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WESTISLAY TIDAL

ENERGY PARK

volume 2

environmental statement

3 of 4

DP ENERGY MARINE

DBE DEME Blue Energy

WEST ISLAY TIDAL ENERGY PARK

VOLUME 2 ENVIRONMENTAL STATEMENT

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Preface

This Environmental Statement (ES) is prepared, by DP Marine Energy Ltd (DPME), in support of an application for statutory consents for West Islay Tidal Energy Park (the Project).

The Project is being developed jointly by DPME and DEME Blue Energy (DBE) on the behalf of West Islay Tidal Energy Park Limited a special purpose Scottish Company which has been incorporated to build and operate the Project.

The Project consists of the installation of 30MW of Tidal Energy Converters and associated infrastructure including the export cables to landfall on Islay

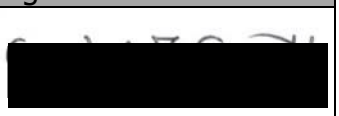
The proposed array of tidal energy devices will be located approximately 6km (at its closest point) from the south west tip of the island of Islay in Argyll and Bute, Scotland. The proposed landfall for the associated electricity export cable will be located adjacent to Kintra Farm on the west coast of Islay.

The Regulatory Authority responsible for assessing the application for consent is Marine Scotland. They will be supported in the assessment process by a number of environmental bodies including Scottish Natural Heritage (SNH).

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

Islay Energy Trust, Custom House, Bowmore, Isle of Islay, PA43 7JJ Tel: 01496 810873	Portnahaven Post Office Portnahaven Isle of Islay PA47 7SH Tel: 01496 860264	Bowmore Post Office, Main Street, Bowmore, Isle of Islay, PA43 7JH Tel: 01496 810366
Port Ellen Post Office, 66 Fredrick Crescent Port Ellen, Isle of Islay, PA42 7BD Tel: 01496 30238	DP Marine Energy Ltd Mill House Buttevant County Cork Tel: +353 22 23955	Scottish Government Library, Victoria Quay, Edinburgh, EH6 6QQ

During the consultation period copies of the Environmental Statement can be purchased from DPME either on CD for a charge of £15 or in hard copy form for £400. Copies of the Non-Technical Summary are available free of charge and a downloadable version is also be available on the West Islay Tidal website: www.westislaytidal.com. Requests for CD and or hard copies of the ES can be made to the DPME address above or by email islay@dpenergy.com

Responsibility	Job Title	Name	Date	Signature
EIA Chapters	EIA Manager	Clodagh McGrath	Monday, 22nd July 2013	
Non EIA Chapters	Project Manager	Blair Marnie	Monday, 22nd July 2013	
Checked	Project Development Engineer	Damian Bettles	Monday, 22nd July 2013	
Approved	Director (DPME)	Simon De Pietro	Monday, 22nd July 2013	
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It should be noted that the NTS and ES has been prepared by DPME supported by DBE with significant input from external sub-consultants on specialist chapters. A review process for Quality Assurance was conducted on all chapters, whether produced by external consultants or internally by DPME.

The ES has been prepared by DPME with all reasonable skill and care and whilst every effort has been made to ensure the accuracy of the material published in this and associated documents, West Islay Tidal Energy Park Ltd, DPME or DBE will not be liable for any inaccuracies.

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DPME would like to acknowledge the technical support provided by Siemens/MCT, Alstom/TGL and Bluewater/BlueTEC for their considerable assistance in enabling the design envelope to be defined.

The licence numbers for proprietary data referenced in diagrams and maps can be found on individual figures.

Glossary of Terms:

Agreement for Lease	Agreement entered into between West Islay Tidal Ltd and The Crown Estate for the rights to development on the seabed, named as West Islay Tidal, shown in Figure 5.1.
Dynamic positioning vessel	A Dynamic Positioning Vessel (DP) can safely maintain its position and heading in a tidal flow using a system of thrusters. DP vessels are able to work safely and efficiently in waters deeper than vessels using anchors.
Export cables	Cables used to export power generated by the tidal turbines to the onshore infrastructure.
Gravity based structure (GBS)	A structure which uses ballast to sit securely on the seabed without needing to be stabilized by piles or anchors. The GBS is used to support a tidal turbine.
Monopile	A single large diameter steel tube that is grouted into a hole bored into the seabed. The monopile is used to support a tidal turbine.
Nacelle	The enclosure of the tidal turbine's mechanical and electrical equipment.
Pin pile	The use of multiple small diameter steel tubes that are grouted into a hole bored into the seabed. The pin piles are used to support a tidal turbine.
Project	For the purpose of this ES, the Project refers to the West Islay Tidal Energy Project.
Remotely operated vehicle (ROV)	A Remotely Operated Vehicle (ROV) is an underwater vehicle able to undertake multiple subsea operations. ROVs are highly manoeuvrable and are controlled by operators on-board the DP vessel.
Tidal turbine	A device that converts hydrodynamic energy in the tidal flow into electrical energy.
Tidal turbine array	Term used to describe a group of tidal turbines.
Turbine support structure (TSS)	A turbine support structure is the structure placed on the seabed onto which a tidal turbine is installed.
Wet mate connector	A device used to connect electrical and data cables underwater.

List of Acronyms

AA Appropriate Assessment
AADT Annual Average Daily Traffic
ABRA Argyll & Bute Renewables Alliance
AC Alternating Current
AD Anno Domini
ADCP Acoustic Doppler Current Profiler
AfL Agreement for Lease
AFT Argyll Fisheries Trust
AGLV Areas of Great Landscape Value
AHC Active Heave Compensation
AIS Automatic Identification System
ALARP As Low as Reasonably Practicable
AMAA Ancient Monuments & Archaeological Areas Act
AOD Above Ordnance Datum
AR4 Forth Assessment Report
ASCOBANS Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish & North Seas
ASFB Association of Salmon Fisheries Board
AST Atlantic Salmon Trust
AWAC Acoustic Wave and Current
BADC British Atmospheric Data Centre
BAP Biodiversity Action Plan
BAT Best Available Technique
BERR Department of Business, Enterprise & Regulatory Reform
BGS British Geological Survey
BOCC Birds of Conservation Concern
BODC British Oceanographic Data Centre
BS British Standard
BSI British Standards Institution
CAA Civil Aviation Authority
CEFAS Centre for Environment, Fisheries & Aquaculture Science
CFA Clyde Fishermen's Association
CD Chart Datum
CIA Cumulative Impact Assessment
CIRIA Construction Industry Research & Information Association
CMACS Centre for Marine and Coastal Studies
CMS Construction Method Statement
COWRIE Collaborative Offshore Wind Research into the Environment.
CPA Coast Protection Act
CPT Core Penetration Tests.
CRM Collision Risk Modelling
dB Decibel
DBE DEME Blue Energy
DDV Drop Down Video
DECC Department of Energy & Climate Change
DEFRA Department for Environment, Food & Rural Affairs
DEME Dredging, Environmental & Marine Engineering
DFO District Fisheries Office
dGPS Differentially corrected GPS
DOE MD Department of Environment, Marine Division
DP Dynamic Positioning
DP Decommissioning Programme
DPME DP Marine Energy
DSFB District Salmon Fisheries Boards
EC European Commission
EcIA Ecological Impact Assessment
EEC European Economic Community
EIA Environmental Impact Assessment
EMEC European Marine Energy Centre
EMF Electro Magnetic Field
EMaP Environmental Management Plan
EMP Environmental Monitoring Programme
ENVID Environmental Issue Identification
EPS European Protected Species
ERCoP Emergency Response Cooperation Plan
ES Environmental Statement
ESAS European Seabirds at Sea
ETA Estimated Time of Arrival
EU European Union
EUNIS European Nature Information System
FAO Food and Agriculture Organisation
FCS Favourable Conservation Status
FEPA Food and Environment Protection Act
FLO Fisheries Liaison Officer
FREDS Forum for Renewable Energy Development in Scotland
FRS Fisheries Research Services
FSA Formal Safety Assessment
FTE Full Time Equivilents
GDP Gross Domestic Product
GHG Greenhouse Gas Emissions
GIS Geographical Information Systems
GPS Global Positioning System
HATT Horizontal Axis Turbine
HLV Heavy Lift Shearleg Vessels
HIAL Highlands & Islands Airports Ltd
HIRA Hazard Identification & Risk Assessment
HRA Habitat Regulations Appraisal
HS Historic Scotland
HSE Health and Safety Executive
ICES International Council for the Exploration of the Sea
ICOMOS International Council on Monuments and Sites.
IFA Institute for Archaeologists
IEMA Institute of Environmental Management
IMO International Maritime Organisation
IPCC Intergovernmental Panel on Climate Change
ISA Immediate Study Area
IUCN International Union for Conservation of Nature
JCP Joint Cetacean Protocol
JNAPC Joint Nautical Archaeology Policy Committee.
JNCC Joint Nature Conservation Committee
kg Kilogram
km Kilometre
km$_2$ Square kilometre
Km/h Kilometre per hour
kV Kilovolts
LAT Lowest Astronomical Tide
LBAP Local Biodiversity Action Plan
LCA Landscape Character Assessment
LDP Local Development Plan
LLA Local Lighthouse Authority
LSCA Landscape Seascape Character Assessment
LSE Likely Significant Effect
m Metre
MarLIN Marine Life Information Network
MAIB Marine Accident Investigation Branch
MARPOL International Convention for the Prevention of Pollution from Ships
MS Marine Scotland
MBES Multibeam Echo Sounder
MCA Maritime and Coastguard Agency
MCS Marine Conservation Society
MCT Marine Current Turbines Limited
MESH Marine European Seabed Habitats
MFA Marine and Fisheries Agency
MGN Marine Guidance Note
MHWS Mean High Water Springs
MLWS Mean Low Water Springs
MLURI Macaulay Land Use Research Institute
mm Millimetre
MMO Marine Management Organisation
MNCR Marine Nature Conservation Review
MNNS Marine Non Native Species
MoD Ministry of Defence
MP Member of Parliament
MPA Marine Protected Area
MPS Marine Policy Statement
MS Marine Scotland
MSFD Marine Strategy Framework Directive
MSFD Marine Strategy Framework Directive
MSL Mean Sea Level
MSP Mean Spring Peak
MSS Marine Scotland Science
ms Metres per second
MSW Multi Sea Winter (adult salmon)
MW Megawatts
NATS National Air Traffic Service
NMRS National Monuments Records of Scotland
NBN National Biodiversity Network
NCI Nature Conservation Importance
NGR National Grid Reference
NIEA Northern Ireland Environment Agency
NLB Northern Lighthouse Board
Nm Nautical miles
NPF National Planning Framework
NSA National Scenic Area
NSRA Navigational Safety Risk Assessment
OCFA Offshore Cable Feasibility Assessment
OSPAR Oslo & Paris Conventions for the protection of the marine environment
OREI Offshore Renewable Energy Installation
OS Ordnance Survey
PAD Protocol for Archaeological Discoveries
PAM Passive Acoustic Monitoring
PAN Planning Advice Note
PBR Potential Biological Removal
PEXA Practice and Exercise Area
PPG Pollution Prevention Guidelines
PHA Preliminary Hazard Analysis
PMF Priority Marine Feature
PSD Power Spectral Density
RCAHMS Royal Commission for Ancient and Historical Monuments for Scotland
ReDAPT Reliable Data Acquisition Platform Tidal
RES Renewable Energy Strategy
REZ Renewable Energy Zone
RNLI Royal National Lifeboat Institution
ROCs Renewables Obligation Certificates
ROS Renewable Obligation Order for Scotland
ROV Remotely Operated Vehicle
ROW Receiver of Wreck, wreck administration department within the UK Maritime Coastguard Agency.
RPM Revolutions per Minute
RSPB Royal Society for the Protection of Birds
RTP Roger Tym and Partners
RYA Royal Yachting Association
SAAR Standard Annual Average Rainfall
SAC Special Area of Conservation
SAM Scheduled Ancient Monument
SAMS Scottish Association for Marine Science
SAR Search and Rescue
SBL Scottish Biodiversity List
SCANS Small Cetacean Abundance in the North Sea
SCADA Supervisory Control and Data Acquisition
SCOS Special Committee on Seals
SEPA Scottish Environment Protection Agency
SEA Strategic Environmental Assessment

