Low Carbon

Siadar Wave Energy Project
Siadar 2 Scoping Report
Voith Hydro Wavegen

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Xodus Group Ltd
8 Garson Place
Stromness
Orkney
KW16 3EE
UK

T +44 (0)1856 851451
E info@xodusgroup.com
www.xodusgroup.com

Environment

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1 INTRODUCTION

1.1 The Proposed Development

The Siadar Wave Energy Project is situated on the northwest coast of the Isle of Lewis. It will convert wave energy to electricity and deliver this to the national grid.

The infrastructure required for a 4 MW project, which includes a 250 m long breakwater, shore connection, control building, borrow pit and other associated works, is already consented. Construction is due to start soon. This consented scheme is referred to as 'Siadar 1'. It is shown in Figure 1-1 below.

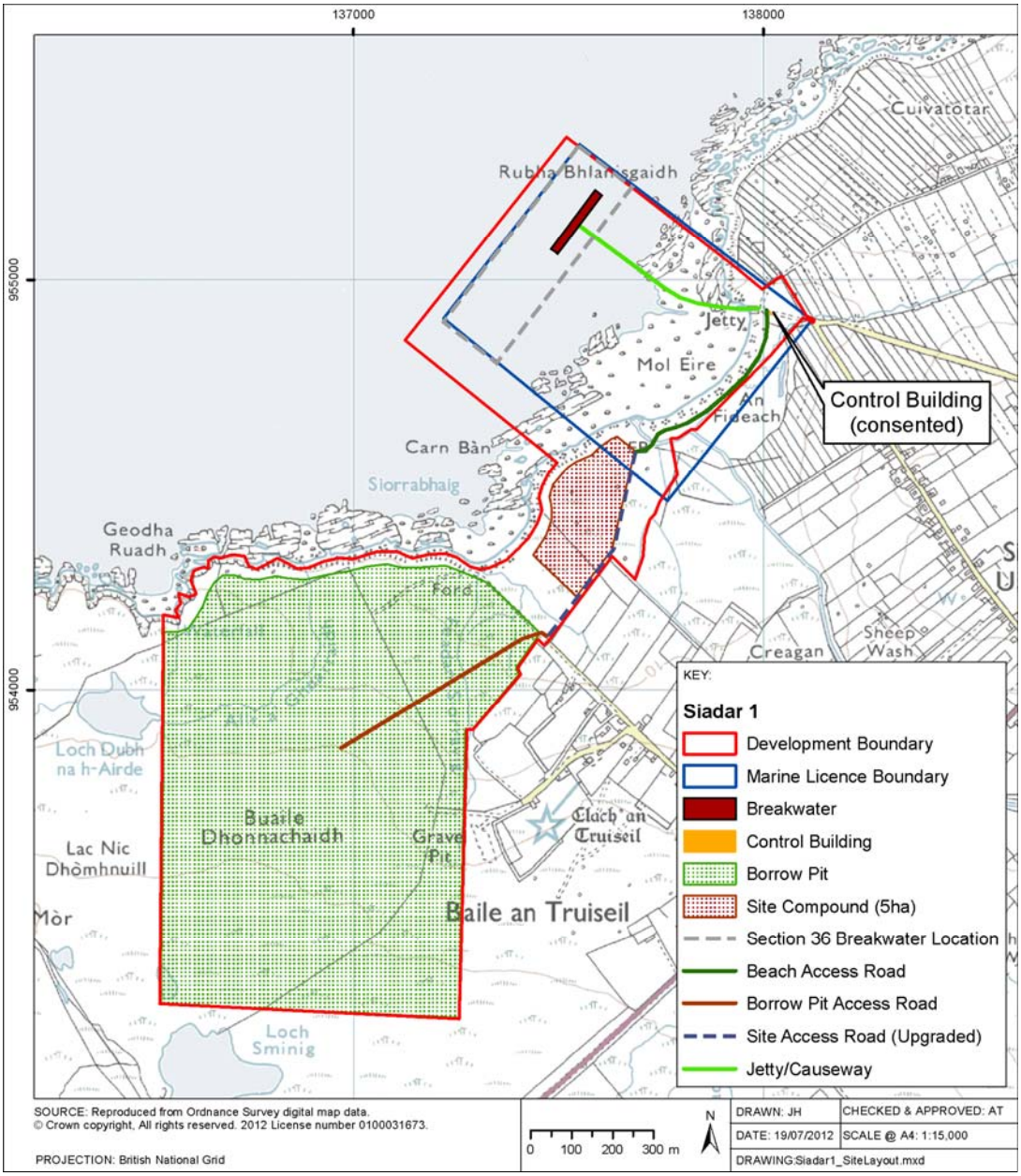


Figure 1-1 Plan of Siadar 1

Voith Hydro Wavegen intends to apply for consent for an additional 26 MW of capacity. This proposed development is referred to as 'Siadar 2'. The additional infrastructure includes:

- Breakwater approximately 1,176 m long;
- Access jetty running along the landward side of the breakwater;
- Shore connection;
- Control building; and
- Improvements to the public road through Baile an Truiseil.

The footprint of the onshore temporary construction facilities (e.g. site compound etc.) will be within the footprint already consented for Siadar 1, but the duration of use will increase. Siadar 2 is shown in Figure 1-2 below.

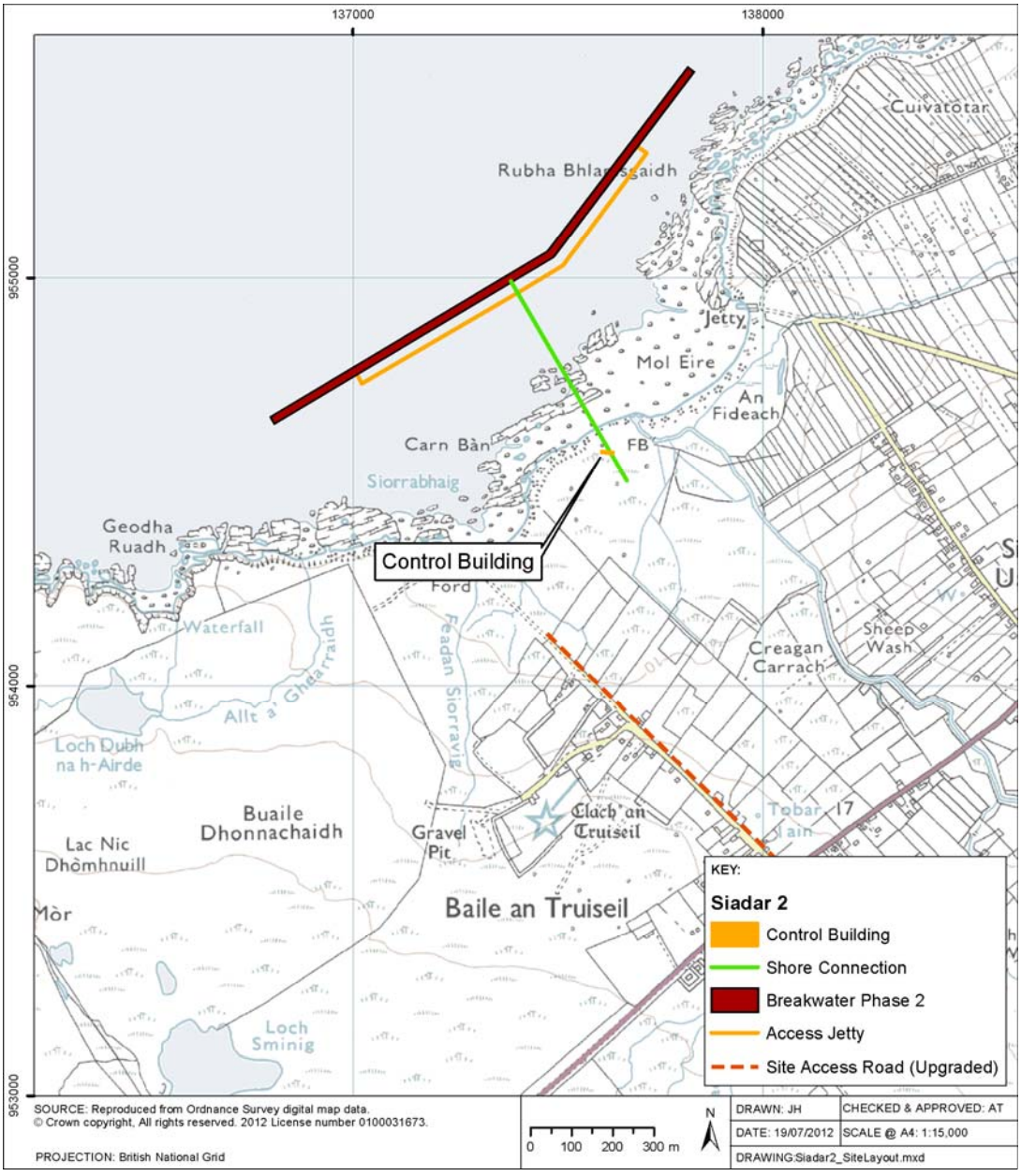


Figure 1-2 Plan of Siadar 2

A shore connection and control building are included in both the Siadar 1 and Siadar 2 developments. However, only one shore connection and one control building will actually be constructed. The final choice will be made based on consideration of stakeholder opinions, technical considerations and programme constraints.

The Environmental Impact Assessment (EIA) will assess the potential impacts of Siadar 2. The baseline used in the assessment will assume that Siadar 1 is complete. The assessment will consider any other changes to the baseline environment since the EIA was conducted for Siadar 1; incremental changes in the magnitude of impacts between Siadar 1 and Siadar 2; and cumulative impacts associated with both phases of the project.

1.2 The Developer

Voith Hydro Wavegen has been at the forefront of wave energy technology since it was founded in 1990. It is based in Inverness and is part of Voith, a privately owned company with over 40,000 employees worldwide. Voith Hydro Wavegen is the project developer for the Siadar Wave Energy Project.

1.3 Oscillating Water Column Wave Energy Technology

The Siadar Wave Energy Project will utilise Voith Hydro Wavegen's oscillating water column wave energy technology. The principle is illustrated in Figure 1-3. The water column within the breakwater moves up and down as it is driven by the action of waves on the seaward face of the breakwater. This compresses air at the top of the chamber, which then drives a special air turbine called a Wells Turbine. The unique feature of the Wells Turbine is that it rotates in the same direction irrespective of the direction of air flow. The turbine is connected directly to the generator.

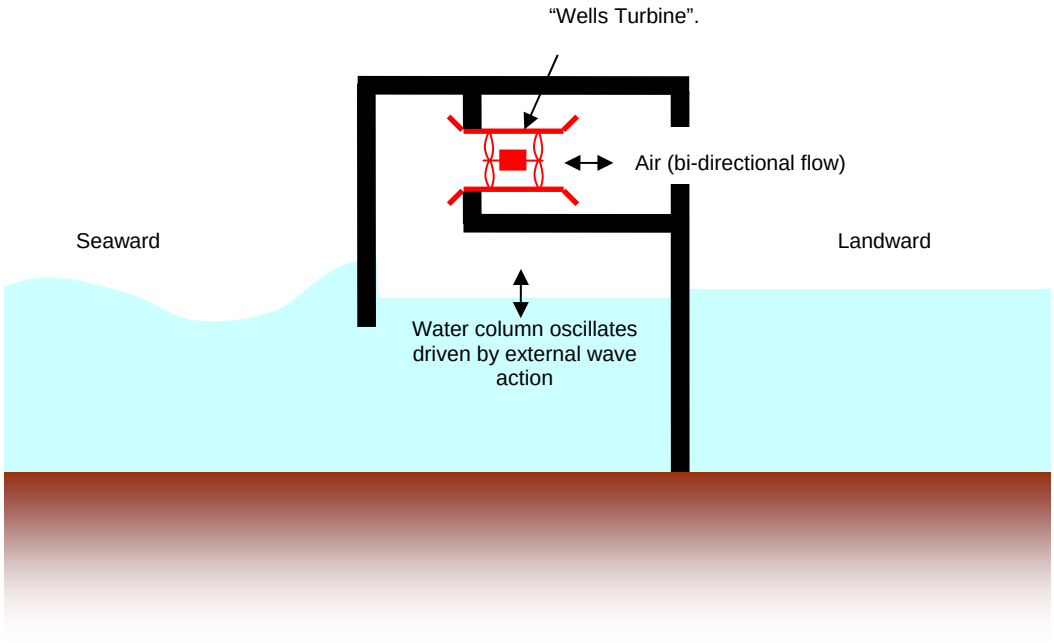


Figure 1-3 Oscillating water column wave energy technology

1.4 Objectives of the Scoping Report

This Environmental Impact Assessment Scoping Report is Voith Hydro Wavegen's written request to the Scottish Ministers, under Regulation 7 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000, the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) and the

Environmental Impact Assessment (Scotland) Regulations 1999 for their opinion as to the information to be provided in the Siadar 2 Environmental Statement.

To ensure knowledge and experience from Siadar 1 is utilised, a 'Scoping Report by Exception' has been produced. Reporting by exception records a deviation from an agreed tolerance level, for example in relation to a project's scope, quality or benefits. An exception report can be used to record either a deviation that has already occurred or one that is expected to occur. In the case of the Siadar Wave Energy Project, the agreed tolerance level is the level of impact predicted from the development of Siadar 1. Deviations in the agreed tolerance level, i.e. predicted impact, may occur due to the development of Siadar 2. This Scoping Report by Exception is based on the information reported in relation to Siadar 1, but identifies differences in the project, baseline environment and predicted impacts between Siadar 1 and Siadar 2. It also takes into account changes and updates in regulatory guidance and legislation since the Siadar 1 consent applications in 2008.

This Scoping Report therefore presents the findings of a gap analysis to determine where information available from studies associated with Siadar 1 may be insufficient for the Siadar 2 Environmental Statement. For each environmental topic, it identifies where previous information is still sufficient and relevant for the assessment of Siadar 2 and where it is deficient due to:

- The changed size and footprint of the project;
- Feedback from regulators on the previous Environmental Statement; and
- Where regulations and expectations have changed since submission of the Siadar 1 Environmental Statement in 2008.

Predicted changes to the baseline or impacts between Siadar 1 and Siadar 2 are discussed in Section 4. Aspects of the environment proposed for assessment are described in Sections 5, 6, and 7.

In summary, the aim of this Scoping Report is to:

- Conduct a preliminary review of the environmental baseline and risks which require more detailed assessment; and
- Provide a framework for consultation and identify the relevant regulatory bodies and statutory and non-statutory stakeholders.

