal Array Limited
c/o OpenHydro
Greenore Port
Greenore
Co Louth
Ireland

Alternatively, the complete ES can be found at:

http://www.gov.scot/Topics/marine/Licensing/marine/scoping/BrimsArray