SFF Scottish Fishermen's Federation
SHEP (Historic Scotland's) Scottish Historic Environment Policy
SHETL Scottish Hydro Electric Transmission Ltd
SHEPD Scottish Hydro Electric Power Distribution Ltd
SIFAG Scottish Inshore Fisheries and Advisory Group
SLA Scenic Landscape Area
SLVIA Seascape & Landscape Visual Impact Assessment
SMA Seal Management Area
SMRU Seal and Mammal Research Unit
SMP Survey Monitoring Plan
SNH Scottish Natural Heritage
SNMP Scotland's National Marine Plan
SOLAS International Convention for the Safety of Life at Sea
SOS Secretary of State
SPA Special Protection Area
SPG Supplementary Planning Guidance
SPL Sound Pressure Level
SPP Scottish Planning Policy
SRSL SAMS Research Services Limited
SSA Setting Study Area
SSE Scottish and Southern Energy
SSER Scottish and Southern Energy Renewables
SSSI Special Site of Scientific Interest
TCE The Crown Estate
TAC Total Allowable Catch
TEC Tidal Energy Converter
TGL Tidal Generation Limited
THLS Trinity House Lighthouse Service
TOC Total Organic Carbon
TSS Turbine Support Structure
TSS Traffic Separation Scheme
TTS Temporary Threshold Shift
UK United Kingdom
UKBAP UK Biodiversity Action Plan
UKC Under Keel Clearance
UKHO UK Hydrographic Office
UKRES UK Renewable Energy Strategy
UNCLOS United Nations Convention of the Law of the Sea
UNESCO United Nations Educational, Scientific & Cultural Organisation.
VATT Vertical Axis Turbine
V Volts
VERs Valued Ecological Receptors
VHF Very High Frequency
VP Vantage Point
VMS Vessel Monitoring System
VTS Vessel Traffic Services
WANE The Wildlife & Natural Environment (Scotland) Act (2011)
WEWS Water Environment & Water Services Act
WITEP West Islay Tidal Energy Park
WGNAS Working Group on North Atlantic Salmon
WHO World Health Organisation
WFD Water Framework Directive
WSA Wider study area
ZAV Zone of Actual Visibility
ZTV Zone of Theoretical Visibility

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WESTISLAY TIDAL

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12. Chapter 12 Commercial Fisheries

12.1 Introduction

This chapter of the Environmental Statement (ES) provides an assessment of the potential effects of the West Islay Tidal Energy Project (the "Project") on commercial fishing activities, including salmon and sea trout fisheries. An assessment of the potential cumulative impacts arising from the Project in conjunction with other planned marine developments and activities is also provided.

Commercial fishing is defined as any legal fishing activity undertaken for declared taxable profit. For the purpose of this assessment salmon and sea trout fisheries are addressed separately to other commercial fisheries as they are principally located in-river (with the exception of some coastal netting) and are distinctly different in their nature to the majority of commercial fishing activity occurring in marine environments.

The following ES Chapters and Technical Appendices support the assessment of potential impacts on Commercial fisheries:

- Chapter 11: Natural Fish;
- Chapter 14: Shipping and Navigation;
- Technical Appendix 11.1 Natural Fish Baseline Report;
- Technical Appendix 12.1: Commercial Fisheries Baseline Report; and
- Technical Appendix 12.2: Salmon and Sea Trout Fisheries.

12.2 Consultation

DP Marine Energy Limited (DPME) has engaged with the local and wider fishing industry throughout the development of the project. Consultation has been undertaken, and will continue, with the organisations listed below:

- Scottish Fishermen's Federation (SFF);
- Clyde Fishermen's Association (CFA);
- Campbeltown District Fisheries Office (DFO);
- Marine Scotland (MS); and
- Individual Fishermen.

Fisheries stakeholder meetings have been held in both Campbeltown and on Islay. These meetings were either advertised locally or invitations were sent to stakeholders identified by the project Fisheries Industry Representative (FIR) and the Islay Energy Trust (IET). Relevant information provided by fishermen at these meetings has been incorporated anonymously into the assessment.

DPME is committed to ensuring that collaboration with the fishing industry is maintained throughout future stages of the development. This will be facilitated by regularly advertised meetings open to all fisheries interests.

12.3 Assessment Methodology

12.3.1 Study Area

The study area for the assessment of commercial fishing activity is shown in Figure 12.1 (Volume 3: Figures). The approach has been to provide a brief national overview (national study area) in order to show fishing grounds in the general area of the project on a national context. The regional study area has been defined to ensure sufficient coverage of those areas surrounding the site, and the local study area is the smallest available spatial unit for the collation of fisheries statistics. Where possible, fishing activities in the specific area of the site have been further described.

The salmon and sea trout fisheries study area has been defined at local, regional and national levels, as shown in Figure 12.2 (Volume 3: Figures) The local study area focuses on the Laggan salmon fishery district which is located closest to the project site and associated western cable route. It should be noted that fisheries statistics for this district may include more than one river (see Technical Appendix 12.2: Technical Salmon and Sea Trout Fisheries). Due to the migratory behaviour of salmon and sea trout the importance of respective fisheries are also described briefly at the regional and national levels. The regional study area is defined by the West Coast salmon fishery region, whilst the national study area is defined by salmon fishery regions throughout Scotland.

12.3.2 Data Sources

12.3.2.1 Commercial Fisheries

The principal sources of data used for the collation of the commercial fisheries baseline were:

- International Council for the Exploration of the Seas (ICES);
- Marine Management Organisation (MMO);
- Marine Scotland (MS);
- Marine Scotland Science (MSS);
- Campbeltown District Fisheries Office (DFO);
- Scottish Fishermens Federation (SFF); and
- Individual Fishermen

The following reports were reviewed and relevant information included within the baseline:

- ICES Stock Assessment Reports and other relevant ICES Publications;
- European Commission (EC)/National and Local Fisheries Legislation;
- MS and MSS publications;
- Centre for Environment, Fisheries and Aquaculture Science (Cefas) publications; and
- Other relevant publications.

The following statistical datasets were analysed for inclusion in the baseline:

- MMO Fisheries Statistics (landings values and fishing effort data 2001 to 2010);

- MMO Surveillance Sightings (2001 to 2010);
- MMO UK Satellite Tracking (VMS) Data (2007 to 2010); and
- Marine Scotland Data Analysis (2007 to 2011).

Data Limitations, Sensitivities and Gaps

There is no single data source or recognised model for establishing commercial fisheries baselines within small, discrete sea areas such as offshore tidal energy sites. It is necessary to use an approach that incorporates a number of data and information sources, each subject to varying sensitivities and limitations. The sensitivities and limitations associated with each dataset are described in detail within Section 3.0 of Technical Appendix 12.1: Commercial Fisheries Baseline report.

During 2012 Marine Scotland Science (MSS) interviewed fisheries stakeholders on Islay as part of the Scotmap project. The project used a questionnaire and mapping approach to gather detailed information on fishing activity and identify grounds, seasonal usage, target species, method and gears used, numbers employed within the industry and determine the contribution of specific sea areas to total landings value. This would be particularly useful to describe commercial fishing on Islay as the fleet is largely formed of small inshore vessels under 15 m in length which are not represented by VMS datasets. The information gathered through the project was originally scheduled to be made available to DPME during July 2012 to inform the baseline described in Technical Appendix 12:1 Commercial Fisheries Baseline report. At the time of writing the results from the Scotmap project were still unavailable and it has therefore not been possible to include information from the ScotMap project within this chapter or the associated technical appendix (Technical Appendix 12.1: Commercial Fisheries Baseline Report.)