It sets out the scope of the Environmental impact Assessment in terms of:

- The key environmental sensitivities to be assessed;
- The baseline data to be used in the assessment;
- Geographical boundaries;
- The potential environmental impacts that may arise from the proposed activities; and
- The level of assessment to be undertaken in the Environmental Impact Assessment and reported in the Environmental Statement.

2 POLICY AND LEGISLATIVE FRAMEWORK

2.1 Introduction

This section highlights the main policy and legislative instruments which are relevant to the Siadar Wave Energy Project.

There have been a number of changes in policy and legislation since the Environmental Statement produced for Siadar 1 in 2008. Most notably these changes relate to national climate change legislation and policy and consenting requirements in the marine environment including:

- Climate Change (Scotland) Act 2009;
- Climate Change Act 2008;
- Marine (Scotland) Act 2010; and
- Marine and Coastal Access Act 2009.

These legislative instruments and all relevant policy applicable to the Siadar Wave Energy Project are detailed below.

2.2 Energy Policy

2.2.1 International Energy Context

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997) forms the highest level of international agreement on Climate Change across 189 States. In 2005 it set binding targets for 37 industrialised countries and the European Community for reducing greenhouse gas emissions by an average of 5 % against 1990 levels over the five-year period 2008-2012.

At a European level, Directive 2001/77/EC, on the “Promotion of Electricity Produced from Renewable Energy Sources in the Internal Electricity Market", was adopted by the European Community in September 2001. Among other measures, it requires under Article 3 that Member States take appropriate steps to encourage greater consumption of renewable electricity in conformity with national indicative targets.

In January 2008 the European Commission published the "20 20 by 2020" package (COM(2008)30 final). This package proposed committing the European Union to a 20 % reduction in its greenhouse gas emissions and to achieving a target of deriving 20 % of the EU’s final energy consumption from renewable sources by 2020. In order to achieve the overall European Union renewable energy target of 20 % the proposal included individual targets for each Member State (with the UK’s proposed target being 15 %). In January 2008, the European Commission proposed binding legislation to implement the 20-20-20 targets. The “climate and energy package” was agreed by the European Parliament and Council in December 2008 and became law in June 2009. The Renewable Energy Directive (2009/28/EC) also provides for European Climate Change Opportunity, where the Commission set the emissions reduction target at 20 % "rising to 30 % if there is an international agreement".

2.2.2 National Policy

2.2.2.1 UK Energy Policy

The UK’s agreed (legally binding) target under the Kyoto Protocol is to reduce greenhouse gas emissions (comprising six gases, including carbon dioxide) by 12.5 % compared to 1990 levels, averaged over the period 2008 to 2012. The Climate Change Act 2008 introduces into UK law a legal requirement on the UK Government to cut emissions by 80 % compared to 1990 levels by 2050. The UK is a signatory to the EU Renewable Energy Directive, which includes a UK target of 15 % of energy from renewable sources by 2020. 30 % of this energy is expected to have to come from renewable electricity generation (DECC, 2012).

2.2.2.2 Scottish Energy Policy

The Scottish Government has signalled its commitment to tackling climate change and strong support for renewable energy development through both legislation and policy. The Climate Change (Scotland) Act 2009 imposes a legal commitment on the Scottish Government to reduce emissions by 42 % from 1990 levels by 2020 and 80 % by 2050.

In July 2011 the Scottish Government published the 2020 Routemap for Renewable Energy in Scotland (Scottish Government, 2011a). This document builds upon the 2009 Scottish Renewables Action Plan (Scottish Government, 2009). The Scottish Government's stated objective is for the equivalent of 100 % of Scotland's electricity demand to be generated from renewable sources by 2020, with an aim of Scotland generating twice as much electricity as it needs (50 % from renewables and 50 % from conventional sources) and exporting as much as it consumes. The 2020 Routemap for Renewable Energy Scotland (Scottish Government, 2011a) highlights the key role marine renewables will play in meeting these targets and objectives.

2.3 Marine Planning Framework

2.3.1 Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009

The Marine (Scotland) Act 2010 created a new legislative and management framework for the marine environment within Scottish Territorial Waters (0 to 12 nautical miles). This follows the UK Marine and Coastal Access Act 2009 under which Scottish Ministers have devolved authority for marine planning and conservation powers in the offshore region (12 to 200 nautical miles).

2.3.2 Marine Policy Statement - UK

The UK Marine Policy Statement (HM Government, 2011) applies to all UK waters and has been adopted by the UK Government, the Scottish Government, the Welsh Assembly Government and the Northern Ireland Executive. The function of the UK Marine Policy Statement is to provide the framework for preparing Marine Plans and taking decisions affecting the marine environment. All national and regional marine plans must be in conformity with the UK Marine Policy Statement.

The objectives of the UK Marine Policy Statement are given as:

- Promote sustainable economic development;
- Enable the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects;
- Ensure a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets; and,
- Contribute to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

The UK Marine Policy Statement emphasises the importance of renewable energy and recognises the importance of considering marine renewable projects in marine planning, stating that "contributing to securing the UK's energy objectives, while protecting the environment, will be a priority for marine planning".

2.3.3 National and Regional Marine Plans

Under the Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009 the Scottish Government must prepare a National Marine Plan for Scottish Territorial Waters and the offshore zone. The Scottish Government may also choose to prepare Regional Marine Plans.

The National Marine Plan is being developed to clarify the overall objectives which provide the basis for managing Scotland's marine environment. A pre-consultation draft of the National Marine Plan was published in March 2011 (Scottish Government, 2011b) and the responses to the consultation were published in July 2011 (Scottish

Government, 2011c). The responses are now being evaluated although it is hoped a final version will be published in the summer of 2012.

Regional marine boundaries for the Regional Marine Plans are in the process of being formulated. These are expected to be finalised in line with the publication of the National Marine Plan. Thereafter, the Regional Marine Plan preparation process will be undertaken.

2.3.4 Marine Protected Areas

Marine Protected Areas are a requirement of the Marine (Scotland) Act 2010. The purpose of Marine Protected Areas is to afford protection to particular features of the marine environment. There are three categories of Marine Protected Areas, namely "Nature Conservation", "Demonstration and Research" and "Historic". The Scottish Government is currently consulting on suitable areas for Nature Conservation Marine Protected Areas. This has resulted in 31 locations identified for possible designation.

There are no Marine Protected Areas search areas located within the vicinity of the proposed development or indeed the west coast of Lewis. The closest site in the Western Isles is located to the south in the Sound of Harris.

Historic Scotland recently consulted (consultation closed on 27th January 2012) on the proposed process for the selection, designation and management of Historic Marine Protected Areas. It is expected that the final guidelines on selection, designation and management of Historic Marine Protected Areas will be published during 2012. Initial candidate sites are likely to be sites already protected under the Protection of Wrecks Act 1973 and Ancient Monuments and Archaeological Areas Act 1979.

2.4 Terrestrial Planning Framework

The principal planning legislation is contained within and derived from The Town and Country Planning (Scotland) Act 1997. Statutory planning control under the Town and Country Planning (Scotland) Act 1997 relates to onshore development landward of Mean Low Water Springs. The Marine (Scotland) Act covers activities seawards of Mean High Water Springs, so there is a degree of overlap between the marine and terrestrial planning frameworks.

The most relevant of terrestrial planning policies that may apply when addressing this overlap, for the elements of the proposed development which may occur on the foreshore, are those stated within the local statutory development plans including the Western Isles Local Plan (Comhairle nan Eilean Siar, 2008) and the Western Isles Structure Plan (Comhairle nan Eilean Siar, 2003). The Local Plan and the Structure Plan are collectively known as the Development Plan, which determines how the council assesses planning applications. The onshore planning regime is currently undergoing review whereby, in the future, a statutory development plan for the Western Isles will comprise a single Local Development Plan.

Current Local Plan and Structure Plan policies are broadly supportive of renewable energy projects including wave energy developments.

2.5 Environmental Impact Assessment Legislation

The purpose of the EIA Directive (Council Directive 85/337/EEC as amended by Directives 97/11/EEC, 2003/35/EC and 2009/31/EC) is to ensure that the competent authority, in relation to development that is likely to have significant effects on the environment, has appropriate information to enable it to come to a decision on whether or not to grant consent. The EIA Directive sets out procedures that must be followed for such projects before they can be given 'development consent'.

If a development is deemed to need an EIA, environmental information must be provided by the developer in the form of an Environmental Statement. The competent authority cannot grant consent for an EIA development without taking into account an Environmental Statement.

The EIA Directive is transposed into Scots Law via Statutory Instruments known as Regulations. The following Regulations are applicable to the development:

2.5.1 Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2000

The Electricity (Environmental Impact Assessment) (Scotland) Regulations are relevant to those elements of the development which require consent under Section 36 of the Electricity Act 1989 (i.e., the "generating station").

2.5.2 The Marine Works (Environmental Impact Assessment) Regulations 2007

The Marine Works (Environmental Impact Assessment) Regulations are relevant to those elements of the development which require a Marine License under the Marine (Scotland) Act 2010 (i.e., the breakwater, shore connection and, any other materials deposited to the sea and works associated with the seabed).

2.5.3 The Environmental Impact Assessment (Scotland) Regulations 1999

The Environmental Impact Assessment (Scotland) Regulations are relevant to those elements of the development which require planning permission in response to an application under Part III of the Town and Country Planning (Scotland) Act 1997 ("the 1997 Act") (Part II of the Regulations).

2.5.4 Habitats Directive and Birds Directive

The European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) are transposed into Scots Law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in 2004, 2007 and 2008). European sites protected under this legislation include Special Protection Areas (SPA), Special Areas of Conservation (SAC) and RAMSAR sites. The European Habitats Directive aims to promote the maintenance of biodiversity by requiring EU Member States to maintain or restore representative natural habitats and wild species at a favourable conservation status, through the introduction of robust protection for those habitats and species of European importance.

2.5.5 Habitats Regulations Appraisal and Appropriate Assessment

Habitats Regulations Appraisal is an iterative process which aims to determine whether plans or projects are likely to have any significant effects and, if necessary, assess adverse impacts on the integrity of European sites. Appropriate Assessment is one stage of this process. The first stage of the Habitats Regulations Appraisal process is screening to identify the European sites that will require an Appropriate Assessment. A Competent Authority shall make an Appropriate Assessment of the implications for a site in view of that site's conservation objectives, before deciding to undertake or give any consent, permission or other authorisation for, a plan or project which:

- Is likely to have a significant effect on a European site in the UK (either alone or in combination with other plans or projects); and,
- Is not directly connected with or necessary to the management of the site.

The need for Appropriate Assessment may extend to plans or projects outwith the boundary of the site. Competent Authorities need to identify the qualifying interests and the conservation objectives for each European site involved in an Appropriate Assessment.

2.5.5.1 European Protected Species

For any European Protected Species, Regulation 39 of the Conservation (Natural Habitats, &c.) Regulations 1994, makes it an offence to deliberately or recklessly capture, kill, injure, harass or disturb any such animal. It is also an offence to deliberately or recklessly obstruct access to a breeding site or resting place of any such animal, or otherwise to deny the animal use of the breeding site or resting place. In addition, it is an offence to disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs. For cetaceans (dolphins, porpoises and whales) only, there is a more general offence related to the deliberate or reckless disturbance of these creatures. The damage or destruction of a breeding site or resting place of any European Protected Species is an offence of strict liability. An EPS Licence is required for any activity that might result in disturbance to a European Protected Species.

2.6 Consent Applications

Table 2-1 provides a list of the consent applications that will be supported by the Environmental Statement.

Table 2-1 Consent applications that will be supported by the Environmental Statement

Works	Consent	Description	Determining Authority
Generating station	Consent under Section 36 of the Electricity Act 1989	Section 36 consent is required for development of offshore generating stations over 1MW within Scottish territorial waters.	Scottish Ministers (through Marine Scotland)
On-shore development	Deemed Planning Consent under Section 57 of the Town and County Planning (Scotland) Act 1997	Consent for the development associated with the generating station that would otherwise require Planning Consent.	Scottish Ministers
On-shore development	Planning Consent under the Town and Country Planning (Scotland) Act 1997, as amended by the Planning etc (Scotland) Act 2006 Section 36	Separate consent may be required for development landward of Mean Low Water Springs. This is only applicable if the Deemed Planning route is found to be inappropriate.	Comhairle Nan Eilean Siar
Breakwater, shore connection and associated works	Marine Licence under Section 25 of the Marine (Scotland) Act 2010	Consent under a Marine Licence covers construction and deposit of structures below Mean High Water Springs. This covers the following areas of the development: > Deposit of objects on the seabed; > The deposit of objects under the seabed, e.g. cables to shore with directionally drilled boreholes; and > Construction on and under the seabed, e.g. drilling for mooring piles (if required).	Scottish Ministers (through Marine Scotland
None	Energy Act 2004	The development is permanently connected to the shore and is therefore excluded from the Energy Act (Section 3.6)	Secretary of State (Department of Energy and Climate Change)

3 PROJECT DESCRIPTION

3.1 Introduction

An overview of the Siadar Wave Energy Project is provided in Section 1.1, including descriptions of Siadar 1 (already consented) and Siadar 2 (the proposed development). This section provides further details of Siadar 2 and where appropriate briefly describes Siadar 1.

As described in Section 1.1, only one shore connection and one control building is required for Siadar Wave Energy Project. Siadar 1 and Siadar 2 both include this infrastructure, but only one will be built. This Scoping Report is prepared on the basis that the shore connection and control building is as per the Siadar 2 development, but that the supply of material is covered by the existing Siadar 1 consent.

The design and construction methods for Siadar 2 are still being developed. The descriptions of the design and construction methods described in the Scoping Report reflect the most up-to-date information available. It is unlikely that there will be a change to the overall principles, but some details could change.

3.2 Rochdale Envelope

Throughout the EIA process, the approach is to assess the maximum potential impacts (also sometimes referred to as a 'worst case'). This approach has been established through relevant case law and is referred to as the 'Rochdale Envelope'[1]. These case precedents have established a custom and practice that has evolved in relation to projects where the final design is not available at the consent application stage. This approach has been confirmed by the courts and endorsed by the Scottish Government as enabling compliance with the legal requirements of the relevant EIA regulations, as long as appropriate conditions are placed in the resulting consents to ensure that the maximum potential impacts will not be exceeded by the final built development, and the development will not give rise to a likely significant effect on the environment that has not been assessed.