12.3.2.2 Salmon and Sea Trout Fisheries

The principal sources of data and information used for the collation of the salmon and sea trout fisheries baseline were:

- MSS;
- Association of Salmon Fishery Boards (ASFB);
- Argyll Fisheries Trust (AFT);
- Relevant District Salmon Fishery Boards (DSFBs);
- Atlantic Salmon Trust (AST); and
- Scientific papers and other relevant publications.

The primary data sets used to inform the salmon and sea trout fisheries baseline were:

- MSS salmon and sea trout catch data by salmon fishery region (1952 to 2011);
- MSS salmon and sea trout catch data by salmon fishery district (2002 to 2011); and
- MSS salmon and sea trout netting effort data (2002 to 2011).

Data Limitations, Sensitivities and Gaps

It should be noted that the analysis of fisheries statistics given below is not intended as an assessment of the abundance or state of the stocks, but rather as an indication of the underlying population trends and relative importance of the fisheries of salmon and sea trout by region and fishery district in Scotland. The important timings of salmon and sea trout fisheries do not necessarily represent salmon and sea trout migration and catch data is limited in terms of presenting an accurate baseline of fish populations and fish migration outside of the time of directed fisheries. This also holds true for rod-and-line catches which do not account for the closed season and give no effort value.

Each fishery in Scotland is required to provide the number and total weight of salmon, grilse and sea trout caught and retained in each month of the fishing season. In this context 'salmon' refers to multi–sea-winter salmon (MSW), whereas 'grilse' refers to one-sea-winter salmon (1SW).

Rod-and-line fisheries are also required to provide the total numbers and weight of salmon, grilse and sea trout caught and released during each month, this practice is known as "catch and release". As a result, MSS catch data for the rod-and-line fishery is broken down into two categories: "rod-and-line" and "catch and release". The total catch by the rod-and-line fishery is in effect the sum of the catches recorded in both categories. Data from both categories have been combined to give an indication of the total rod-and-line catch. Similarly, the catch by net-and-coble and fixed engines (bag and stake nets) has been combined in some instances to provide an indication of the total catch of the net fishery.

The distribution patterns, behaviour and migration routes of salmon and sea trout in the marine environment, particularly in waters off the west coast of Scotland are not fully understood. As a result, accurate estimates of the numbers, time period and origin of the salmon and sea trout potentially migrating through or otherwise using the development site or its vicinity cannot be quantitatively assessed.

The catch data used in this report are Crown copyright, used with the permission of MSS. Marine Scotland is not responsible for interpretation of these data by third parties.

12.3.3 Assessment Approach

12.3.3.1 Commercial Fisheries

There are no published guidelines relating specifically to the assessment of impacts of offshore tidal developments upon commercial fishing activities in Scottish waters. It is considered therefore, that aspects requiring assessment are as specified in the Cefas and Marine Consents and Environment Unit (MCEU) (2004) Guidelines for offshore wind developments[(1)]:

- Implications for fisheries during the construction phase;
- Implications for fisheries when the development is completed;
- Adverse impact on commercially harvested fish and shellfish populations;
- Adverse impact on recreational fish populations;
- Complete loss or restricted access to traditional fishing grounds;

- Safety issues for fishing vessels;
- Increased steaming times to fishing grounds;
- Obstacles on the sea bed post construction; and
- Interference with fisheries activities.

In addition to the above, the following potential impact has also been considered for assessment:

- Displacement of fishing activity into other areas.

12.3.3.2 Salmon and Sea Trout Fisheries

As a result of salmon and sea trout fisheries being located in riverine or (to a lesser extent) coastal environments, no direct impacts are expected to occur as a result of the construction/decommissioning and operational phases of the Project. For this reason salmon and sea trout fisheries are scoped out of further assessment within this chapter of the ES. It is considered however that changes to the behaviour of these species in the offshore environment could affect both in-river and coastal salmon and sea trout fisheries. A full assessment of the potential impacts on these species in the marine environment is provided in Chapter 11: Natural Fish and Shellfish Resources.

12.3.4 Assessment Limitations

The limitations of an assessment of impacts on commercial fishing activities are principally associated with potential changes to the existing baseline. Target species, the location and productivity of fishing grounds, and levels of fishing effort are subject to change over short timescales in response to fluctuations in landings and changes in quota allocations, legislation, economic constraints, weather and conservation restrictions. The assessment undertaken is therefore limited to the baseline identified.

A number of commercial fishing activities identified in the baseline are not restricted to the regional study area, and some vessels have the potential to target wider grounds located around the Scotland and UK. It is acknowledged that this varies on an individual basis and some vessels may spend more time fishing in certain areas of the regional or local study areas. It is not possible, however, within the scope of this assessment to consider the extent of an impact on an individual basis. Fishing grounds potentially impacted by the development have therefore been considered in the context of their relative importance to the regional study area, as well as to available fishing grounds around the UK.

Impacts arising from the construction/decommissioning and operational phases of the Project have the potential to alter the behaviour, abundance and distribution of commercially important fish species. Any such changes may therefore indirectly affect commercial fishing activities. A full assessment of the potential impacts of construction, operation and decommissioning upon fish and shellfish species is provided in Chapter 11: Natural Fish and Shellfish Resources.

12.3.5 Significance Criteria

The significance criteria used for this assessment is as described below. It is acknowledged that the impacts of offshore tidal energy developments upon

commercial fishing activity are not easily categorised due to the limitations associated with fisheries data and the dynamic nature of the industry. Therefore, the assigning of receptor sensitivity and impact magnitude is to some extent qualitative and reliant on professional experience and judgement.

Receptors have been defined by fishery i.e. scallop fishery, Nephrops fishery and crab and lobster fisheries, and sensitivities assigned on this basis. It should be noted that the sensitivity of each fishery may vary with each potential impact, as well as between the construction, operational and decommissioning phases. As a result these are described separately and in each instance the characteristics described in Table 12.1 are taken into account.

Receptor Sensitivity	Definition
High	Category of fishing receptor, which by virtue of vessel design, is limited in its operational range and method versatility. A high dependence upon a single, spatially restricted fishery or a limited number of short duration, seasonal fisheries.
Medium	Category of fishing receptor with a wide area of operation but with limited method versatility. A dependence on a limited number of fisheries.
Low	Category of fishing receptor with an extensive operational range and high method versatility. Vessels able to exploit a large number of fisheries or a limited number of wide ranging spatially extensive fisheries.
Negligible	Category of fishing receptor with an extensive operational range and very high method versatility. Vessels are able to exploit a large number of fisheries.
No Change	Receptor has no history of fishing in the areas under consideration

Table 12.1 Definition of Receptor Sensitivity

The magnitude of an effect is considered for each predicted impact on an individual fishery basis and is defined geographically, temporally and in terms of the likelihood of occurrence. The definitions of terms relating to the magnitude of a potential impact on commercial fisheries are provided in Table 12.2.

With respect to duration of potential impacts, those associated with construction are considered to be short term occurring over a maximum of six months. Impacts associated with operation are long term, occurring over the 25 year lifetime of the Project.

Magnitude of impact	Definition
Major	A high proportion of total annual landings weights/values derived from fishing within the Project site or over the export cable route
Moderate	A moderate proportion of total annual landings weights/values derived from fishing within the Project site or over the export cable route
Minor	A minor proportion of the total annual landings weights/values derived from fishing within the Project site or over the export cable route

Magnitude of impact	Definition
Negligible	Receptor has very little or no history of fishing in the areas under consideration
No change	Receptor has no history of fishing in the areas under consideration

Table 12.2 Definition of Magnitude of Impact

Table 12.3 applies the significance criteria to the assessment of an effect, taking into account the magnitude of effect and sensitivity of the receptor. In the context of impacts on commercial fisheries, a low magnitude combined with a low sensitivity results in a minor significance. Those effects which are moderate or major are considered significant with respect to EIA assessments.

Receptor Sensitivity	Magnitude			
	Major	Moderate	Minor	Negligible
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

Table 12.3 Assessment of Significance

Where the development poses a potential health and safety risk to fishing vessels and crew, the significance criteria outlined previously is not applied. In these instances the risk is assessed based on the parameters used in Chapter 14 Shipping and Navigation and Table 12.4, below.

Risk Criticality	Condition	Explanation
Broadly Acceptable	None	Technical review is required to confirm the risk assessment is reasonable. No further action is required
Tolerable with Monitoring	With a commitment to risk monitoring and reduction during operation	Risk must be mitigated with engineering and/or administrative controls. Must verify that procedures and controls cited are in place and periodically checked
Tolerable with Additional Controls	With a commitment to further risk reduction before operation	Risk should be mitigated with design modification, engineering and/or administrative control to a Risk Class of 4 or below before construction
Tolerable with Modifications	With a commitment to further risk reduction before construction	Risk must be mitigated with design modification and/or engineering control to a Risk Class of 5 or lower before consent
Unacceptable	None	Risk must be mitigated with design modification and/or engineering control to a Risk Class of 5 or lower before consent
Unacceptable	None	Risk must be mitigated with design modification and/or engineering control to a Risk Class of 5 or lower before consent

Table 12.4 Risk Matrix Description

It is important to note that the assessment of risks used in this chapter is qualitative and for the purposes of the EIA only. In light of the absence of significant fishing activity within the proposed boundary of the tidal site, and the potential risks associated with underwater turbines and fishing gear, it is considered that the area will effectively be closed to fishing. It is however recognised that there is currently no legal mechanism to restrict access to the area occupied by the operational site and the assessment of safety risks by individual skippers' may differ to those provided here.

12.3.6 Engineering Parameters and Worst Case

A realistic 'worst case' scenario for the impacts of the Project upon commercial fishing activities has been identified by the Rochdale Envelope parameters described in Chapter 4 EIA, ES and Consultation and 5: Project Description. The parameters which constitute the worst case scenario have been selected on the premise that they will result in the greatest potential impact upon the fishing activities described in the baseline below.