The commercial wave energy industry is evolving rapidly, with ongoing improvements in Wave Energy Converter technology, infrastructure and installation techniques. The Rochdale Envelope approach provides essential flexibility to enable projects to take full advantage of these improvements. To commit to a detailed development design at consent application stage would also prevent the development benefiting from the lessons learned from other work being done in the wave industry, including the continued testing of the proposed wave technology. The Rochdale Envelope approach allows the detailed design of the development to vary within specific defined parameters.

3.3 Project Aspects

3.3.1 Introduction

The following sub-sections describe the key aspects of Siadar 2, with reference where appropriate to Siadar 1.

3.3.2 Shore Connection (Causeway and Jetty)

The shore connection provides vehicular access to the breakwater for construction and operation purposes and will incorporate a slipway suitable for small vessels.

The shore connection landward of low tide will be a rubble mound causeway covered in amour units which will be cast on site. These units will be 'x-bloc' or similar, an example of which is shown in Figure 3-1. Seaward of low tide will be a jetty supported by steel piles grouted into holes drilled approximately 5 m into the seabed.

The shore connection is located close to the outfall from Scottish Water's treatment works. Improvement or strengthening works to the outfall may be required.

[1] The 'Rochdale Envelope' arises from two cases: R. v Rochdale MBC ex parte Milne (No. 1) and R. v Rochdale MBC ex parte Tew [1999] and R. v Rochdale MBC ex parte Milne (No. 2) [2000]

Figure 3-1 X-bloc examples shown for illustrative purposes

3.3.3 Breakwater Technology and Structure

The Siadar 2 breakwater will incorporate the oscillating water column wave energy technology as described in Section 1.3. The breakwater will be a reinforced concrete structure up to approximately 1,176 m long with a crest level of approximately 11.5 m above chart datum (approximately 7.3 m above Mean High Water Springs). The breakwater will comprise approximately 98 oscillating water column cells, each approximately 12 m wide, and will be a solid complete structure. Small gaps may be introduced along the length to allow for a change in breakwater orientation, for breaks during construction, and if there is an unsuitable area of seabed. The gap widths will probably be less than one collector cell.

The breakwater will be anchored with steel piles grouted into pre-drilled holes in the seabed and will adopt the same method proposed to construct the jetty for the shore connection. Within each collector cell will be two Wells Turbines. The components of the collector cell are illustrated in Figure 3-2.

The turbine is located between the oscillating water column chamber and an Exit Plenum. The Exit Plenum is a room situated between the turbine and the outside environment. Exit plenums contain an opening to the outside environment to allow air to enter/exit the system. Noise attenuation measures will be installed in the exit plenums if required.

The turbines will be operated in groups, each of which will be connected to an Inverter Room. The Inverter Rooms will contain electrical inverters, heating, ventilation and air conditioning systems, transformers and other electrical equipment. An access corridor will also run throughout the length of the breakwater to allow access to all Inverter rooms.

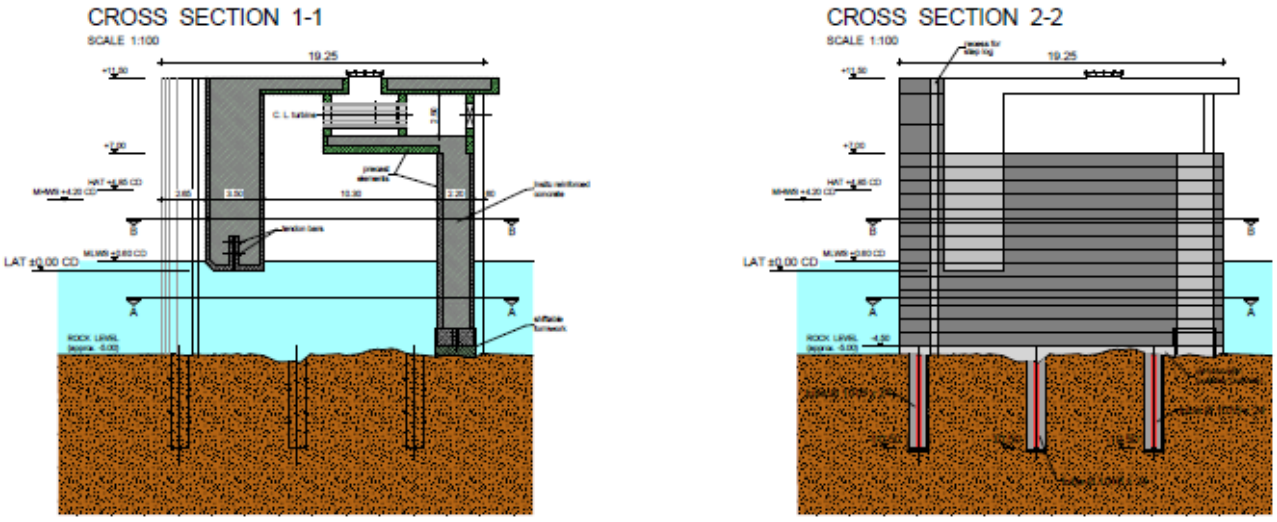


Figure 3-2 Cross sections showing the components of the breakwater collector cells

3.3.4 Parallel Access Jetty

An access jetty will be constructed along the landward side of the breakwater. The design and construction will be similar to the jetty associated with the shore connection.

The parallel access jetty provides access for construction plant to immediate locations along the breakwater, thus facilitating construction at multiple work faces. On completion of construction, the jetty may be retained as permanent access, or it may be removed.

3.3.5 Site Access Road

Access to the site for Siadar 1 and Siadar 2 is via the public road through Baile an Truiseil from the A857. Improvement of this road will require widening to approximately 7m where possible and provision of passing places where this isn't achievable due to presence of walls and buildings adjacent to the road. Road strengthening works may also be required.

The public road will be maintained in a serviceable condition at all times. On completion of construction it will be reinstated to a condition similar to or better than condition present prior to construction.

3.3.6 Control Building

A control building will be located to the south of the River Siadar and will be similar in style and dimensions to the Siadar 1 control building. The internal layout and contents may differ slightly to accommodate the mechanical and electrical requirements of a larger project.

3.3.7 Site Compound

A 5 ha construction site compound was consented with Siadar 1. The same site compound will be utilised for Siadar 2. The activities within the site compound for Siadar 2 will be similar to those for Siadar 1.

3.3.8 Borrow Pit

A borrow pit was consented with Siadar 1. It will probably not be required for Siadar 2.

3.3.9 Power and Communications Cables

The power/communications cables which are a component of Siadar 1 and Siadar 2 will run from the breakwater to the control building. The horizontal alignment of the cables will follow the shore connection. The cables will be below ground from the control building to the seaward end of the causeway; seaward of this the cables will be attached to the deck of the jetty.

3.3.10 Grid Connection

A grid connection will be provided at the control building and a new (predominantly overhead) line will be installed from the sub-station at Barvas. The grid connection and any associated grid reinforcement works are subject to separate consents and approvals process and are therefore not part of this Scoping Report.

3.3.11 Working hours

The following maximum working hours are proposed:

- Offshore (seaward of Mean Low Water Springs) 24 hrs / 7 days;
- Onshore (landward of Mean Low Water Springs) 07:00 to 20:00 Monday to Saturday.

There may be limited work outside the onshore hours where required to support the offshore work.

The sensitivities of Sunday working on the Isle of Lewis are recognised. The 7-day working proposal above is driven by the need to maximise the use of expensive plant and equipment.

3.3.12 Exterior lighting

Active areas of the construction site will be illuminated during the working hours identified in Section 3.3.11. In addition, there may be 24-hour security lighting in critical areas.

During operation, navigation lights on the breakwater, occasional lighting at the control building and temporary lighting during maintenance may be required.

3.4 Construction Methodology

3.4.1 Shore connection causeway

The general principle adopted for the project is 'build from land', which means that the majority of construction work is relatively unaffected by sea conditions.

To construct the causeway on the intertidal zone some preparation of the ground will be required to allow for the receipt of materials and to provide a suitable base on which to build the causeway. The intertidal area will be cleared of cobbles and other loose material and will be re-distributed in the local area.

The causeway will be constructed using land based plant working on and adjacent to the structure during the low tide period. The sequence of construction activities involves delivery of material to the workface from the construction compound by dump truck then placement of core material by an excavator. Larger rock is then placed on top of the core by an excavator. 'X-blocs' are then placed individually on the outside of the rubble mound profile by crane to provide stability and protection. Plant, machinery and stockpiles will be maintained in the construction compound and positioned on the foreshore either side of the structure when required. It is unlikely that materials will be stockpiled on the foreshore area.

Materials for the shore connection causeway will be obtained from the borrow pit, which is already consented as part of Siadar 1.

3.4.2 Shore connection jetty

The shore connection jetty will be constructed using land-based plant situated on the already completed jetty spans (or initially on the causeway). For each jetty span the construction sequence will be:

- Drill two holes in the seabed;
- Install the piles;
- Grout the annulus between the pile and the hole to secure the pile; and
- Install the jetty deck.

The crane then moves forward on the completed jetty span to repeat the process.

Installation of the piles is undertaken as follows;

- From the already installed jetty span a crawler crane lowers a casing to the seabed. The casing will be approximately 18.5 m long with a diameter of approximately 1.2 m and will be fitted with a cutting bit. The casing is positioned where the hole is to be drilled and oscillated so it is drilled into the seabed a small distance.
- A drill rig and drill string is then fitted to the crane and lowered down through the casing to drill a hole in the seabed to approximately 5 m below seabed level.
- The drill string and drill rig are then removed from the crane and a pile is installed and positioned into the hole through the casing.
- The piles are filled with concrete and grouted into place while the casing is still in position.

- The casing is removed and the process is repeated for the next section of jetty span. The rate of drilling is estimated to be approximately 0.3 m per hour.

Pile drilling and grouting will take place within the temporary casing to guide the drilling operation and pile installation and to contain drill cuttings and grout. Drill cutting arisings will be pumped up from the cutting head and collected at a sedimentation tank located on the jetty. Processed water will be discharged to the sea and the settled material will be disposed of.

The supply of materials for the jetty is already consented as part of Siadar 1.

3.4.3 Parallel access jetty

The parallel access jetty will be installed along the landward side of the breakwater using the same construction method as that described above for the shore connection jetty (Section 3.4.2).

3.4.4 Breakwater

The breakwater will be constructed using land-based plant situated on top of the structure.

Any significant seabed irregularities will be levelled over the entire breakwater footprint using a rock grinding attachment such as those supplied by Erkat©, mounted on an excavator. An example rock grinding attachment is shown below in Figure 3-3. All cuttings generated during this operation will be discharged to sea. It is assumed that it will take approximately one day to level the seabed required for one collector cell.

Figure 3-3 Example rock grinding attachment for seabed levelling

When the seabed is levelled (as confirmed by survey) piles and a temporary deck will be installed following the same method as described for the jetty (Section 3.4.2). Pre-cast concrete units will be craned over the top of the piles to form the walls of the cells. Gaps between the seabed and the bottom of the collector cell walls will be filled with grout bags or similar.

When the pre-cast concrete units have been installed they will be clamped together with steel tensioning rods. In-situ concrete will then be poured into and contained within the precast concrete unit voids. Mechanical and electrical equipment will then be craned into position.

Commissioning will take place in stages when parts of the structure are complete.

3.4.5 Mechanical and electrical equipment and commissioning

Mechanical and electrical equipment will be installed as the civil engineering structure is completed. Commissioning will then follow.

3.4.6 Delivery of plant and materials

Materials will be delivered by road and by sea. Materials delivered by road will be stored in the construction compound and transported to the work areas as and when required. Materials delivered by sea will be craned directly onto the shore connection jetty or the breakwater. If necessary they may be transported to the onshore site compound for temporary storage.

The principle quantities of materials required for Siadar 2 are provided in Table 3-1. For comparative purposes, the table also includes a summary of the principle quantities for Siadar 1.

Table 3-1 Approximate quantities of materials required for Siadar 1 and Siadar 2

Item	Siadar 1	Siadar 2	Most likely source and transport option for Siadar 2
Causeway			
X-bloc armour	8,100 tonnes 1,172 units (each unit 7.2 tonne / 3.0 m^3)	8,100 tonnes 1,172 units (each unit 7.2 tonne / 3.0 m^3)	Pre-cast on site.
Rock (1.5 tonne)	3,800 m^3	3,800 m^3	Siadar 1 borrow pit
Rock (0.3 to 1.0 tonne)	14,200 m^3	14,200 m^3	Siadar 1 borrow pit
Rock (0.15 tonne)	3,400 m^3	3,400 m^3	Siadar 1 borrow pit
Rock (quarry run)	8,900 m^3	8,900 m^3	Siadar 1 borrow pit
Jetty			
Steel piles	32 circular hollow piles 219 tonnes (1,016 mm dia x 14.2 mm thick x 18 to 22 m long)	32 circular hollow piles 219 tonnes (1,016 mm dia x 14.2 mm thick x 18 to 22 m long)	Transport by road from Stornoway.
Grout in annulus between pile and drilled hole	50 m^3	50 m^3	Transport by road from Stornoway.
Other structural steel	384 tonnes	384 tonnes	Transport by road from Stornoway.
Pre-cast concrete deck	306 m^3 240 No x 3.2 tonnes	306 m^3 240 No x 3.2 tonnes	Pre-cast on site
Abutment	25 m^3	25 m^3	To be confirmed
Insitu concrete as infill to piles	478 m^3	478 m^3	To be confirmed
Breakwater	**15 cells, 200 m**	**98 cells, 1,176 m**	
Steel piles	48 circular hollow piles 620 tonnes (1,000 mm dia x 24 mm thick x 22 m long)	294 circular hollow piles 3,798 tonnes (1,000 mm dia x 24 mm thick x 22 m long)	Transport by road from Stornoway.

Item	Siadar 1	Siadar 2	Most likely source and transport option for Siadar 2
Grout in annulus between pile and drilled hole	136 m^3	833 m^3	Transport by road from Stornoway.
In situ concrete as infill to piles	215 m^3	1,317 m^3	Transport by road from Stornoway.
Pre-cast concrete units	9,787 m^3 535 units x 56 tonne	63,942 m^3 3,495 units x 56 tonne	Siadar 2: transport by sea
Grout bags (for gap between collector and seabed)	720 m^3	4,704 m^3	Transport by road from Stornoway.
In situ concrete	12,536 m^3	81,902 m^3	Transport by road from Stornoway.
Structural steel reinforcement for *in situ* concrete (front and back of collector)	1,048 tonnes	6,847 tonnes	Transport by road from Stornoway.
Structural steel reinforcement for *in situ* concrete in piles	205 tonnes	1,256 tonnes	Transport by road from Stornoway.
Structural steel reinforcement for pre-cast units	1,958 tonnes	12,792 tonnes	Transport by road from Stornoway.
Turbines	30	196	Transport by road from Stornoway.
Parallel access jetty			
Steel piles	N/A	196 circular hollow piles 1,341 tonnes (1,016 mm dia x 14.2 mm thick x 18 to 22 m long)	Transport by road from Stornoway.
Grout in annulus between pile and drilled hole	N/A	306 m^3	Transport by road from Stornoway.
Other structural steel	N/A	2,509 tonnes	Transport by road from Stornoway.
Pre-cast concrete deck	N/A	3,998 m^3 3,136 x 3.2 tonnes	Transport by sea
In situ concrete as infill to piles	N/A	2,928 m^3	Transport by road from Stornoway.

Either the Siadar 1 shore connection or the Siadar 2 shore connection will be constructed, but not both (Section 3.1).

The rate of ready mix supply i.e. road transport for the Siadar 2 *in situ* concrete will be of the order of 400 m^3 / wk. For Siadar 2 pre-cast concrete units will be imported so there is no requirement for a ready mix supply of concrete.

The concrete demands for Siadar 2 shore connection (primarily pre-cast x-blocs) will be met by the Siadar 1 on-site facilities.

3.5 Operation

The operational life of Siadar 2 is anticipated to be approximately 35 years. The Siadar Wave Energy Project will generally operate 24 hours a day with the exceptions of shut downs to undertake inspection, maintenance and repairs or other exceptional circumstances. The plant will be operated remotely and there will be no full time staff present on the site.

Table 3-2 summarises planned operation and maintenance activities:

Table 3-2 Planned operation and maintenance activities

Activity	Typical frequency
Monitor performance and energy output (remote monitoring)	Continuous
Routine maintenance visit for general inspection and undertaking minor maintenance	Monthly
Through inspection of the offshore mechanical and electrical equipment	Annually
Empty septic tank at control building	Annually
Interim structural inspection of readily accessible parts of the breakwater and shore connection	2 years
General maintenance and repair of the control building	5 years
Replace turbine rotors and generator bearings	5 years
Full structural inspection of the breakwater, including inside OWC chambers requiring small vessels, ROV and divers	10 years

3.6 Decommissioning

There are a number of factors and options that will determine the decommissioning strategy for Siadar 2. The most likely decommissioning options will be considered and assessed as part of the EIA processes and reported in the Environmental Statement.

A Decommissioning Programme, (including the assessment of environmental impacts associated with decommissioning) will be developed. The Decommissioning Programme will be drafted prior to the commencement of installation and updated nearer the time of actual decommissioning once specific details of the decommissioning procedures are available.

It is likely that, all onshore facilities will be removed to approximately 0.5 m below land level and all offshore facilities will be removed to the seabed. Legacy uses of the development may be considered but are not included within the current development proposal.

3.7 Programme

The following is a summary of the key milestones in the Siadar Wave Energy Project:

Commence construction (Siadar 1)	Autumn 2012
Commission first 4 MW (Siadar 1)	Spring 2015
Commission up to 20 MW (SIadar 2)	April 2017
Commission up to 30 MW (Siadar 2)	2021
Decommissioning (Siadar 1 and Siadar 2)	2046

Due to the potential for adverse weather and sea conditions it is unlikely that there will be offshore work during the period 1st November to 28th February. The onshore work during this time will also be limited.

4 DIFFERENCES BETWEEN SIADAR 1 AND SIADAR 2

4.1 Introduction

As described in Section 1.4, the objective of the 'Scoping Report by Exception' is to ensure knowledge and expertise gained from the studies undertaken for Siadar 1 is utilised. As a consequence, baseline information described below is drawn from the studies undertaken for Siadar 1. The scope of the Siadar 2 Environmental Statement will thus be derived from the knowledge gained from the Siadar 1 studies, changes in the size and duration of development proposals between Siadar 1 and Siadar 2, and changes to potential impacts.

The studies undertaken for Siadar 1 provide a good background to the nature and type of issues likely to be encountered throughout the development of Siadar 2. Consequently, those environmental topic areas which are not considered to have the potential to experience significant effects or are not predicted to change compared with the Siadar 1 assessment are not included in this Scoping Report by Exception and are therefore not proposed for inclusion in the Siadar 2 Environmental Statement.

The aim of this section is to highlight the difference between Siadar 1 and Siadar 2 in the baseline environment and the predicted impacts. Where changes in impacts are predicted, the nature of the change and the reasons for it are described. The information is set out in table format for ease of presentation.

4.2 Onshore footprint

The onshore footprint for Siadar 2 is similar to that for Siadar 1.

The time over which some of the onshore footprint aspects, i.e. construction compound and Baile an Truiseil access road, will be required will increase due to the longer construction period required for Siadar 2.

4.3 Offshore footprint

The offshore footprint is increased due to the larger breakwater proposed for Siadar 2 compared with the Siadar 1.

4.4 Potential for Differences in Baseline Environment and Predicted Impacts

EIA topic	Baseline environment changes	Predicted impact changes
Terrestrial Ecology	May have occurred due to ecological changes since the previous application. Terrestrial survey will result in an update to the baseline description.	May result due to the increased time over which onshore facilities are required over the construction period. May result due to the presence of sensitive receptors.
Fish Ecology	Unlikely based on availability of existing baseline data for the area. Desk study will result in an update to the baseline description.	May result due to the increased time over which onshore facilities are required over the construction period.
Benthic Habitats and Ecology	Site-specific environmental conditions were obtained from desk study information and survey data collected during the previous application. Marine ecology site survey and intertidal survey will result in an update to the baseline description.	May result due to the increased spatial extent of the Siadar 2 breakwater and increased time over which intertidal areas will be utilised during the extended construction period. May result due to the presence of previously unknown sensitive receptors.

EIA topic	Baseline environment changes	Predicted impact changes
Coastal Processes	Unlikely due to the long-term patterns characteristic of coastal processes.	May result due to the increased spatial extent of the Siadar 2 breakwater.
Landscape, seascape and visual	May have occurred due to changes since the previous application including appearance of new developments. Site survey will result in an update to the baseline description.	May result due to the increased spatial extent of the Siadar 2 breakwater present during operation. May result due to the change in location of the jetty, shore connection and control building. May result due to the presence of additional sensitive receptors.
Transport and Access	May have occurred due to changes since the previous application. Desk study will result in an update to the baseline description.	May result due to the increased duration of the construction phase for Siadar 2. May result due to the presence of additional sensitive receptors.
Tourism and Recreation	May have occurred due to changes since the previous application. Desk study will result in an update to the baseline description.	May result due to the increased duration of the construction phase for Siadar 2 and the increased size in breakwater present during the operational phase. May result due to the presence of additional sensitive receptors.
Onshore Noise	May have occurred due to changes since the previous application. Desk study will result in an update to the baseline description.	May result due to the increased duration of the construction phase for Siadar 2 and the greater number of wave energy devices being deployed during the operational phase. May result due to the presence of additional sensitive receptors.
Underwater Noise	Unlikely due to the nature of the existing baseline environment.	May result due to the increased duration of the construction phase for Siadar 2 and the greater number of wave energy devices during the operational phase. May result due to the presence of additional development in the area.
Surface Water and Hydrology	Unlikely due to the nature of the existing baseline environment.	May result due to the increased duration of the construction phase for Siadar 2.
Terrestrial and Marine Cultural Heritage	Unlikely due to the nature of the existing baseline environment. Site survey will result in an update to the baseline description.	May result due to the increased duration of the construction phase for Siadar 2 and the increased size in breakwater present during the operational phase. May result due to the presence of additional sensitive receptors.

5 PHYSICAL ENVIRONMENT

5.1 Surface Water and Hydrology

5.1.1 Existing environment

The proposed development is to be located on the exposed northwest coast of Lewis adjacent to the village of Siadar. It is approximately 27 km (17 miles) northwest of Stornoway, the main town on Lewis. This area of Lewis, along with other parts of the Western Isles, offers the greatest coastal wave energy resource in the UK (DTI, 2004; Marine Energy Group, 2004).

The Isle of Lewis is relatively low-lying with the highest point in north Lewis being recorded on Beinn Mholach at 292 m (958 ft) above sea level. The interior is dominated by boggy moorland which forms extensive inland areas of north Lewis. Some of the land in the vicinity of Siadar is classified as locally important agricultural land (Western Isles Local Plan, 2008).

The coastal zone adjacent to Siadar consists of a small rocky bay backed by a cobble beach, areas of exposed bedrock and small cliffs <2 m in height. The area consists of shallow peat and moraine till overlaying Lewisian Gneiss (BGS, 1991; BGS and Theadgould, 1997; Lewis Wind Power Limited, 2004). Some granite is also present at the southwest edge of Siadar Bay but no evidence of peat exists at the beach edge (Lewis Wind Power Limited, 2004).

The Soil Survey of Scotland map (Macaulay Land Use Research Institute, 2010) shows that northern central Lewis is covered in blanket peat. The remaining cover of soils is generally non-calcareous humic gleys. Isolated patches of forest soils and alluvium also exist in various locations near to the coast in northern Lewis.

The Siadar Wave Energy Project construction site lies close to three catchments:

- Loch Dubh na h-Airde catchment – this very minor catchment is located to the southwest of the proposed development area lying on the lower slopes of the Tom a Mhinister;
- Feadan Siorrabhaig catchment – this very small catchment is immediately to the southwestern extremity of the proposed development site, lying on the north facing slopes at the head of Tom a Mhinister; and
- River Siadar catchment – this flows northwest from its furthest headwater of Loc nana Leac. The channel runs in a wide mature valley, typical of many catchments flowing out along the northwestern coast.

The River Siadar (Abhainn Shiadair) was classified as ‘good’ overall by SEPA (SEPA, 2010). As reported in the Environmental Statement produced for Siadar 1, the coastal strip in the vicinity of the proposed development was classified as ‘A Excellent’ according to SEPA’s coastal classification scheme. SEPA confirmed at the time that no chemical water quality information was available for the other streams in the survey area.

5.1.2 Key issues identified

- Disturbance to surface water resources including the River Siadar; and
- Disturbance to surface flows related to onshore construction work.

5.1.3 Approach to EIA

The previous Terrestrial Geology, Hydrology and Hydrogeology assessment undertaken for Siadar 1 covers construction, operation and decommissioning phases and identifies effects/mitigation for surface water, ground water and water users.

No survey is proposed as part of Siadar 2 as the onshore footprint is not anticipated to change between Siadar 1 and Siadar 2.

Updated baseline information for Siadar 2 will be used to inform the EIA study and to update the Terrestrial Geology, Hydrology and Hydrogeology chapter within the Environmental Statement. For Siadar 2 the chapter will be renamed 'Surface Water and Hydrology' to highlight the change in emphasis compared with Siadar 1.

Data requirement	Outline survey or data collection method	Other data sources
Characterisation of the surface water and hydrological conditions at the site.	High level walkover survey to appraise the current nature of the surface water and hydrology in the region. Assessment based predominantly on Siadar 1 studies.	Consultation input.

5.2 Coastal Processes

5.2.1 Existing environment

Seabed surveys were carried out in 2006 and 2011 by Aspect (2006, 2011). The survey scopes included a bathymetry survey of the bay and collection of seabed video footage.

5.2.1.1 Bathymetry

The seabed slopes gradually from the Mean Low Water Springs mark at an appropriate gradient of 1.0° (1:35 to 1:50) and reaches approximately 28 m water depth 1,400 m from the shore. The water depth at the breakwater location is approximately 8 m (5 m LAT) at mean sea level and the near shore seabed is shallow and primarily a continuation of bedrock (Aspect, 2006).

5.2.1.2 Coastal and seabed geology and surface sediment

The seabed is composed mainly of exposed, jagged, kelp-covered rocks interspersed with small areas of sand. The rock has long, linear features with many fissures that in places are up to 3 m wide and approximately 50 m in length. Many of the crevices and gullies between the rock outcrops are filled with both coarse and fine sand.

Areas of broken rocks and boulders are evident in the infralittoral and towards the southeast of the study site.

The shoreline adjacent to the breakwater location comprises a small rocky bay, backed by a cobble beach with areas of exposed bedrock and low cliffs. There are several bedrock outcrops, particularly at either side of the bay and along the adjacent coastline. These are interspersed by more cobble beaches and eroding cliffs.

5.2.1.3 Tides

Carloway (15 miles southwest of Siadar) has a spring tidal range of 3.6 m and a neap tidal range of 1.6 m (HR Wallingford, 2000). The area is also exposed to high energy waves and storm surges that can cause tidal levels to be higher (British Geological Survey, 1997). The flood tide runs southwest to northeast and the ebb tide runs in the opposite direction. The tidal currents are low velocity (HR Wallingford, 2000).

5.2.1.4 Waves

The western coasts of the Western Isles are exposed to winds and open offshore waters of the North Atlantic Ocean, and in turn produce high energy waves. Wave heights are known to exceed 3 m for over 10 % of the time and 1 m for 75 % of the time (Draper, 1991). The predicted 50 year wave height is approximately 35 m of the west coast of the Western Isles, which is significantly greater than other parts of the UK (Lee and Ramster, 1981).

5.2.1.5 Wind

Unsheltered areas of the west coast of the Isle of Lewis are frequently exposed to strong southerly and southwesterly winds and gales. The Western Isles is noted as being one of the windiest places in the U.K. For 75

% of the time wind speeds can exceed 4 m/s and 0.1 % of the time wind speed can exceed 20 m/s at more exposed locations (British Geological Survey, 1997).

5.2.2 Key issues identified

> Wave diffraction and reflection during operation;

> Wave climate effects on coastal morphology i.e. effect of construction on localised erosion; and

> Reduced dispersion and sheltering effects due to the breakwater extension.

5.2.3 Approach to EIA

The assessment undertaken for Siadar 1 included an assessment of impacts on offshore hydrodynamic processes and prevailing coastal processes at the shoreline, (for construction, operation and decommissioning phases of the project).

Assessment of the coastal environment was undertaken to determine effects on wave climate, erodability of the coastline and other relevant factors.

In terms of survey requirement for Siadar 2, explicit sediment modelling is assumed to not be required based on the results of consultation during the Siadar 1 studies. Wave modelling will be undertaken as an extension to the existing wave resource study. This information will be used to update the coastal processes baseline.

High resolution bathymetric data are available from surveys undertaken by Aspect.

Updated coastal processes baseline information for Siadar 2 will be used to inform the EIA study and update the coastal processes chapter within the Environmental Statement. The field visit will be used to collect further infield data for the Siadar 2 coastline.