Determining the parameters that constitute a realistic worst case is based on how fishing activities described by the baseline will be most affected. There are two manners in which this could occur. Firstly, the Project has the potential to adversely impact commercially important fish and shellfish populations. For example, increased sediment concentrations resulting from the construction phase could potentially smother eggs, larvae or adults (dependent on species) leading to reductions in population size. Secondly, the Project has the potential to constitute a physical obstruction or risk to normal fishing activities. The worst case parameters relating to potential impacts on fish and shellfish species are identified in Chapter 11: Natural Fish The parameters representing a worst case scenario for commercial fisheries have therefore been defined on the basis of physical obstructions or risks to fishing activity.

Commercial fishing will be excluded during construction to a distance of 500m around perimeter turbine locations. It is likely that 50m safety exclusion zones will be implemented around each surface piercing tower during operation. Outside of these safety zones, current legislation does not provide a mechanism to prohibit fishing within operational offshore renewable sites. As the maximum number of turbines will fill the site however, and due to the safety risks associated with submerged tidal turbines and fishing vessels it is considered that the site will effectively be closed to fishing activity. In addition, dependent on the types of turbines and foundations selected, navigation (e.g. steaming) through the site may not be possible due to potential collisions with installed or partially installed infrastructure.

The parameters for the design of the Project which represent a realistic worst case scenario for the assessment of commercial fishing activities are provided in Table 12.5.

Design Parameters	Worst Case Option	Justification
Tidal Site		
Maximum number of turbines	30 1MW subsea turbines	Greatest impact upon fishing activity
Total area of development	2.28 km²	Greatest impact upon fishing activity

Design Parameters	Worst Case Option	Justification
Turbine	Open Rotor Horizontal Axis Turbine (HATT) Alstom/TGL – 1MW	Poses greatest safety risk to fishing vessels
Foundation type	Bluetec Floating Platform Design with four point catenary mooring and minimum spacing of 61m	It is assumed that this constitutes the greatest footprint as catenary moorings will extend some distance beyond perimeter platforms, dependent on the angle of mooring lines from platform to anchorage points Poses greatest safety risk to fishing vessels. Risk of fouling of towed and static gears around the perimeter of the development will be increased due to presence of moorings.
Cables		
Total length of 33Kv export cable route to Kintra (Islay)	21km to Kintra	Greatest impact upon fishing activity
Installation status	Surface laid armoured cables	Represents greatest safety risk to fishing activity/loss of fishing grounds/displacement of vessels into other areas
Construction schedule		
Maximum duration of construction	6 months/year over two years	Maximum duration of impact on fishing activity
Seasonality of construction	Q2 and Q3 (spring-summer)	Highest potential to interact with fishing activity
Maximum number of construction vessels	Undefined	Depending on transit routes/construction port and vessel numbers this will influence potential of conflict with fishing activity e.g. fouling of static gears and causing vessels towing mobile gears to change direction/alter tow.
Safety Zones		
Maximum safety zone during construction	500m around construction works	Potential loss of fishing area and interference with static gears (e.g. relocation)
Maximum safety zones during operation	50m zones around each tower	Maximum loss of fishing area around perimeter of operational site (assuming fishing will be effectively excluded from site due to safety risks)
Decommissioning		
In the absence of a detailed decommissioning plan, activities which require the removal of infrastructure are considered to result in impacts which are commensurate with those incurred during construction. In the event that infrastructure is left 'in situ', impacts are considered to be commensurate with those incurred during operation.		

Table 12.5 Commercial Fisheries 'Worst Case' Scenario

12.4 Existing Baseline Environment

12.4.1 Commercial Fisheries

12.4.1.1 National Overview

Landings values of the top ten commercial species from the local study area (ICES rectangles 40E3 and 40E4) are shown in a national context in Figure 12.3

(Volume 3: Figures). Total combined landings from ICES rectangle 40E3 in which the Tidal Site and Western Export Cable Route are located are of moderate importance on a national scale and principally comprised of shellfish such as edible crab, lobster, velvet crab and scallops.

12.4.1.2 Regional Overview

Landings values recorded in the regional study area by species and method are shown respectively in Figure 12.4 and Figure 12.5 (Volume 3: Figures). Landings values are generally higher in central and eastern rectangles, with those from 40E4 particularly high. The majority of landings are comprised of shellfish with significant landings of finfish recorded only in 41E2 and 40E2 (haddock and mackerel, respectively). These values are low compared to landings of shellfish recorded elsewhere in the study area.

The majority of landings values recorded in the eastern side of the study area are comprised of Nephrops, which are also an important species north of the site in 41E3. Landings of Nephrops from 40E3, in which the development is located, are comparatively low. In contrast, approximately 75% (£5,987,513) of landings values in 40E4 originate from this fishery. Bottom otter trawls (including both categorisations of demersal and Nephrops trawls) record the highest landings values by method and are the principal gears used to target the fishery. Creels are also used to target Nephrops, although with the exception of 41E4, record lower values.

Landings of edible crab comprise the greatest contribution to the total landings from 40E3, 40E2 and 39E2. Lobsters represent relatively high landings values in 40E3, 41E3 and 41E2. Velvet crabs record significant proportions of landings by value in 40E3 and 41E3. All three species are targeted by vessels operating creels.

Scallops comprise a significant proportion of the total landings values in central (40E3 and 39E3) and eastern rectangles (39E4, 40E4 and 41E4). Landings of queen scallops contribute significantly to the total value recorded in 39E3. Queen scallop landings by boat dredges are principally by Scottish vessels, which utilise a type of dredge which varies to those used to target king scallops, known as 'gate gear'. Queen scallops are also targeted by vessels operating demersal otter trawls. King scallops are principally targeted by vessels operating boat dredges.

Razor clams record comparatively low landings values in 40E4 and 39E4. The methods used to the target the species differ by rectangle: in 40E4 hand fishing records the majority of landings values, whereas mechanized dredges record higher values in 39E4.

The distribution of landings values by vessel categories in the regional study area is shown in figure 12.6. (Volume 3: Figures). The over-15m fleet record a significant proportion of landings values in 39E3, 39E4, 40E4. As vessel size in the Firth of Clyde is restricted to less than 21.3m a significant proportion of vessels targeting Nephrops and scallops in eastern areas of 39E4 and 40E4 will be less than this length. The contribution of the over-15m fleet to the total landings values in 39E3 likely reflects increased activity by larger vessels targeting both queen and king scallop fisheries. Vessels under-15m (both under-

10m and 10-15m categories) tend to record higher proportions of landings values where creel caught shellfish such as crab and lobster are commercially important.

Average landings values in the regional study area by vessels from different licensing authorities in the British Isles are shown in figure 12.7 (Volume 3: Figures) Scottish vessels record the highest overall values. Northern Irish vessels targeting Nephrops record relatively high values in the southern Firth of Clyde (39E4)[(2)]. Landings from Northern Irish vessels represent approximately 50% in rectangles 39E2 and 39E3, and 90% in 40E2. Landings by English, Welsh and Irish vessels are negligible.

12.4.1.3 Tidal Site and Western Export Cable Route (ICES Rectangle 40E3)

Landings values of the five species of greatest commercial importance in 40E3 are shown in Figure 5.10, Technical Appendix 12.1: Commercial Fisheries Baseline Report. Landings are comprised almost entirely of high value shellfish. Edible crab (£623,273, 29%) and scallops (£622,573, 29%) represent the highest value species, followed by velvet crab (£458,884, 21%) and lobster (£339,314, 19%). Edible crab, velvet crab and lobster are generally targeted by creelers, the majority of which are under-10m in length. Scallops are targeted by vessels operating dredges and are equally targeted by the under-10m and over-15m fleets. Nephrops (targeted by vessels operating demersal trawls) landings in the local study area are of low value compared to adjacent south and south eastern areas, constituting only 3% (£69,763) of total landings. Nephrops are equally targeted by the under-10m and over-15m fleets. Combined values of all other species comprise a minimal component of the total average landings values for 40E3 (£31,378, 1%).

Annual variability in landings values of commercially important species in 40E3 are shown in Figure 5.16, Technical Appendix 12.1: Commercial Fisheries Baseline Report. Velvet crab, lobster and Nephrops values have remained consistent over the ten year period for which data is presented. Edible crab landings show more variability, increasing steadily from 2001 then rising sharply from 2006 to 2007 (£658,474 to £1,052,754) subsequently declining in 2008 (£518,665) and 2009 (£294,491).

Seasonal variation in landings values from 40E3 is shown in Figure 5.18, Technical Appendix 12.1: Commercial Fisheries Baseline Report. Landings of edible crab are generally highest during the third and fourth quarters, with peaks recorded in October (£78,400) and December (£111,004). For scallops, landings values are highest in the first six months of year and peak in June (£80,607). Landings values of lobster and Nephrops are broadly highest during spring and summer with peak values in both fisheries recorded during August (£50,336 and £10,864, respectively). The value of velvet crab landings are highest from August onward, showing a distinct peak in December (£118,361), doubling the value recorded in previous months.

The highest percentages of total catch (by value) from 40E3 are landed into Port Ellen (34.2%) and Port Askaig on Islay (26.6%) and represent a significant proportion of respective total landings values (89.1% and 97.5%). Lower values are landed into Rathmullan (N. Ireland) and Oban (8.3% and 7.7%, respectively). These landings constitute almost a third of total landings into Rathmullan

(27.6%) but less than 5% of the port total for Oban. Landings into Portnahaven (1.0%) and Bruichladdich, also on Islay (0.8%), contribute minimally to total landings values from 40E3, but this represents over 97% of the total value landed into these ports.

12.4.2 Fisheries

The fisheries identified as occurring in the area of the Tidal Site and Western Export Cable Route (ICES Rectangle 40E3) are:

- Crab and lobster fishery; and
- Scallop fishery.

These fisheries are discussed in detail below.