Data requirement	Outline survey or data collection method	Other data sources
Characterisation of the coastal geology and its present rate/state of erosion at the site.	High level walkover survey to appraise the current nature of the coastal geology in the region. Updated wave modelling as an extension to the existing wave resource study. Assessment based predominantly on Siadar 1 studies.	Wave modelling outputs for the Siadar 2 project. Consultation input.

5.3 Underwater Noise

5.3.1 Existing environment

Baseline underwater noise levels will be estimated based on noise measurement exercises undertaken at other acoustically similar sites in the UK using a similar approach to that adopted for the Siadar 1 Environmental Impact Assessment.

5.3.2 Key issues identified

It is considered that the key issues will be the effects of noise on wildlife (and in particular marine mammals) for the following aspects:

> Operational noise due to turbines; and

- Construction noise and in particular noise due to pile drilling and rock grinding.

5.3.3 Approach to EIA

The Siadar 1 study includes an analysis of construction and operational noise. The Siadar 2 study will include a reassessment of noise from construction and operational activities of the Siadar 1 and Siadar 2 combined.

No survey is proposed however baseline conditions will be estimated based on noise measurements made at other acoustically similar sites in the UK.

The approach to the Siadar 2 assessment will be as follows:

- Estimate baseline underwater noise levels;
- Determine construction underwater noise levels based on the construction method statement and undertake a noise impact assessment based on criteria derived from relevant guidance (JNCC guidelines);
- Determine operational noise levels based on airborne measurements and using underwater noise propagation modelling;
- Compare predicted operational noise levels against baseline noise levels and undertake a noise impact assessment based on criteria derived from relevant guidance;
- If necessary, develop mitigation measures to reduce impact to as low as reasonably practicable; and
- Undertake assessment of residual impact and cumulative impact with any other developments in the vicinity.

Data requirement	Outline survey or data collection method	Other data sources
Establish expected underwater noise conditions likely during construction and operation of the proposed development.	No survey proposed. Assessment to be based on assessment undertaken for Siadar 1.	Sound power level data for turbines. Consultation input.

6 BIOLOGICAL ENVIRONMENT

6.1 Terrestrial and Marine Habitats and Species (excluding benthos and fish)

6.1.1 Existing environment

6.1.1.1 Terrestrial Habitats

West Coast Energy undertook an environmental baseline survey at Siadar using Phase 1 survey methodology (JNCC, 1993) during September 2006 (West Coast Energy, 2006a). Habitats in and adjacent to the proposed area of the development include coastal grassland, semi improved acid grassland, heath/mire, blanket bog and several wetlands. These habitats have been modified by grazing, cutting, drainage and agricultural practices.

The survey did not identify any priority species of plant listed by the EC Habitats Directive or the Wildlife and Countryside Act 1981, and there are no national or international designations in the area. There are however several species known from the Siadar area, which are listed in the Western Isles Local Biodiversity Action Plan . These include several mammal species (e.g. otter, harbour porpoise, baleen whales, small dolphins, toothed whales, and harbour and grey seals) and turtles.

Crofting 1 is the dominant land type in the area surrounding Siadar (Richards, 1998); however, boggy moorland is present nearby with an area of machair to the south.

6.1.1.2 Birds

There are no specific conservation designations relating to birds within the immediate Siadar area, although there are internationally important breeding bird populations within approximately 3 km of the Siadar area. These include the Lewis Peatlands RAMSAR and SPA and the Barvas SPA.

A breeding bird survey of the shore areas of Siadar and Baile an Truiseil was carried out as part of the Siadar 1 EIA (Rothwell, 2007). The survey area included the foreshore and some of the croftland and common grazings of the townships of Siadar and Baile an Truiseil. The survey was undertaken between the 31st May 2007 and the 30th June 2007.

The survey identified breeding birds of various species including; common gull, curlew, lapwing, oystercatcher, redshank and snipe. Other species are known from the area, but were not identified from the survey; including red-throated divers, black-throated divers, corncrake and eider ducks among others. None of the breeding bird populations found on the site represented more that 0.1 % of the UK breeding population.

Grasslands in the Western Isles are internationally important for the breeding corncrake, a globally threatened bird (Heredia *et al*, 1996). Previous studies of corncrake distribution have shown them to be close by to Siadar, but are more likely to be found inland than at the coast.

This agrees with the observation of a calling corncrake heard approximately 500 m in land from the survey area during the bird survey (Rothwell, 2007).

6.1.1.3 Otters

The Eurasian otter is protected by national and international legislation. It is an offence to disturb, kill, trap or harm the animal or damage or disturb its resting, feeding and breeding sites. The otter is listed on Appendix I of CITES, Appendix II of the Bern Convention and Annexes II and IV of the European Habitats Directive. It is protected under Schedule 5 of the Wildlife and Countryside Act 1981 and Schedule 2 of the Conservation (Natural Habitats & c.) Regulations 1994 (Regulation 38).

The Western Isles is an important location for otters and they are strongly classified as being marine in their distribution (Turtle and Meakin, 1997). Previous studies have shown that otters tend to concentrate their activities on rocky shores and at seaweed zones (Bryan, 1994).

The survey undertaken for the Siadar 1 EIA (West Coast Energy, 2006b) found evidence of otter presence at various sites within the survey area.

6.1.1.4 Pinnipeds

Both grey and harbour seals are protected under European legislation and are listed in Annex II of the European Habitats Directive. They are also protected under the Conservation (Natural Habitats & c.) Regulations 1994 and the Conservation of Seals Act 1970. Both species of seal are known to feed on a wide variety of fish. Sandeels comprise about 50 % (by weight) of the fish consumed, with the remainder being gadoids, flatfish and sculpins. Crustaceans are also taken as food (Hammond *et al*, 1994).

No seal haul out or breeding sites are known at Siadar, however during the May/June of 2007 (Rothwell, 2007) the shore area of Siadar was observed for sightings of grey seals and any particular behaviour was identified and noted. Grey seals were observed to be present and foraging in the coastal waters of Siadar.

Harbour seals tend to favour more sheltered locations and there are no known harbour seal haulout sites in the Siadar Bay area. No harbour seal presence was recorded during the survey.

As neither grey nor harbour seals haul out in the Siadar area, they are only expected to be occasionally present in transit or foraging.

6.1.1.5 Cetaceans

All species of dolphins, porpoises and whales (cetaceans) are listed in Annex II of CITES, Appendix II of the Bern Convention Annex, and in Appendix IV of the EC Habitats Directive as species of European Community interest and in need of strict protection. They are also protected under Schedule 5 of the Wildlife and Countryside Act, 1981. The harbour porpoise is covered by the terms of Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas, an international agreement with the aim of promoting the conservation of small cetaceans.

For the Siadar 1 EIA, the Sea Mammal Research Unit at St. Andrews University provided data on the presence of cetaceans along the entire western stretches of the British Isles. Data for the area are not specific enough to give species or numbers utilising Siadar Bay. Therefore, the likelihood of species presence is inferred from various data sources including SNH, Hebridean Whale and Dolphin Trust, Sea Mammal Research Unit and anecdotal evidence. Species of cetacean present to the west of the Hebrides include:

- Inshore populations: White-beaked dolphin, Risso's dolphin, Harbour porpoise;
- Inshore and offshore populations: Long-finned pilot whale, Bottlenose dolphin, Killer whale;
- Offshore populations: Atlantic white-sided dolphin, Common dolphin, Sperm whale, Fin whale; and
- Migratory species: Minke whale, Sei whale, Humpback whale, Blue whale, Sowerby's beaked whale, Northern bottlenose whale, Beaked whale spp.

6.1.1.6 Conservation designations

There are no marine conservation designations in the immediate area of the proposed development. There are however, internationally important conservation designations further inland which are shown in Figure 6-1. Specific details are provided in Table 6-1 below.

Figure 6-1 Conservation designations in the vicinity of the proposed development

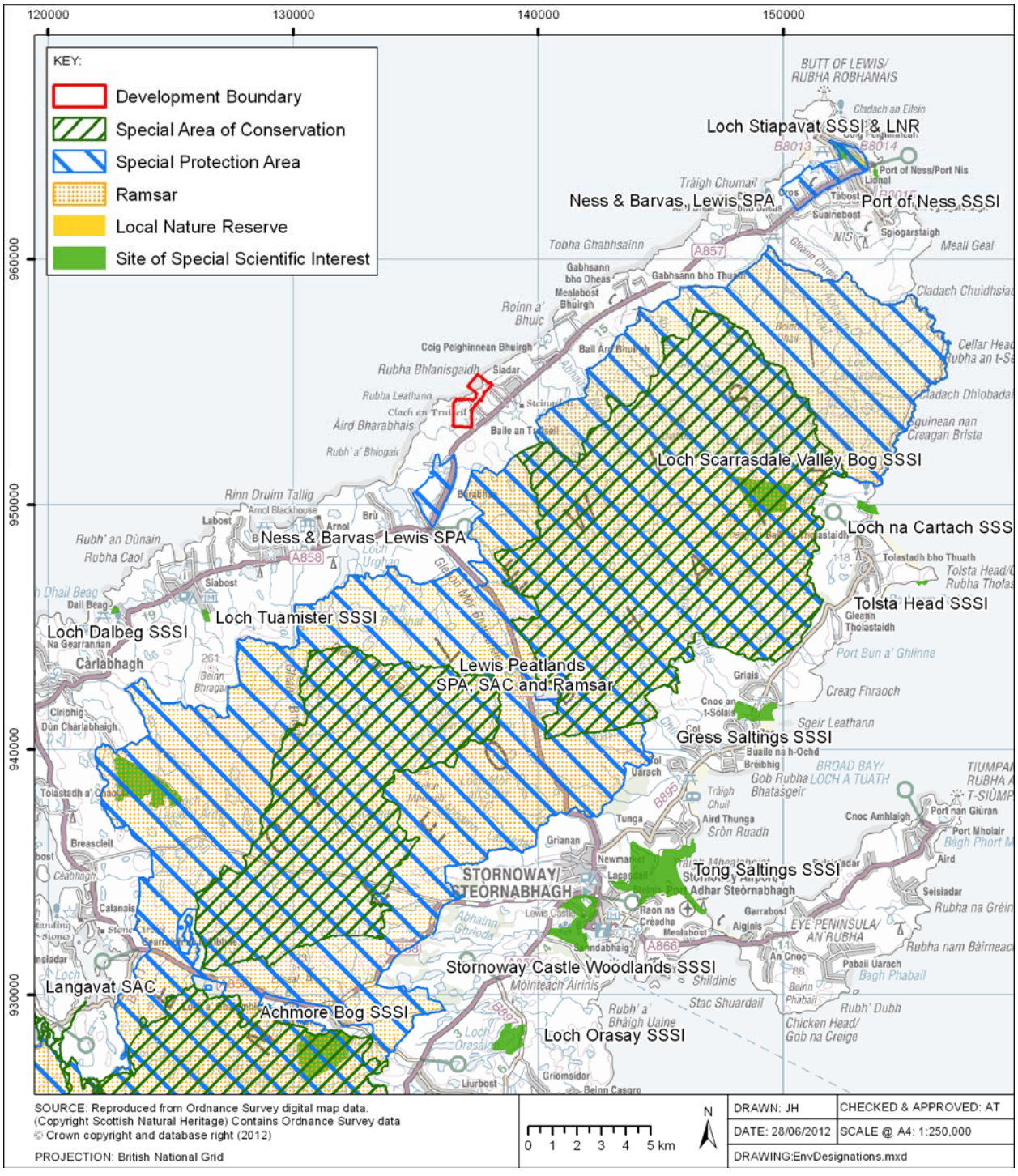


Table 6-1 Conservation and protected sites in the vicinity of the proposed development

Site	Area (ha)	Distance from proposed development	Qualifying Interests
Lewis Peatlands RAMSAR	58,984.23	3 km	Blanket bog Breeding bird assemblages; Dunlin (*Calidris alpina schinzii*) breeding assemblages.
Lewis Peatlands SAC	27,945.59	3 km	Blanket bogs Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto- Nanojuncetea* Natural dystrophic lakes and ponds Otter (*Lutra lutra*)
Lewis Peatlands SPA	58,984.23	3 km	Black-throated diver (*Gavia arctica*) Dunlin (*Calidris alpina schinzii*) Golden eagle (*Aquila chrysaetos*) Golden plover (*Pluvialis apricaria*) Greenshank (*Tringa nebularia*) Merlin (*Falco columbarius*) Red throated diver (*Gavia stellata*)
Barvas SPA	649.2	3 km	Breeding site for corncrakes

6.1.2 Key issues identified

- Disturbance to internationally important inland conservation designations; and
- Disturbance (including underwater and onshore noise (Sections 5.3 and 7.4)) to marine and terrestrial ecological interests including cetaceans, otters and birds during construction and operation activities.

6.1.3 Approach to EIA

Ecological assessment for Siadar 2 covers the Siadar 1 onshore footprint and onshore operations during the construction, operation and decommissioning project phases. Baseline studies undertaken for Siadar 1 included a Phase 1 terrestrial and intertidal habitat survey, otter survey and breeding bird survey.

An ecological walkover survey will be undertaken as part of Siadar 2 to confirm habitat types and the status of protected species (e.g. otter) within the Siadar 1 onshore footprint. The ecological walkover survey will identify and evaluate changes in baseline terrestrial and intertidal ecology conditions occurring since the Siadar 1 surveys.

An extended Phase 1 terrestrial habitat survey will be undertaken, which will cover previously un-surveyed areas to identify and evaluate habitats and species within the proposed Siadar 2 onshore footprint. The extended Phase 1 habitat survey in previously un-surveyed areas would also include intertidal habitats where relevant, and an appropriate survey buffer (500 m).

Updated information from the Siadar 2 survey will be used to update the Siadar 1 terrestrial ecology chapter within the Environmental Statement.

Data requirement	Outline survey or data collection method	Other data sources
Determine species present in the area and how they might be affected by the proposed development.	Extended Phase 1 habitats survey. Phase 1 intertidal survey. Pre-construction baseline otter survey. Intertidal and vantage point bird surveys.	Protected species records from the local biodiversity records centre. Local biodiversity officer to confirm the status of local nature conservation sites. Consultation input.

6.2 Benthic Habitats and Ecology

6.2.1 Existing environment

6.2.1.1 Intertidal

A habitat survey of the intertidal zone was undertaken during October 2006 (West Coast Energy, 2006b) using Marine Intertidal Phase 1 survey methodology (Wyn *et al*, 2000).

Due to the area being exposed to regular and considerable wave action, marine communities tend to consist of large populations dominated by relatively few species (Irving, 1997). The shores around Siadar follow the typical pattern of an exposed to moderately exposed shore on the Scottish Atlantic coast, with no unusual species of particular conservation interest being recorded.

Fauna present include sea hares, small mussels, limpets, edible periwinkle, acorn barnacle and the beadlet anemone. The rocky shores to the north of the bay are more exposed and subsequently support a more limited fauna and flora. Small mussel clumps are limited to crevices. Rock pools dominated by coralline algae and *Corallina* spp. were found throughout the site from mid to low shore.

6.2.1.2 Subtidal

A preliminary survey of the inshore area covering the consented breakwater and proposed Siadar 2 development site, comprising bathymetry, sidescan sonar and seabed sampling using video camera, was carried out during June 2006 (Aspect, 2006). This was augmented by further bathymetry and sub-bottom profiling survey work in August to September 2010 (Aspect, 2010). The area surveyed ranged from 0 m to just over 28 m relative to chart datum, and the seabed sloped gradually at an average angle of approximately 1° offshore towards the northwest.

Video photography indicated that the predominant shallow rock and boulder habitats were covered by dense kelp with an understory of foliose red algae and encrusting barnacles. The larger patches of mobile coarse or fine sediment were generally rippled and no visible epifauna or infauna was noted.

In addition to this geophysical site characterisation work, an environmental survey was recently conducted in an inshore area immediately northeast of the Siadar Wave Energy Project site in August 2011, in an area leased by Lewis Wave Power Ltd for the development of a wave energy demonstration array. This survey was based on video sampling along transects over water depths from the sublittoral fringe down to just over 21 m relative to chart datum (Envision, 2011).

The findings agreed with the general description provided by Aspect (2006, 2010) in that the seabed consisted predominantly of bedrock, with patchy areas of boulder, cobble and gravel occurring where they have gathered as a result of wave action, such as in gullies and along the fault lines identified by Aspect (2010). In addition, however, Envision (2011) provided further detail on the marine communities present and their distribution with depth. The dominant habitat consists of rock dominated by the kelp *Laminaria hyperborea*. This occurs either as 'forest' where the plants are tall and densely-growing, or as 'park' where the plants are much smaller and much less dense. The differences tend to be dependent on depth, with kelp forest occurring to roughly 18m depth, and kelp park in deeper water. The kelp forest, in particular, supports diverse communities of red foliose algae and encrusting biota such as ascidians, bryozoans, sponges and coralline algae.

The biotopes tend to change with distance from shore, with coarse sands and gravel occurring close inshore (apparently mobile, occurring in ripples and with no obvious fauna associated with it) being replaced by kelp forest, then kelp park (both mainly on either bedrock or boulder/cobble).

Overall, in the lease area neighbouring the Siadar Wave Energy Project site, the following biotopes or biotope complexes were found:

- *Laminaria hyperborea* forest with dense foliose red seaweeds on exposed upper infralittoral rock (IR.HIR.KFaR.LhypR.Ft);
- As previous plus Infralittoral coarse sediment (IR.HIR.KFaR.LhypR.Ft and SS.SCS.ICS);
- Both as previous plus *Laminaria saccharina* and filamentous red algae on infralittoral sand (IR.HIR.KFaR.LhypR.Ft/SS.SCS.ICS and SS.SMp.KSwSS.LsacR.Sa);
- *Laminaria hyperborea* park with dense foliose red seaweeds on exposed lower infralittoral rock (IR.HIR.KFaR.LhypR.Pk);
- As previous plus Sublittoral coarse sediment - unstable cobbles and pebbles, gravels and coarse sands (IR.HIR.KFaR.LhypR.Pk and SS.SCS);
- Brittlestar bed on faunal and algal encrusted, exposed to moderately wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr.Bri).

It is therefore likely that some of these biotopes, particularly those described as *Laminaria hyperborea* forest or park, will occur around the Siadar Wave Energy Project site.

6.2.2 Key issues identified

- Potential presence of priority marine species however none recorded to date;
- Sublittoral and intertidal habitat disturbance during construction; and

6.2.3 Approach to EIA

As part of the studies undertaken for Siadar 1 an assessment was undertaken of impacts from offshore project components on habitats and species occurring below the Mean Low Water Springs level. Baseline studies included a Phase 1 habitat survey of intertidal habitats (West Coast Energy, 2006), and underwater video assessment of the subtidal zone (Aspect, 2006).

A benthic survey of the seabed area proposed for development during Siadar 2 of the Project is proposed to expand and compliment the data collected during the Siadar 1 EIA. An intertidal survey will be undertaken to identify any changes since the previous survey undertaken to inform the Siadar 1 assessment.

Updated marine habitats and ecology baseline information will be used to inform the EIA study and update marine habitats and ecology chapter within the Environmental Statement.

Data requirement	Outline survey or data collection method	Other data sources
Intertidal habitats within potential area of impact. Subtidal habitats within potential area of impact.	Marine intertidal Phase 1 survey to categorise the habitats and establish the species present. Benthic ecology survey within the proposed development area including video footage and photography and data analysis.	Digital data providers and Marine Scotland/Scottish Natural Heritage Commissioned surveys. Published literature and biodiversity records websites. Joint Nature Conservation Committee references. Geophysical data collected by Aspect. Data collected to inform studies on the west coast of Lewis. Consultation input.

6.3 Fish Ecology and Fisheries

6.3.1 Existing environment

There are 67 species of fish recorded in Western Isles waters, although data for the immediate area of Siadar Bay is lacking. Four British marine and estuarine species protected under national, European and international legislation have been found in the waters of the Western Isles (Potts and Swaby, 1997).

The distribution of fish species can vary greatly between juvenile and adult phases and with seasonal migrations. However, Barne *et al* (1997) and Coull *et al* (1998), interpreted information on the distribution and relative abundance of fish species obtained from recorded fish landings to infer the fish species likely to be present around the Western Isles.

Mackerel are widely distributed around Britain and are present in the seas around Lewis. Mackerel use the waters to the west of Lewis as a spawning and nursery ground between May and August. Migration of mackerel occurs twice a year; May - July and November - March. Herring, cod, haddock, saithe, lemon sole, Norway pout and sprat also use the area for spawning and/or nursery grounds (Barne *et al*, 1997; Coull *et al*, 1998).

In addition to the commercially important fish species, the coastal waters around Lewis are also likely to support populations of smaller fish species which provide a food source for birds and mammals in the area.

Migratory salmonids, including both sea trout and Atlantic salmon, are afforded protection by the EC Habitats Directive, Bern Convention and Freshwater Fisheries (Consolidation) (Scotland) Act 2003. These fish are also of high resource value to anglers.

Sea trout are commonly found in the River Siadar. Historically salmon have also been found in the Siadar area, but have not been recorded recently. However, they are not known to frequent the River Siadar every year unlike rivers to the south (such as the River Barvas). It is known that rivers with larger populations of trout (e.g. the River Siadar) are less likely to also support salmon populations.

Information provided by the Western Isles Fisherman's Association indicates that the west coast of Lewis supports a small lobster and velvet crab fishery, of approximately 10 vessels. However the northwest Lewis coastline is very exposed and only suited to fishing in the summer months. Creel boats using this area fish out of Loch Roag, Loch Carloway and Ness, and will not generally work in water depths as shallow as those at the proposed breakwater site. The Siadar pier is only known to be used by one 27 ft creel boat during the summer and autumn months. Winkle picking takes place along the shore in Siadar Bay.

Stornoway Sea Angling Association also uses the area for fishing, launching their vessels from Bragar, with these vessels at times using the waters off Siadar. They are generally targeting herring, mackerel and dogfish.

6.3.2 Key issues identified

> Few anticipated due to low numbers of migratory fish recorded during surveys;

> Disturbance to migratory salmonids; and

> Disturbance to marine fish during construction and operation.

6.3.3 Approach to EIA

As part of the Siadar 1 studies a desk study of fish species likely to be present in Siadar Bay is included within the baseline of the Marine Habitats and Ecology Chapter.

It is not anticipated that there is a requirement to undertake surveys for Siadar 2. Assessment associated with Siadar 2 will be based on a data review and update of the desk-study including assessment of recent River Siadar electrofishing survey results.

Updated baseline information will be used to inform the EIA study. An Environmental Statement chapter specific to fish ecology will be prepared.

Data requirement	Outline survey or data collection method	Other data sources
Species which utilise the area.	Electrofishing survey results. No additional survey proposed.	Coull *et al.*, 1998 and Ellis *et al.,* 2010 spawning/nursery ground data. Marine Scotland Science – fish landings data and tagging project. Consultation with local fishermen (confirmation of presence, absence, seasonality). Scottish Fishermen's' Federation. Western Isles Fisheries Trust. Western Isles Fisheries Association. Association of Salmon Fisheries Board.

7 HUMAN ACTIVITIES AND USES

7.1 Landscape, seascape and visual amenity

7.1.1 Existing environment

The proposed development will be located in a shallow bay on the northwest coast of Lewis. The bay is backed by a stony beach and exposed rock. The Abhainn Shiadair flows into the centre of the bay, and there is a small slipway located within the bay.

The landscape and seascape of the surrounding area comprises open sea, a rocky shoreline, settled crofting land and open peat moorland. The landscape is low-lying and large in scale, with a maximum elevation of around 65 m above ordnance datum to the south, and little more than 10 m above ordnance datum along the coast.

There are small crofting settlements at Siadar Iarach, Siadar Uarach and Baile an Truiseil, linked by minor roads to the A857 which runs parallel to the coast. The settlements comprise small, scattered houses, and there are no larger man-made structures in the landscape.

The landscape character of the area is described in Richards (1998), and is revised in Benson *et al.* (2004). Two landscape character types are identified: crofting land; and boggy moorland. Seascape character in the area is defined in Scott *et al.,*(2005) as being 'low rocky island coast'.

There are no nationally or locally designated landscapes in the area. There are five scheduled monuments within around 5 km of the proposed development site.

7.1.2 Key issues identified

- Changes to landscape character and resources;
- Changes to seascape character and resources; and
- Changes to visual amenity.

7.1.3 Approach to EIA

The assessment of effects on seascape, landscape and visual amenity will follow current good practice, as set out in Guidelines for Landscape and Visual Impact Assessment (2nd edition 2002) published by the Landscape Institute and the Institute of Environmental Management and Assessment. The approach taken will be similar to that adopted for Siadar 1, but will be updated to reflect current planning policy and guidelines, especially recent and developing guidance from SNH.

A study area will be defined and agreed with consultees. The study area is likely to extend to around 5 km radius from the site, and will be informed by examination of the zone of theoretical visibility of the proposed development. A number of representative viewpoints will be selected to inform the assessment. The locations of viewpoints will be agreed with consultees, but are likely to be similar to the viewpoints adopted by Siadar 1. If needed, additional viewpoints will be incorporated to cover the enlarged extent of the Siadar 2 development. A number of these viewpoints will be illustrated with photomontages.

The baseline assessment undertaken for Siadar 1 will be updated as required.

For Siadar 1 an assessment was undertaken of onshore and offshore impacts on landscape and seascape including the construction, operation and decommissioning project phases, with consideration of impacts to local cultural heritage interests. This will be updated as required to reflect the changes to Siadar 1.

For Siadar 2, as an extension to the breakwater structure is proposed, the assessment will require reconsideration of impacts on seascape and visual amenity, together with impacts on landscape arising from construction activities.

The updated seascape, landscape and visual baseline information for Siadar 2 will be used to inform the EIA study and to update and extend the seascape, landscape and visual chapter within the Environmental Statement.

Data requirement	Outline survey or data collection method	Other data sources
Landscape and seascape character and visual amenity around the development area.	Field survey including walkover and detailed observation of the landscape of the project site and the study area. Land-based survey including detailed observation of the seascape of the project site and the study area. Site visits to representative viewpoints.	Published literature. Consultation input. Landscape, Seascape and Island Character Studies (SNH & Comhairle nan Eilean Siar). Development Plan. Relevant guidance such as SNH guidance: Marine Aquaculture and the Landscape and Visual Representation of Wind farms (December 2007). Landscape Institute and IEMA guidelines (Wilson, 2007).

7.2 Terrestrial and Marine Cultural Heritage

7.2.1 Existing environment

An archaeological study (Headland Archaeology, 2006) commissioned for the Siadar 1 EIA comprised a desk-based assessment followed by a walkover survey. The aim of the archaeological survey was to identify and confirm the status and importance of all the archaeological interests onsite.

A range of cultural heritage sites were identified reflecting activity in the landscape around Siadar from the Neolithic and Iron Age, to the pre-crofting and crofting era. A total of 66 cultural heritage sites have been identified in the immediate Siadar area.