12.4.2.1 Crab and Lobster Fishery

The crab and lobster fishery represents approximately 70% (£ 1,421,471) of total landings by value from rectangle 40E3 (Figure 5.10, Technical Appendix 12.1: Commercial Fisheries Baseline Report) and is primarily targeted by full time vessels operating creels. Lobsters are targeted over areas of rough ground with the most prolific fishing occurring from April to September. The fishery is not limited to this period although landings outside these months are generally lower. First sale price increases markedly towards December as a result of demand from the Christmas market (pers. comm. creel fisherman, 4.10.2012). Edible crabs are caught over mixed substrates and depths. Velvet crabs tend to be targeted over rough, weedy ground closer to shore (pers. comm. creel fisherman, 22.2.2013). Similar to lobster, the highest first sale prices occur during December. Green crab and spiny lobster (known locally as crayfish or crawfish) are also landed although in much lower volumes than edible crab and lobster.

Vessels operating out of Islay ports targeting the crab and lobster fishery in 40E3 are principally under-10m in length and therefore their activity is not represented by VMS data sets. The small size of these vessels means that they are restricted in their operational range and weather conditions play a significant role in determining levels of activity, particularly during the winter. There are currently approximately 20 vessels under-10m in length which operate out of ports of Islay and four over-10m (pers. comm. Campbeltown DFO, 20.11.2012).

Grounds targeted by creel vessels operating from Islay, as depicted by individual skippers, during consultation meetings held on Islay (22.2.2013) are shown in Figure 12.8 (Volume 3: Figures). It should be noted that this describes the general location of grounds around Islay. Specific grounds fished by individual vessels are located in more discrete areas within these wider areas.

There is no activity within the boundary of the Tidal Site. Areas in the immediate vicinity (north and west) are targeted during March, April and May, principally by a single Islay based vessel. These grounds are occasionally targeted at other times of year when fishing additional areas located in the vicinity. This area is characterised by very strong tides, rapid changes in depth and heavy swell. These grounds are therefore only fished intermittently (2 to 3 days maximum) in certain conditions, and fleets cannot be left to soak for prolonged periods due to the risk of fastening, damage or loss (pers. comm. creel fisherman, 22.2. 2013).

Grounds located in the vicinity of the Western Cable Route (south of Loch Indaal) are targeted by at least five vessels, and a significant proportion of their fishing time is spent in these areas. These areas are of increased importance during the winter months as they are situated in lee of the land and provide increased fishing opportunities when more exposed areas are unfishable. It was reported during consultation that grounds are also located around the Mull of Oa, south of the cable landfall at Kintra (pers. comm. creel fisherman, 22.2.2013).

12.4.2.2 Scallop Fishery

King scallops represent approximately 28% of all landings in 40E3 (£622,573) and are the second highest value species in the regional study area. In light of the nomadic nature of a proportion of the scallop fleet, landings values from grounds in 40E3 are shown on a national scale (Figure 12.9, Volume 3: Figures). In this context landings are of moderate to high importance.

King scallops inhabit a range of depths in excess of 100m with preferred substrate typically comprising sand, gravel and mud, often interspersed with larger stones and rocks [(3)]. The majority of scallops in the Islay area are landed by vessels operating dredges. A hand dive fishery also exists in the regional study area although this method contributes minimally to total landings values.

Dependent on size, engine power and winch capacity, vessels tow either one or two steel beams onto which an array of dredges is attached. The beam is fitted with solid rubber wheels at each end to aid passage over the seabed. Small vessels tow one to two beams with 4 to 6 dredges; larger vessels may tow two beams with up to 14 dredges each. Typically dredges are the spring loaded 'Newhaven' design which utilises steel teeth along the leading edge to rake the scallops from the substrate. Dependent on ground type dredges penetrate the seabed to a maximum of 20cm.

Vessels targeting scallops in the Islay area can be divided into two broad categories: the 'nomadic' fleet which comprises large over-15m (frequently over-20m) vessels capable of long trips in difficult weather which target grounds cyclically around the UK, and smaller vessels which target local grounds as their operational range is restricted by virtue of their size.

There are currently eight scallop dredgers with home ports on Islay, seven of which are under-15m and will not be represented by VMS datasets. At least a further four vessels operate out of Kintyre ports such as Carradale and Campbeltown, three of which are over-15m in length. An additional over-15m vessel is currently based at Gigha. Vessels from Kintyre also target grounds around Islay and in the Sound of Jura as well as those in the Firth of Clyde. Other nomadic vessels also periodically target these grounds particularly when closures are in effect in the Irish Sea, including large vessels from ports including Kirkcudbright and Troon. Including local and visiting vessels, up to 15 vessels may target grounds in the study area at any one time (pers. comm. scallop fisherman and scallop industry representative, 20.11. 2012).

The location of scallop grounds in the Islay area, as illustrated by Marine Scotland VMS data, (2011, over-15m vessels only) are shown in Figure 12.10 (Volume 3:

Figures). There was no activity recorded within the tidal site boundary during 2011. The Western Export Cable route intersects high intensity grounds immediately south of the Rinns of Islay and Loch Indaal.

Consultation has indicated that smaller vessels target broadly similar areas to the over-15m fleet (pers. comm. scallop fishermen, 22.2.2013), although additional grounds are located both to the west of Islay and to the north, around Colonsay.

Grounds targeted by local scallop dredgers are shown in Figure 12.11 (Volume 3: Figures). Specific areas targeted within these wider grounds, and the proportion of total fishing time spent in each, will vary on an individual vessel basis. It was reported during consultation that a significant proportion of local vessels fishing time is spent on the area intersected by the Western Cable Route. Smaller vessels (under-15m) are more dependent on grounds located close to respective home ports due to limited operational ranges and a reduced capacity to fish in adverse weather conditions.

12.4.2.3 Salmon and Sea Trout Fisheries - Overview

The right to fish for salmon in Scotland, whether in inland waters or at sea, is a heritable right. The taking of salmon without the right or written permission to do so is prohibited under the Salmon and Freshwater Fisheries (Protection) (Scotland) Act 1951.

The only lawful fishing methods in inland waters are rod-and-line and net-and-coble. Fixed nets/engines are prohibited. At sea, it is prohibited to catch fish by enmeshment. Trolling and long-lining are also illegal. Effectively the only lawful methods which can be used to capture salmon and sea trout are net-and-coble, fixed engines and rod-and-line.

The annual closure for salmon fishing in Scotland (except in the Tweed district) is a continuous period of not less than 168 days. Actual dates may vary but are generally from late August to mid-February, depending upon individual District Salmon Fishery Board (DSFB) policy. Angling may continue for a few weeks either side of this. Weekly close times are also nationally enforced, being 24 hours (Sunday) in the case of angling and 60 hours for all other methods.

Salmon fisheries are saleable and netsmen or companies may acquire fishing rights over relatively large areas. Other interested parties may also purchase rights. For example, the Atlantic Salmon Conservation Trust has historically bought coastal sites to close them down as a conservation measure in order to halt coastal netting activities. Similarly, rod-and-line interests may buy up river netting rights to close them down, often through DSFBs.

An indication of the current trends in salmon, grilse and sea trout catches in Scotland with respect to those recorded historically (1952-2011) is provided below. For the purpose of clarity, data from the rod and line (including catch and release) and net (net and coble and fixed engines) fisheries are presented separately.

Figure 5.4, (Appendix 12.2: Salmon and Sea Trout Fisheries) shows the total declared catch for salmon, grilse and sea trout from the rod and line fishery from

1952-2011. Catches of (MSW) salmon have remained relatively stable throughout the period for which data is presented. Numbers of grilse taken in the rod and line fishery have increased, particularly in the latter half of the time series. This may be partially related to an observed shift in the sea age structure of some populations from MSW to grilse dominance over the same time period (see Technical Appendix 12.2: Salmon and Sea Trout Fisheries Baseline Report). Catches of sea trout show a general pattern of decline, with current numbers taken by rod and line approximately half that recorded during the 1950s.

Fisheries statistics derived from the rod and line fishery do not account for fluctuations in effort. Therefore, increases in the popularity of rod and line fishing and improvements in the catch reporting system may both have contributed to apparent similarities between historic and present day catch levels.

Figure 5.5 (Technical Appendix 12.2 Salmon and Sea Trout Fisheries) shows the total declared catch of salmon, grilse and sea trout originating from the net fisheries (all methods combined). The decline in numbers of fish resulting from these fisheries is principally a result of recent decreases in fishing effort as a result of netting stations buyouts and closures, changes in salmon and sea trout abundance and competition from the aquaculture industry which has lowered the price of wild salmon.

12.4.2.4 Regional Overview (including local study area)

Annual reported catch (average 2002-2011) for salmon, grilse and sea trout by district is shown in Figure 12.12 (Volume 3: Figures). On average the greatest total catch is recorded in the Lochy district (913), followed by those recorded in the Awe (526) and Laggan (305) districts. Total combined catch of salmon, grilse and sea trout are considerably lower from other districts. For example, in the Ormsary district an average of only 58 fish is reported annually.

In addition to differences in total numbers caught, the proportion of the reported catch formed by salmon, grilse and sea trout also varies by district. In the Lochy the highest reported catches are of grilse (557; 61%), with salmon and sea trout recording lesser proportions of the total (246; 27% and 115; 13%, respectively). In the Awe district catches of both salmon and grilse are in excess of 200 per year and are approximately equal (255; 49% and 246; 47%, respectively). By comparison, reported numbers of sea trout are markedly lower (24; 5%). In the Laggan district (local study area) salmon (128; 42%) represent a significantly greater proportion of the total average catch than grilse (44; 14%) with sea trout captures (134; 44%) contributing a similar quantity to the total catch as salmon.