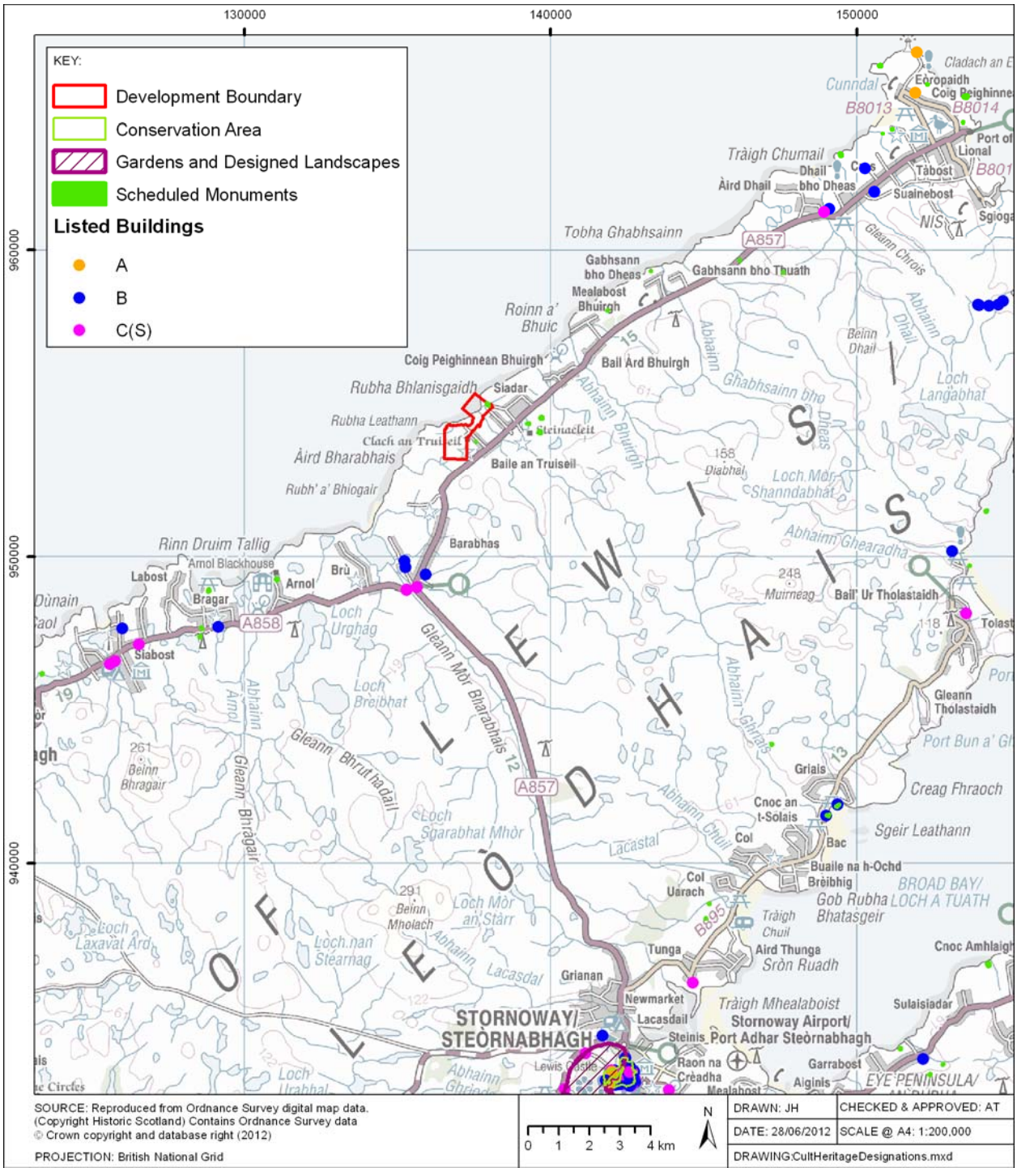
The Siadar 2 report will review and update the baseline information: a search of the Scheduled Monuments Register will be undertaken to take into account both marine and terrestrial archaeological discoveries that have come to light since the previous assessment report. The search area will cover both Siadar 1 areas impacted by the Siadar 2 works and an updated gazetteer will be created.

A terrestrial field survey will also be undertaken at this stage, to survey previously unsurveyed areas.

A marine section within the cultural heritage assessment will also be updated. Available offshore surveys of the area will be reviewed alongside the results of the Headland Report prepared in 2006 and with reference to the Isle of Lewis Wave Array Environmental Statement (Aquamarine, 2012). This will assess relative sea-level change, submerged cultural remains, wrecks and subsea features and the potential for them based on the information available.

Known sites of cultural heritage are shown in Figure 7-1 below.

Figure 7-1 Sites of cultural heritage value in the vicinity of the proposed development



7.2.2 Key issues identified

> Effect on key heritage assets such as Scheduled Ancient Monuments and Listed Buildings;

> Effect on history and cultural heritage of Lewis; and

> Effect on visual character of historic landscape.

7.2.3 Approach to EIA

Assessment undertaken for Siadar 1covers construction, operation and decommissioning Phases, in addition to impacts on the local historic setting where relevant. As part of the baseline, side scan sonar data were reviewed to identify features in the marine environment (Headland Archaeology, 2006), in addition to a walkover survey of the proposed onshore footprint.

For Siadar 2 an additional field walking survey is proposed, over the onshore area not covered by the original assessment.

The updated cultural heritage baseline information for Siadar 2 will be used to inform the EIA study and to update the cultural heritage chapter within the Environmental Statement.

The methodologies used in the investigation will be in accordance with current legislation, standards and guidelines produced by Historic Scotland and the Institute for Archaeologists.

Data requirement	Outline survey or data collection method	Other data sources
Features of archaeology or cultural heritage importance in the onshore and offshore development area.	Walkover survey and desk based survey. Zone of Theoretical Visual influence maps and photomontages produced for the landscape, seascape and visual assessment.	SNH. County Archaeologist. Historic Scotland. Sites and Monuments Records.

7.3 Tourism and Recreation

7.3.1 Existing environment

The rugged coastline, sandy beaches and remoteness of the Western Isles are features that attract visitors to the area (Dunbar *et al.*, 1997).

Tourism in Lewis tends to be dominated by outdoor activities including cycling, hiking, mountaineering, angling, surfing and golf. Other activities include visiting ancient monuments, archaeological sites, heritage sites, Gaelic culture and wildlife watching (Dunbar *et al*, 1997).

The northwest coast of Lewis includes a number of Lewis's top tourist attractions, including the Butt of Lewis, Dun Carloway Broch, Arnol Blockhouse, Garenin Blackhouse village and the standing stones at Calanais.

Several surfing sites are located along the north coast of Lewis. The Stormrider Guide Europe – Atlantic Islands (2007) indicates three breaks along this coast, the closest of which is approximately 10 km from the proposed site. Surfing activity is also known to occur at Borve, which is approximately 3 – 4 km from the proposed site and local surfers are known to occasionally use breaks at the south of Siadar Bay.

At present there are no specific tourist facilities in Siadar, however the local population is keen to develop facilities in the village. One of the main developments presently under discussion is the creation of a coastal path connecting those already in existence to the north and south of the Siadar area.

7.3.2 Key issues identified

> Tourism associated benefits for Lewis; and

> Disturbance to tourism and recreation interests on the west coast of Lewis.

7.3.3 Approach to EIA

It is proposed that the Environmental Statement chapter for Siadar 2 focuses on potential negative impacts on tourism and recreation. The study area will be determined by the zone of visual influence (as developed in the landscape, seascape and visual impact assessment).

The updated tourism and recreation baseline information for Siadar 2 will be used to inform the EIA study and to update the chapter within the Environmental Statement.

Data requirement	Outline survey or data collection method	Other data sources
Establish recreation and level of use in and around the development area.	Consultation with stakeholders.	Tourist guides and websites. Recreational organisation websites. Consultation input.

7.4 Onshore Noise

7.4.1 Existing environment

Noise monitoring was undertaken for Siadar 1 at three locations representative of the closest noise sensitive receivers to the project. Monitoring was undertaken over a period between 13th March to 10th April 2007 encompassing a range of meteorological and sea state conditions. Ambient and background noise levels were found to be primarily influenced by noise from waves crashing on the coastline and it was shown that there was extremely good correlation between sea state and noise level. Average ambient noise levels ranged between 50 – 56 dB L_{Aeq} and average background noise ranged between 46 – 50 dB L_{A90}. The lowest background noise levels over the period were around 24 dB L_{A90} during periods of calm weather, low sea state and in the quietest part of the night.

7.4.2 Key issues identified

> Disturbance to humans in association with construction noise; and

> Disturbance to humans in association with operational turbine noise.

7.4.3 Approach to EIA

The Siadar 1 study includes an extensive baseline survey and an analysis of construction and operational noise. For the Siadar 2 assessment no survey is proposed however a reassessment of noise from construction and operational activities of Siadar 1 and Siadar 2 combined will be undertaken.

The noise output from the operational turbines will vary depending on wave height, as will background noise levels. It is therefore proposed to plot the background noise levels as a function of sea state and then to compare this with the operational noise from turbines under similar sea state conditions.

The Siadar 1 assessment states that the turbine noise is likely to be tonal in character; therefore careful consideration will need to be given to controlling operational noise. The Siadar 2 onshore noise study will address the need for detailed engineering noise control, particularly given the larger scale of Siadar 2. The assessment will be updated in accordance with the latest policy, guidance and standards, including the Scottish planning advice note relating to noise (Scottish Government, 2011d) which has been significantly revised since the Siadar 1 EIA. The approach to the Siadar 2 assessment will therefore be as follows:

> Plot the Siadar 1 baseline noise data against sea state;

- Determine construction noise levels based on the construction method statement and undertake a noise impact assessment based on criteria derived from relevant policy, guidance and standards (e.g. BS 5228, Advisory Leaflet 72, Minerals Policy Statement 2 etc.);
- Determine operational noise levels at the noise sensitive receptors under a range of sea states using noise propagation modelling;
- Compare predicted operational noise levels against baseline noise levels under a range of sea states and undertake a noise impact assessment based on criteria derived from relevant policy, guidance and standards (e.g. Scottish Government, 2011d; WHO, 1999; BSI, 1999).
- Develop mitigation measures to reduce impact to as low as reasonably practicable; and
- Undertake assessment of residual impact and cumulative impact with any other developments in the vicinity.

Data requirement	Outline survey or data collection method	Other data sources
Establish expected onshore noise conditions likely during construction and operation of the proposed development.	No survey proposed. Assessment to be based on data collected for Siadar 1.	Sound power level data for turbines at various sea states / wave heights. List of plant used during construction. Engineering drawings of turbines. Acoustic performance data for silencers and other potential mitigation measures.

7.5 Transport and Route Access

7.5.1 Existing environment

7.5.1.1 Marine traffic

Large commercial shipping passes the west coast of Lewis along designated deepwater channels that are located 10 km (6 miles) offshore (Stornoway Harbour Master, pers. comm.). Less than 1,000 vessels per annum pass the west coast of Lewis (DOVRE SAFETEC, 1999: Referenced in Eagle Lyon Pope Ltd. & Safety at Sea Ltd., 2005).

There are no harbours in the immediate vicinity of the proposed breakwater site, but a basic slipway is located at the north of Siadar Bay.

The northwest coast of Lewis has been categorised by the Royal Yachting Association (2005) as a light usage area, with few recreational craft seen during summer months. The project site is out with any areas regarded as general sailing areas, and only as a place where day tripping and other boating activities occur. Shipping activity is therefore limited to small numbers local fisherman and recreational crafts.

There are no naval exercise areas immediately adjacent to the proposed development area and no indications that the area is more than a transit route for surface vessels.

7.5.1.2 Land-based traffic

The A857 is the primary trunk route in Lewis connecting the main town of Stornoway with the Siadar area and further north. This road is the principal route for the communities along the northwest coast of Lewis to access the wider island, including places of work, places of worship, schools, shops, doctors, vets and all other facilities. This road has the ability to take standard European 40 tonne Heavy Goods Vehicles; however, as parts of the road network on Lewis are built onto peat it is unclear what density of such vehicle use could be maintained without road

damage. Also due to the peaty, spongy nature of the ground onto which the roads are constructed, Heavy Goods Vehicle movements are likely to induce some vibration effects.

There are no traffic counts specifically for the village of Siadar; therefore counts must be inferred from numbers taken elsewhere in Lewis. The two most recent Transport Scotland counts were taken in the summer and the autumn of 2006, both lasting a day at two different sections of the A857. The data from both of these surveys were provided by Transport Scotland and are summarised in Table 7-1. The count on the 15th May 2006 was taken from just outside of Stornoway (NGR 140300, 939400) while the count on the 2nd of October 2006 was taken near the end of the A857 at Port of Ness (NGR 153300, 963600).

Table 7-1 Traffic count survey results

Codes	Stornoway (15/05/2006)	Port of Ness (02/10/2006)
CC1 – Pedal cyclists	3	0
CC2 – Twin wheeled motor vehicles	10	2
CC3 – Cars	1534	298
CC4 – Buses	54	13
CC5 – Light goods vehicles	514	77
CC6 – Rigid 2-axle HGVs	74	8
CC7 – Rigid 3 axle HGVs	30	2
CC8 – Rigid 4 axle HGVs	6	0
CC9 – Articulated 4 axle HGVs	0	0
CC10 – Articulated 5 axle HGVs	2	0
CC11 – Articulated 6 axle HGVs	3	0

7.5.2 Key issues identified

- Disturbance due to increased vessel traffic during construction; and
- Disturbance due to increase construction traffic.

7.5.3 Approach to EIA

For Siadar 1 an assessment was undertaken of effects on the local area due to increased marine and road traffic activity during construction, operation and decommissioning phases. A very high level navigational risk assessment was undertaken to provide qualitative investigation of effects on marine vessel traffic.

For marine traffic no survey is proposed. It is assumed that as for the Siadar 1detailed study of navigational issues can be scoped out. This approach will require negotiation and agreement with the Maritime and Coastguard Agency.

The existing traffic assessment undertaken for Siadar 1 will be updated to indicate construction will take place over a longer period and to consider proposed road improvement works. Methods employed in the construction phase may also affect local traffic, which as a result, may require further assessment.

For the Siadar 2 Environmental Statement no detailed study of navigational issues is proposed. A short summary section will be included within Transport and Route access section (as per the approach adopted for the Siadar 1 Environmental Statement).

The updated Transport and Route Access baseline information for Siadar 2 will be used to inform the EIA study and to update the Transport and Route Access chapter within the Environmental Statement. The field visit will be used to collect infield data for Siadar 2.

Data requirement	Outline survey or data collection method	Other data sources
Establish level of sea and road traffic likely in and around the development area during construction and operation.	A field visit will be used to understand the nature of the road network both in the vicinity of the site and along the routes likely to be taken by construction traffic.	Traffic counts from Comhairle nan Eilean Siar (if available). Traffic counts from Transport Scotland (if available). Ordnance Survey maps. Consultation input.

7.6 Cumulative Effects

The EIA Regulations require that potential cumulative and in-combination effects are taken in to account in the development EIA. The EIA will consider how the proposed development at Siadar may interact with other ongoing and planned projects and activities. It is recognised that there is the potential for cumulative effects to arise from development, maintenance and operation of the development, adding to existing activities such as fishing and tourism.

Inevitably the assessment of these 'future projects' is dependent upon the level of information available on those projects at the time of undertaking the cumulative assessment. Due to the fact it is expected different levels of detail will be available for different projects, the cumulative impact assessment is proposed to be undertaken qualitatively. Sufficient data is unlikely to be available in the public domain to allow a fully quantified cumulative impact assessment.

Cumulative effects are the combined effects of more than one comparable project (i.e. wave energy projects) within a region over time. In-combination impacts are the combined effects of the Project and different seabed users within a region over time. In both cases incremental changes caused by past, present or reasonably foreseeable activities in the area, together with the proposed project will be considered. Examples of cumulative or in-combination impacts include:

- Cumulative loss of fishing grounds due to restrictions from the Project and other developments;
- Cumulative effects with other developers on water quality;
- Recurring loss of habitats in areas that are disturbed over an extended period (cumulative or in-combination);

Impacts that will be considered in this EIA relate to impacts due to the Project and other wave energy projects (including Siadar 1) and other seabed users e.g., commercial fishing.

The assessment of cumulative impacts has been dependant on the public availability of information on other projects in the planning process. It is generally acknowledged that there are difficulties in assessing cumulative impacts via a single-project EIA. Where appropriate, reference will be made to guidance on the assessment of cumulative impacts developed by The Crown Estate (The Crown Estate, 2011).