The proportion of total catch (salmon, grilse and sea trout combined) by method (average 2002-2011) is shown in Figure 12.13 (Volume 3: Figures) Overall, rod and line (both methods combined) represents the dominant method of capture. The majority of fish captured by rod and line are returned to the water (e.g. catch and release) in the Lochy (672; 73%), Awe (429; 82%) and Aline (64; 88%) districts. The proportion of retained fish in the rod and line fishery is greater in other districts including those located in the vicinity of the tidal farm and associated export cable route. For example, approximately equal numbers of fish captured in the Laggan rod and line fisheries are retained and released (158; 52% and 148; 48%, respectively). In the Ormsary district, the proportion of the

total rod and line catch that is retained is greater than that released (18; 31% and 34; 60%, respectively). Within the regional study area, the Lochy, Nell and Stunart regions are the only districts in which fixed engine and net and coble fisheries account for significant proportions of respective total catches of salmon, grilse and sea trout. No captures by either net and coble or fixed engine are recorded in the Laggan district (local study area).

12.4.2.5 Net Fishery by Region

The annual declared catch from the net fishery (net and coble and fixed engines) by salmon fishery region is provided in Figure 12.14 (Volume 3: Figures). The catch in the regional study area (West Coast Region) has been further broken down by individual district. The location of active net fisheries in 2010 (MSS, 2012) are also provided. It should be considered that average values provided for 2001-2011 will likely overestimate the current levels of exploitation due to the inclusion of statistics from netting stations which are no longer active.

As shown previously, the numbers of salmon, grilse and sea trout reported from east coast net fisheries are considerably higher than those recorded from the west (excepting the Solway Region). The regions reporting the greatest overall numbers net caught salmon, grilse and sea trout are the North East (14, 928) East (6,360) and North (5,969). Although total numbers of netting stations are similar on the east and west coasts (25 and 23, respectively), it should be considered that on the west coast 18 (78%) of these stations are located in the Solway Region. There are therefore only 7 active netting distributed among the remaining 4 regions located on the west coast.

On the west coast (excluding the Solway), the highest numbers of net caught salmon, grilse and sea trout are reported from the regional study area (West Coast Region) in which three active netting stations are located (two fixed engine and one net and coble). Of the reported total net catch for the region, 67% (196 fish) originates from the fixed engine fishery in the Lochy District. The only net and coble fishery currently active in the regional study area is located in the Nell district from which catches represent 19% (57 fish) of the regional total. Catches from the Stunart district contribute an average of 11% of to the total recorded net catch for the region. The Crenan net and coble fishery was not active in 2010 and past captures contribute an average of only 2% (5 fish) to the current West Coast total net catch. Similar to the Crenan, the Ormsary net and coble and fixed engine fisheries were not active in 2010 and have historically recorded low average annual returns (2% of the West Coast total net catch). The most recent netting activity in the Ormsary region was recorded in 2007. There has been no licensed netting activity in the Laggan district for the ten year period over which data has been analysed.

12.4.2.6 Local Study Area (Laggan District)

As described previously, the local study area has been defined by the Laggan district due to its situation in the immediate vicinity of the Islay Tidal Site and associated cable route.

The Laggan and Sorn District Salmon Fisheries Board are responsible for the management of migratory fish species in the River Laggan and River Sorn on Islay. In the past this has included work such has habitat and electrofishing

surveys. In 2001, the Board supported the Argyll Fisheries Trust (AFT) with electrofishing surveys aimed at determining the stocks of juvenile and salmon and trout in both catchments. The results of the survey indicated that there were good numbers of adult salmon spawning during the winter of 2001/2002 and that survival from egg to fry had been high. Numbers of salmon parr were however lower than would be expected based on the number of fry present. A survey conducted in the Sorn yielded similar results, which indicated that good numbers of spawning adult salmon based on relatively high numbers of fry populating suitable habitats.

Principal Fishing Methods in the Laggan District

Salmon and sea trout fishing in the Laggan district is based purely on the rod and line fishery. The proportion of fish retained and released within the fishery are approximately equal (Figure 5.11, Technical Appendix 12.2: Salmon and Sea Trout Fisheries). In terms of rod and line fishing the Laggan is considered the more productive of the two Islay rivers with the most popular beat controlled by the Laggan Estate which has an annual average of 146 salmon. The Dunlossit, Islay, and Foreland estates and Port Ellen Angling Club also hold salmon fishing rights on the Laggan. The salmon season on Islay runs from the 25th February to 31st October.

12.5 Assessment of Potential Effects

12.5.1 Adverse Effects on Commercially Exploited Fish & Shellfish

The principal species targeted within the vicinity of the Project (Tidal Site and Western Cable Route) are as follows:

- Edible crab;
- Lobster;
- King Scallop; and
- Velvet crab.

As described previously there is the potential for the construction, operation and decommissioning phases of the Project to cause adverse impacts on fish and shellfish populations of commercial importance. In turn, this may result in changes to behaviour or a decline in species abundance, indirectly affecting the productivity of a given fishery. Whilst this indirect effect is briefly discussed within this chapter, impacts on fish and shellfish resources are fully assessed in Chapter 11: Natural Fish.

All of the potential effects identified within Chapter 11: Natural Fish have been assessed as having an overall impact rating of negligible or no significant effect (see Table 7.4.1.5.1, Chapter 11 Natural Fish). Taking these findings into account, in addition to the potential for short term displacement effects which may have a limited indirect effect on catch rates, it is predicted that indirect impacts on commercial fishing will not be greater than those identified within Chapter 11: Natural Fish.

12.5.2 Construction Phase

The impacts of construction of the Tidal Site and Western Export Cable Route have been assessed on the commercial fisheries identified in the local study area (ICES rectangle 40E3). The potential effects arising from the construction are listed in Table 12.5, along with the worst case criteria against which each construction phase effect has been assessed.

12.5.2.1 Temporary Loss or Restricted Access to Traditional Fishing Grounds

During the construction phase, temporary loss of fishing area will occur as a result of:

- Safety zones around construction activities; and
- Safety zones around installed or partially installed infrastructure.

Temporary safety zones of 500m will be imposed around construction works, from which all non-construction associated vessels would be excluded. Safety zones around partially installed infrastructure will further restrict access resulting in temporary loss of fishing area. Depending upon the amount of incomplete infrastructure and number of construction vessels, there may be a number of safety zones across the site. It therefore follows that fishing opportunities within the Tidal Site and along the Western Export Cable Route could be increasingly reduced as construction advances as fishing activity cannot resume until cables (both inter array and export) are either buried or protected, and post-installation surveys have confirmed that it is safe for trawling to resume. The worst case scenario has identified that all cables will be surface laid and therefore fishing activities will not be able to resume. It should be noted that as no significant fishing activity has been identified within the site boundary, this impact relates primarily to the Western Export Cable Route.

Crab and Lobster (Creel) Fishery

As described previously, the crab and lobster fisheries represent a combined annual average of £1,421,471 equal to 70% of total landings by value from rectangle 40E3 (see Figure 12.4 Volume 3: Figures). All species are targeted year round although landings values fluctuate seasonally (see Section 12.4.1.3). The fishery is principally targeted by full time vessels operating creels, the majority of which are less than 10m in length. By virtue of their size, these vessels are restricted in their operational range and weather plays a significant role in determining levels of activity. The majority of these vessels are unable to adapt their methods to target other fisheries without considerable modification to their structural design and gears.

In addition to analysis of VMS datasets consultation with creel fishermen on Islay during February 2013 indicated that no creeling activity occurs within the boundary of the Tidal Site. Figure 12.11 Volume 3: Figures, shows grounds in the vicinity are situated immediately north, west and east of the development. The area identified to the west is subject to particularly strong tidal conditions and is therefore targeted intermittently, with activity highest during the spring and summer. These grounds will not be impacted by construction works and therefore there is considered to be no impact on the crab and lobster fishery from the construction phase of the Tidal Site.

The Western Export Cable Route intersects creel grounds south of the Rhinns of Islay and Loch Indaal (Figure 12.11 Volume 3: Figures). These grounds are targeted year round by at least five vessels and are of increased importance during the winter months. Consultation indicated that grounds are also located at the eastern end of the cable route, south of Bowmore (pers. comm. Creel fisherman, 22.2.2013).

In light of their limited operational range, low method versatility and dependence on spatially restricted grounds, the creel fisheries are assigned a receptor sensitivity of **high.** Consultation indicated that there are currently five vessels which regularly target grounds in the vicinity of the Western Cable Route. This represents a significant proportion of the full time creel vessels operating from Islay. The area of seabed affected by the cable is however likely to be relatively small when the total extent of the grounds within the fishery are taken into account. The magnitude of the effect is therefore considered to be **minor** and the impact of loss of fishing area for the creel fishery during the installation phase of the Western Export Cable is assessed to be **moderate**, which is significant in EIA terms.

Scallop Fishery

Consultation and analysis of available VMS datasets indicates that scallop dredging does not occur within the boundary of the Tidal Site and therefore it is considered that there will be no impact on the scallop fishery from the construction of the Tidal Site.

Figure 12.13 and Figure 12.14 (Volume 3: Figures) demonstrate that the Western Export Cable Route intersects scallop grounds situated immediately south of the Rinns of Islay and Loch Indaal. As described previously, there are a number of scallop dredging vessels with home ports on Islay which target local grounds year round, generally due to their restricted operational range. As a result, these vessels have increased dependence on those fishing areas traversed by the Western Export Cable Route, and a receptor sensitivity of **medium** is assigned to Islay based scallop dredge vessels.

Vessels operating out of mainland ports may also target grounds around Islay, however these vessels also access other grounds closer to their home ports such as those located in the Firth of Clyde (40E4) or west of Kintyre. Similarly, nomadic vessels periodically targeting these areas have a wide range of grounds available to them due to increased operational range and ability to fish in adverse weather conditions. Both groups of vessels are therefore assigned a receptor sensitivity of **low.**

Exposed cables represent a considerable safety risk to vessels towing scallop dredges. If gear comes fast during towing and retrieval is unsuccessful then the gear may have to be released from the vessel. This is costly for fisherman and represents a further safety risk to other vessels. In certain situations, such as when towing in heavy swell/rough weather, fastening can potentially result in capsize of the vessel. Similarly, fastening of dredges on a single side of a vessel towing two beams can undermine its stability potentially resulting in capsizing.

Of further consideration is the manner in which the cable crosses the grounds (e.g. east to west). This could potentially rule out towing of gear from north to south (or vice versa) in the area of the cable as the risk of fastening would be elevated. In this context it should be considered that tow lengths are typically between 2nm and 4nm.

For the reasons outlined above, skippers of scallop dredging vessels may avoid fishing the area of the area of the export cable. As the cable is to be surface laid, this may lead to a progressive loss of fishing grounds occurring concurrently with installation. The spatial extent of the grounds physically covered by the cable is however relatively small.

Due to the increased dependence on grounds in the vicinity of the Western Export Cable Route the magnitude of the impact on local vessels is assessed to be **moderate.** Considering both receptor sensitivity and the magnitude of the effect, the impact is assessed to be of **moderate** significance, which is significant in EIA terms.

For visiting and nomadic fleets which have wider grounds available, the magnitude of the effect is considered to be **minor**. Based on these criteria the impact of temporary loss of grounds resulting from installation of the Western Export Cable on these fleets is assessed as **minor**, which is not significant in EIA terms.

12.6 Proposed Management and Mitigation

In light of the identification of significant impacts relating to the loss or restricted access to creel and scallop fishing grounds it is proposed that a working group is established with key fisheries stakeholders to establish a forum for on-going engagement with the fishing industry. It advised that in order to achieve progress in reaching agreements that are both feasible and acceptable to the fishing industry that the group would include representatives from the following:

- DP Marine Energy (DPME);
- Brown and May Marine (BMM);
- Nominated local FIRs;
- Scottish Fishermen's Federation (SFF);
- Marine Scotland (MS); and
- The Crown Estate.

In the first instance a construction management plan could be developed via the working group with direct inputs from those fishermen potentially impacted by the development. Once more information is available with respect to construction schedules and methodologies it may be possible to work collaboratively to minimise interference throughout the construction period to acceptable levels. The construction management plan would aim establish clear protocol for engagement between the developer and fishermen throughout the construction period in order to minimise potential conflict and could include but may not be limited to:

- On-going dialogue between the fishing community and the developer throughout the construction phase;
- Employment of a dedicated project Fisheries Liaison Officer (FLO) with local knowledge on-board construction vessels and onshore if necessary;
- Effective dissemination of project information - via Notice To Mariners, Kingfisher Information System, DFO, CFA and project FLO;
- Protocol for the navigation of construction and works vessels to and from the site (i.e. agreement of transit lanes to minimise interference to fishing activities, agreement for 'holding' areas for vessels in the event of bad weather);
- Protocol for removal of seabed obstacles pre and post-construction
- Establish protocol for procedure to be followed in the event of interaction between construction and fishing activities such as claims for lost and/or damaged gear;
- Post construction surveys and possible rectification procedures; and
- Refinement of construction schedules and final engineering design to minimise impacts upon commercial fishing activities.

The second key function of the working group would be to identify and develop options for mitigation in collaboration with the fishing industry where it is not possible to minimise impacts through the construction management plan alone (e.g. through refinement of construction schedules/design). Potential alternative mitigation options to be explored through the working group could include:

- Provision of appropriate training and subsequent employment for local fishermen/vessels e.g. as offshore personnel/guard vessel duty;
- Improvement of port facilities such as derricks, gear, fuel, and catch storage;
- Stock enhancement of local scallop and lobster fisheries from hatchery/wild seed; and
- Development of alternative shellfisheries such as mussel or oyster cultivation.

It is recognised that during the installation of the Western Cable Route there may be a requirement for a small number of local vessels to temporarily remove static gear from areas in which they are normally deployed. Should this be the case, engagement with the owners of the vessels concerned will be undertaken in order to determine the most appropriate compensation measures.

In the case of exposed sections of cable which could constitute fastening risks, it is recommended that these are buried to the maximum depth feasible (e.g. 1m to 2m), thereby eliminating the risk of cable damage or gear fastening. Furthermore, where burial is not possible then graded rock placement should be used where feasible. Appropriate advisory safety zones could then be applied and monitored until exposed sections are suitably buried or protected and it has been demonstrated that trawling may resume. The location of installed cable should be charted and added to the Kingfisher Information System.

With the implementation of this mitigation, the residual impact of loss or restricted access to creel and scallop grounds during construction is considered to be **minor.**

12.6.1 Safety Issues for Fishing Vessels

In order to ensure that the fisheries stakeholders are fully aware of the safety risks associated with the construction phase, fishermen will be kept fully informed of the construction schedule through the project FLO, relevant DFO's, Notices to Mariners and the Kingfisher Information Service.

12.6.1.1 Tidal Site

It is expected that safety zones of 500m will be in place around construction activities associated with the Tidal Site from which all marine traffic, including fishing vessels, will be excluded. Infrastructure that is not fully installed will be appropriately marked and lit and may be marked with temporary buoys, close around all infrastructure, both fully and partially installed. Aside from the potential for collisions occurring between vessels not under command and drifting (assessed in detail within Section 9.4.1 of Chapter 14: Shipping) risks to fishing vessels would only occur following if infringements of these safety zones. It should also be recognised that the ultimate responsibilities with regards to safety will lie with the masters of vessels. Provided these zones are adhered to, the safety risk to vessels and their crew will be **broadly acceptable**.

12.6.1.2 Inter Array Cables

Consultation with fishermen on Islay (22.2.2013) and Campbeltown (4.10.2013) and other sources of data (e.g. VMS and surveillance sightings, see Technical Appendix 12.1: Commercial Fisheries Baseline Report) indicate that there is currently no active fishing within the boundary of the Tidal Site. In the absence of applied and monitored safety zones which prevent fishing activity around sections of installed surface laid inter array cabling the possibility of activity occurring cannot, however, be ruled out. This constitutes a potential fastening risk to fishing vessels and therefore safety risk to vessels and their crew are **tolerable with additional controls**.

12.6.1.3 Western Export Cable Route

A lack of similar advisory safety zones around sections of installed, surface laid sections of export cable in areas where fishing activity has been demonstrated to occur also presents a similar (and more likely) fastening risk as identified for inter array cables. With respect to the installation of the Western Export Cable safety risks to fishing vessels and their crew are also deemed to be **tolerable with additional controls**.

12.6.1.4 Proposed Management and Mitigation

Controls and mitigation suggested to be implemented during the construction phase are also detailed in Chapter 14: Shipping and Navigation. Regarding exposed sections of cable, which could constitute fastening risks to fishing gear, it is proposed that these are buried where possible or suitably protected using methods such as graded rock mattressing (if feasible). Appropriate advisory safety zones could then be applied and monitored until exposed sections are suitably buried or protected and it has been demonstrated that trawling may

safely resume. Provided these zones are adhered to, the safety risk to vessels and their crew would then be **acceptable with monitoring**.

12.6.1.5 Increased Steaming Times to Fishing Grounds

The implementation of 500m safety zones and installation of Bluetec mooring devices with a minimum spacing of 61m and taut mooring lines could result in a progressive loss of sea area through which to safely navigate the Tidal Site during the construction phase. This could result in some short term increases in steaming distances and times, and therefore higher operational costs for fishing vessels.

The amount of sea area occupied by the Tidal Site is relatively small (2.28 km^2). The same is true of areas temporarily restricted by safety zones during the construction and installation phase of both the Tidal Site and Western Cable Route. It is therefore considered that most fishing vessels will not be required to deviate significantly from normal steaming routes. The sensitivity of the receptors (all fishing vessels) is therefore considered to be **low** and the magnitude of the impact is assessed as **minor**. The effect will, therefore, be of **minor** significance, which is not significant in EIA terms.

12.6.1.6 Proposed Management and Mitigation

As no significant impact of increased steaming times to fishing grounds have been identified, it is considered that no further mitigation and monitoring is required.

12.6.1.7 Interference with Fishing Activities

An additional impact to be considered is the potential for navigational conflicts to arise between fishing and construction vessels transiting to and from the Tidal Site and Western Export Cable Route. This could include the fouling of marker buoys, resulting in loss of static gear, or vessels operating towed gear methods being required to alter tow direction.

Under International Regulations for Preventing Collisions at Sea (International Maritime Organisation (IMO), 1972)[5] a power driven vessel must give way to a vessel engaged in fishing. Under these rules, construction vessels, other than those of more restricted manoeuvrability than vessels fishing, must not impede the progress of vessels fishing. As the masters of construction vessels will be appropriately certified and briefed, interference is not anticipated to occur and the risk is therefore deemed **broadly acceptable**.

In the case of the possible fouling of static gears by construction and maintenance vessels, in the absence of mitigation embedded within the construction schedule the risk is deemed **tolerable with additional controls**.

12.6.1.8 Proposed Mitigation and Management

It is recommended that construction vessel transit routes are planned in consultation with the fishing industry to avoid conflict with deployed static gears. In addition, crews should be made aware of the surface markers used. Fishermen should be kept informed of the schedules, transit routes and communication channels of construction vessels. With adherence to the above procedures,

conflicts between construction works and fishing activities should not occur and the risk is deemed **tolerable with monitoring**.

12.6.1.9 Displacement of Fishing Vessels into other areas

There is potential for temporary displacement of fishing vessels into other areas as result of construction activities, potentially increasing competition for fishing grounds outside of the area where construction is occurring. This has the potential to result in either conflict between vessels competing for the same resource (e.g. creel grounds), or between different fishing methods (i.e. static and towed gears). As no fishing activity has been identified within the Tidal Site boundary, for the construction phase this impact is considered relevant for the Export Cable Route only.

Displacement of fishing vessels into other areas will be a function of the loss or restricted access to traditional fishing grounds. As described above, significant effects of this nature were identified for the creel (crab and lobster) and local scallop fisheries only.