The projects Voith Hydro Wavegen proposes to consider from a cumulative and in-combination impact assessment perspective include:

- Stornoway onshore wind farm;
- Eishken onshore wind farm;
- Pelamis Wave Power wave energy project off the west coast of Great Bernera; and
- Lewis Wave Power wave energy project of the west coast of Lewis.

8 CONSULTATION

8.1 Background

The Public Participation Directive provides members of the public in European member states with the opportunity to participate in consenting and ongoing regulation of certain activities within member states. The Directive makes specific changes to the way EIA is undertaken, and the EIA Directive has been amended to incorporate these requirements. For the purposes of EIA the requirements of the Public Participation Directive are implemented through the 2003 amendment of the EIA Directive (2003/35/EC) which is then transposed into Scottish law via the EIA Regulations (see Section 2.3).

Planning Advice Note PAN 81: *Community Engagement - Planning with People* also provides guidance to local authorities and developers when engaging communities through the planning process.

Where an application is made under the Marine (Scotland) Act 2010 and the Town and Country Planning (Scotland) Act 1997, statutory consultation will be undertaken in accordance with the relevant regulations as appropriate.

In addition to legislation and guidance covering public involvement, there are statutory and non-statutory consultees relevant to specific consent and licence applications and defined in the legislation, e.g. for the Electricity Act Section 36 and Marine Licence applications.

8.2 Consultation Process

Voith Hydro Wavegen has a stakeholder engagement plan to outline the strategy for consultation and also keeps a record of all meetings and events held. Voith Hydro Wavegen has already undertaken some consultation associated with Siadar 2 of the proposed development and intends to continue its consultation with stakeholders and the wider community through a variety of mechanisms when required.

8.3 Questions for Stakeholders

This 'Scoping Report by Exception' document is the latest phase in the ongoing consultation process and will be circulated to key stakeholders, both statutory and non-statutory consultees, to inform them of the proposed EIA and invite them to comment. The aim of the consultation on this document is to ensure that the scope of the EIA is fit for its purpose to assess the potential environmental impacts of the proposed development.

Voith Hydro Wavegen would find it useful if consultees could consider the following questions as part of their response to the 'Scoping Report by Exception':

1. Has the project identified all regulatory requirements that need to be addressed during the Siadar 2 EIA?

2. Does the 'Scoping Report by Exception' identify all possible environmental receptor types that need to be considered in the EIA? If not, please identify any additional receptors you feel should be considered.

3. Have all possible and likely environmental effects been identified in Sections 4 - 7? If not, please identify any further effects that you feel should be assessed.

4. Does the list of proposed consultees reflect the range of stakeholders that should be considered as consultees for this project? If not, please suggest any additional organisations you feel should be consulted.

5. Do you feel that the scope of environmental studies is adequate to inform:

a. A full assessment of the possible environmental impacts; and

b. Any Appropriate Assessment which may be required?

6. Do you have any comments on the proposed data sources detailed in Sections 5 - 7? Please identify any further data sources you think may be relevant and useful.

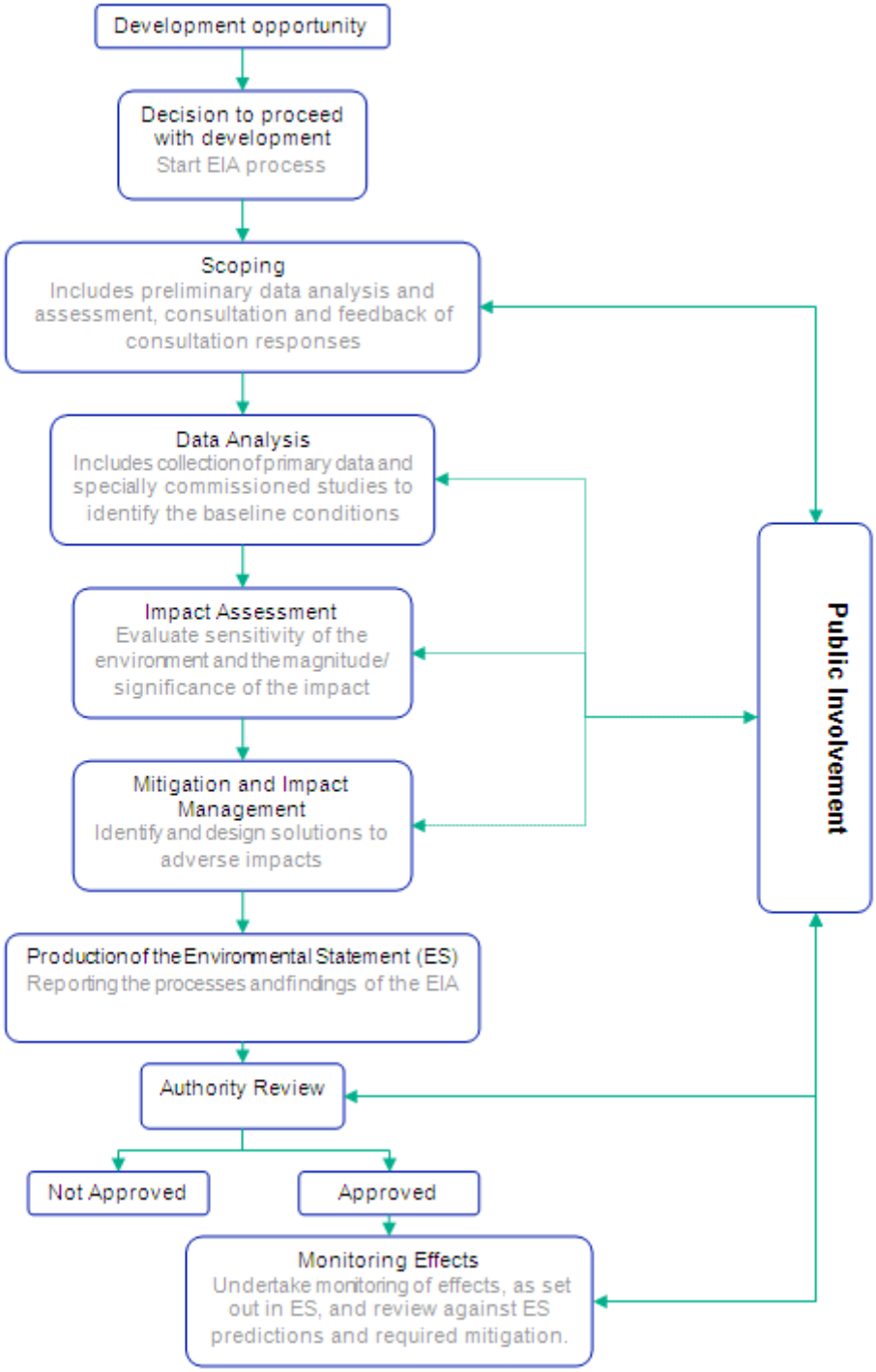
8.4 Stakeholders

In addition to Marine Scotland, statutory and non-statutory consultees who will be consulted as part of the scoping phase are listed below:

- Scottish Environment Protection Agency (SEPA)
- Comhairle nan Eilean Siar – Renewables Lead
- Scottish Natural Heritage (SNH)
- The Crown Estate
- Association of Salmon Fisheries Board
- British Surfing Association
- British Telecom
- The Chamber of Shipping
- Civil Aviation Authority
- Defence Infrastructure Organisation
- Galson Estate Trust
- Health and Safety Executive
- Historic Scotland
- Inshore Fishery Groups
- Maritime and Coastguard Agency
- National Air Traffic Services
- Northern Lighthouse Board
- Ports & Harbours
- Royal Society for the Protection of Birds (RSPB)
- Royal Yachting Association
- Scottish Canoe Association
- Scottish Fishermen's Federation
- Scottish Fishermen's Organisation
- Scottish Surfing Federation
- Scottish Water
- Scottish Wildlife Trust
- Surfers Against Sewage
- Transport Scotland, Scottish Government Planning.
- Western Isles Fisheries Trust
- Western Isles Fisherman’s Association
- Whale & Dolphin Conservation Society

9 ENVIRONMENTAL IMPACT ASSESSMENT

9.1 EIA Process



9.2 Geographical Boundaries

The geographical scope of the Siadar 2 EIA will include the entire development from the offshore generating array through to the onshore infrastructure. The geographical area described in terms of the environmental baseline will be varied according to the area over which there is potential to impact sensitive receptors. The area of assessment for each topic will be defined during the EIA and described in the Environmental Statement.

9.3 Scope of the EIA

It is considered that the EIA scope will provide a robust appraisal of the likely significant effects of the project on the environment by:

- Establishing and reviewing the existing environmental conditions within the licence area and surrounding environment;
- Identifying and assessing any likely significant environmental impacts associated with the project; and
- Assisting in the identification of appropriate measures to mitigate any significant adverse impacts.

9.4 Assessment Methodology

The environmental effects of Siadar 2 of the Project will be predicted for each relevant environmental resource and receptor. Baseline environmental conditions building on the baseline established during the previous EIA will be compared with conditions anticipated to be experienced during and subsequent to operations.

As part of an integrated approach the impacts to the physical, biological and human environment will be assessed together. After initial examination of the most important impacts and their relevance to the project, each impact will be viewed across the three different aspects of the environment. However, to maintain the receptor led approach the impacts will be discussed under the relevant subject areas. Further discussion of the broader impacts to the entire environment will then take place to ensure an integrated approach is maintained.

9.4.1 Consideration of Siadar 1 and Siadar 2

The EIA will consider impacts of Siadar 2 of the project, including construction, operation and maintenance, and decommissioning where they are predicted to differ from impacts of Siadar 1. Identifying and describing those impacts which are different to those identified in the previous EIA.

9.4.2 Identification of Potential Impacts

The scoping exercise plays a role in identification of impacts. The initial scoping overview provides an indication of the type of environment in which the project takes place. Along with the project description it is then possible to make an initial appraisal of potential impacts and their relevance to the project. Comments from consultees will also identify further potential impacts. In this manner the scoping exercise will examine impacts relevant to the project and their potential to be significant issues.

Following receipt of the Scoping Opinion (Marine Scotland's response to this Scoping Report) the proposed scope of the EIA will be reviewed. Scopes of the proposed surveys and studies will be amended if required.

Data on the baseline environmental conditions, i.e. site characterisation (physical and biological) are available from a number of sources and provide information on the biological and physical properties across the proposed development area. Additional baseline information will be sourced from the regulatory organisation responsible and through dedicated surveys and studies if required.

It is noted that the determination of potential impacts consistently across different natural and human environments can be difficult. Scientific evidence as well as predictions based on observation of similar activities will be used in the impact assessment process.

9.4.3 Predicting and Evaluating Significance

The prediction of impacts and evaluation of their significance will require expert judgement of relevant specialists working together to systematically examine project activities and their effects on the environment. In addition the process involves quantifying project parameters that are pertinent to impacts, based on the information that is available. Throughout this process and development of the project description, impacts will be reassessed as required in relation to any changes or ongoing development of the Project. Impacts will be quantified using the available baseline data and relevant studies into the magnitude and temporal and spatial extent of each impact in relation to the proposed development.

For each potentially significant impact, the nature of the environmental resource or receptor that is likely to be affected and the magnitude of the impact to it will be considered, together with (where appropriate) the probability of an impact taking place.

9.4.4 Mitigation

Mitigation measures are the actions or systems that are used, or have been proposed, to manage or reduce the potential negative impacts identified. They may also be used to enhance the positive benefits, especially in relation to social issues.

Mitigation will be an integral part of the project. All of the potential impacts identified from this project are subjected to either standard recognised best practice mitigation measures or to impact specific, feasible and cost effective mitigation. The mitigation measures considered pertinent for each issue considered will be outlined in the individual technical sections in the Environmental Statement.

9.4.5 Residual Impact Assessment

Any impacts remaining after mitigation measures have been applied are considered residual impacts. The significance level of the residual impacts identified for the proposed development will be assessed using the same approach described above.

9.5 Environmental Management and Monitoring Plan

Voith Hydro Wavegen understands the importance of identifying practical and appropriate management and monitoring measures during the EIA process. It is anticipated that these measures will also be highlighted during the ongoing consultation process.

The Siadar Wave Energy Project will be the subject of an appropriate Environmental Management and Monitoring Plan. This plan will be informed through the stakeholder consultation process and by the findings of the EIA.

9.6 Environmental Statement Table of Contents

The proposed structure of the Siadar 2 Environmental Statement is set out below:

1 Introduction

- 1.1 Background to the scheme
- 1.2 Voith Hydro Wavegen
- 1.3 Overview of Siadar 2
- 1.4 Purpose of the Environmental Statement

2 Purpose and scope of the environmental impact assessment

- 2.1 Introduction
- 2.2 Extent of design
- 2.3 Data gaps and uncertainties

7.1 Introduction

7.2 Physical characteristics

7.3 Biological characteristics

7.4 Human environment

8 Environmental Impact Assessment Methodology

8.1 Introduction

8.2 EIA process

8.3 Significance of effects

8.4 Rochdale Envelope

8.5 Cumulative effects

8.6 Mitigation and monitoring

8.7 References

The EIA topic-specific assessment chapters will follow Section 8. These chapters will include:

- Terrestrial Habitats and Ecology
- Fish Ecology
- Surface Water and Hydrology
- Benthic Habitats and Ecology
- Coastal Processes
- Onshore Noise
- Underwater Noise
- Landscape/Seascape and Visual
- Transport and Route Access
- Tourism and Recreation
- Terrestrial and Marine Cultural Heritage
- Accidental Events

The EIA topic-specific assessment chapters will all follow the same chapter structure:

- List of relevant supporting studies
- Introduction
- Assessment parameters
    - Rochdale Envelope
    - Area of assessment
- Assessment methodology
    - List of consultations that have been undertaken in table format
    - List of relevant issues raised in scoping opinion and how they have been addressed in table format
    - Desk study

- Field study
- Significance criteria
- Data gaps and uncertainties

> Baseline description

> Potential impacts during construction and installation

> Potential impacts during operation and maintenance

> Potential impacts during decommissioning

> Cumulative effects

> Proposed mitigation and monitoring

> Summary and conclusions

> References

Concluding chapters include:

> Environmental Management and Monitoring Plan

> Glossary

> Abbreviations

> Appendices

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11 ABBREVIATIONS

DECC	Department of Energy and Climate Change
EIA	Environmental Impact Assessment
JNCC	Joint Nature Conservation Committee
SNH	Scottish Natural Heritage
SEPA	Scottish Environment Protection Agency