The primary concern amongst creel fishermen relates to the displacement of static gears into areas where other static gears are deployed at such densities that there may be conflicts over available space or resources. As described previously, significant levels of creel fishing occur within the vicinity of the Western Export Cable Route. It is therefore likely that gear will need to be removed from the cable corridor during installation. As adjacent areas may already be occupied by static gear this will potentially lead to conflict between vessels. In addition, the presence of scallop dredging activity in areas adjacent to creel grounds highlights further potential for conflict between gears if creel fishing is displaced closer to these areas in order to compensate displacement within the fishery. As assessed previously, the sensitivity of the receptor is considered to be **high**, and the magnitude of effect is **minor** and therefore the potential displacements effects within the creel fishery are assessed to be of **moderate** significance.

With respect to the local scallop fleet, these vessels are considered to be receptors of **medium** sensitivity. As explained previously the Western Export Cable intersects scallop grounds and is to be surface laid, potentially leading to a progressive of loss of fishing grounds occurring concurrently with installation. In addition, due to the presence of surface laid cable and the east to west route through the grounds, skippers may elect not fish in the vicinity of the cable. This may lead to displacement of vessels into other areas. The magnitude of the impact on local vessels is therefore assessed to be **moderate**. Considering both receptor sensitivity and the magnitude of the effect, the impact is assessed to be of **moderate** significance, which is significant in EIA terms.

12.6.1.10 Proposed Mitigation and Management

Mitigation identified previously for loss or restricted access to traditional fishing grounds (Section 12.5.2.1) will also apply to the impact of displacement of fishing vessels into other areas.

12.6.2 Operational and Maintenance Phase

The impacts of the operational and maintenance phase of the Tidal Site and Western Export Cable Route have been assessed on commercial fisheries in the local study area (ICES rectangle 40E3). The potential effects arising from operation and maintenance are listed in Table 12.5 along with the worst case criteria against which each effect has been assessed.

The impacts described below should be considered in the context of the operational life of the Project, currently estimated to be 25 years in design life. The assessment provided below is based on the current baseline, and the potential of this to change over time should be recognised.

12.6.2.1 Loss or Restricted Access to Traditional Fishing Grounds

The description of the current commercial fisheries baseline has not identified any fishing activity within the boundary of the Tidal Site. In addition, it is considered that due to the considerable safety risks associated with fishing in the vicinity of submerged turbines and unburied inter array cabling, the Tidal Site will effectively be closed to fishing during operation. For this reason the impact of loss of fishing grounds during the operational life of the Tidal Site are not assessed further.

Post installation, the export cable will be surface laid. As such this has the potential to reduce access to traditional fishing grounds for vessels towing mobile gears such as scallop dredges and demersal trawls, due to associated fastening risks. Discrete areas where stone mattressing may be used as cable ballast also represent a fastening risk. Both of these risks additionally apply to static gear methods as there is potential for static gear to become snagged on the cable. Skippers may deem the potential safety issues or risk of gear loss too great to warrant fishing in the vicinity of surface laid cables or areas protected by stone mattresses. It should be considered that the presence of any suspended cable sections or spans (e.g. over areas of rough ground) will further exacerbate the risk of gear fastenings. The impacts of the operational export cable on static and towed gear methods are considered below.

Crab and Lobster Fishery

As described previously, the Western Export Cable intersects grounds targeted by five full time Islay based vessels. These areas are fished year round and are situated south of the Rinns of Islay and Loch Indaal. Consultation indicated that additional grounds are located at the eastern end of the cable, south of Bowmore and around the Mull of Oa (pers. comm. creel fisherman, 22.2.2013).

As previously described the sensitivity of vessels in the creel fishery are considered to be **high**. Fleet anchors, creels or other components may fasten on exposed cables or stone mattresses and fleets may be damaged or lost in their entirety. It should also be considered that in areas of strong tides fleets may move considerable distances and even if deployed some distance from the cable a fastening risk may still exist. In light of these considerations skippers may elect not to fish areas of the grounds through which the cable passes if risks of losing gear are deemed too high. The physical area of seabed covered by the cable is however relatively small when the total extent of grounds is considered. The magnitude of the impact is therefore assessed as **minor**. On the basis of these considerations the magnitude of the impact is assessed to be **moderate**, which is significant in EIA terms.

Scallop Fishery

The Western Cable Route intersects scallop grounds situated immediately south of the Rinns of Islay and Loch Indaal. As described previously, there are a number of scallop dredging vessels with home ports on Islay. Due to increased dependence on grounds local to Islay, a receptor sensitivity of **medium** has been assigned.

Vessels operating out of mainland ports may also target grounds around Islay but can also access other grounds closer to home ports such as those located in the Firth of Clyde (40E4) or west of Kintyre. Similarly, nomadic vessels periodically targeting these areas have a wide range of grounds available to them due to increased operational range and ability to fish in adverse weather conditions. In these cases both groups of vessels are assigned a receptor sensitivity of **low.**

As described within the assessment potential impacts during the construction phase, exposed cables represent a considerable safety risk to vessels towing scallop dredges. If gear comes fast during towing and retrieval is unsuccessful then the gear may have to be released from the vessel. This is costly for fisherman and represents a further safety risk to other marine users. In certain situations fastening can potentially result in capsize of the vessel.

In addition, the east to west route of the cable across the grounds could potentially result in modification to operating practices. Specifically, to prevent the risk of fastening, tows (typically 2-4nm long) may have to be shortened when travelling north to south (or vice versa) due to the central position of the cable on the grounds. In the case of discrete areas which are protected by stone mattresses, these may present a fastening risk for smaller vessels although successful retrieval is more likely. It is likely that larger vessels have the power to tow directly over stone mattresses this may however expose the cable and render it vulnerable to further damage. Dredges and other components of the vessels gear may also be damaged.

For these reasons, skippers of scallop vessels may avoid fishing the area of the cable route, resulting in a permanent loss of grounds. The spatial extent of the grounds covered by the cable is however relatively small. In the case of the local fleet the magnitude of the effect is therefore assessed to be **moderate**.

Based on the criteria outlined above the magnitude of the impact for local Islay based scallop vessels is assessed to be of **moderate** significance, which is significant in EIA terms.

For the nomadic fleet and those vessels operating from mainland ports the magnitude of the effect is assessed as **minor** due to the small area of seabed covered by the cable compared to available wider grounds. In light of these considerations the significance of the impact for these fleets is considered to be of **minor** significance.

12.6.2.2 Proposed Mitigation and Management

In the case of exposed sections of cable which could constitute fastening risks to vessels operating creels and scallop dredges, it is recommended that these are

buried to the maximum depth feasible (e.g. 1m to 2m), thereby eliminating the risk of cable damage or gear fastening. It is recommended that where burial is not possible then graded rock placement should be used where feasible and subsequent surveys are conducted to ensure that it is safe for vessels to resume fishing. The installed export cable route should be planned to avoid any potential spans. The location of the installed cable should be charted and added to the Kingfisher Information System.

Following implementation of the mitigation outlined above, the residual impacts of loss or restricted access to grounds during the operational phase are considered to be **minor.**

12.6.2.3 Safety Issues for Fishing Vessels

As described previously, the commercial fisheries baseline has not identified any fishing activity within the boundary of the Tidal Site. Furthermore, due to the considerable safety risks associated with fishing in the vicinity of submerged turbines and unburied inter array cabling it is further considered that this is unlikely to change in the near future. It must however be acknowledged that existing legislation does not prevent fishing from occurring within operational renewable energy sites and individual skippers may elect to attempt to fish in the site despite potential safety risks identified. For these reasons safety risks associated with fishing in the Tidal Site are assessed as **tolerable with additional controls**.

With respect to the operational phase of the installed Western Export Cable, due to the fastening risks associated with surface laid cable, this is also assessed to represent a risk to fishing vessel safety which is **tolerable with additional controls**

Proposed Mitigation and Management

With regard to the Tidal Site, the developer may apply to the Scottish Government for the area to be designated as a no fishing area (see Chapter 14: Shipping and Navigation). In addition, the Tidal Site and devices should be charted and added to the Kingfisher system. This would reduce the risk to **tolerable with monitoring** (see Chapter 14: Shipping and Navigation)

In the case of exposed sections of cable which could constitute fastening risks to fishing gear, it is recommended that these are buried to a depth of 1m to 2m. Where burial is not possible exposed cable should be suitably protected using graded rock placement (if feasible). The location of the cable should be added to the Kingfisher system. This would reduce the risk to **tolerable with monitoring** (see Chapter 14: Shipping and Navigation)

12.6.2.4 Increased Steaming Time to Fishing Grounds

The use of Bluetec mooring devices with a minimum spacing of 61m and taut mooring lines could result in insufficient sea area through which to safely navigate through the Tidal Site during operation (see Chapter 14: Shipping and Navigation). The sea area covered by the Tidal Site is however relatively small (2.28km^2). The sensitivity of the receptors (all fishing vessels) is therefore considered to be **low** and the magnitude of the impact is assessed as **minor**. In light of these considerations the operational Tidal Site is not expected to result in

significant increases to steaming times and is expected to have a **minor** impact on fishing vessels, which is not significant in EIA terms.

The installed export cable will not impact upon steaming times during the operational phase. Fishing vessels are therefore assigned a receptor sensitivity of **negligible**. Similarly the magnitude of the effect is also assessed to be **negligible**. The significance of the impact of increased steaming time associated with the operational cable route is therefore **negligible.**

12.6.2.5 Proposed Mitigation and Management
As no significant impact has been identified mitigation and management is not required.

12.6.2.6 Obstacles on the Seabed post Construction
Obstacles left on the seabed post construction could result in damage to, or loss of, fishing gears, as well as representing a safety hazard to other marine users. Marine policy(6) prohibits the discarding of objects or waste at sea. The reporting and recovery of any accidentally dropped object is also required.

Provided there is compliance to obligatory standards by contractors, the impact is considered to be **broadly acceptable**.

12.6.2.7 Proposed Mitigation and Management
As no significant impact has been identified mitigation and management is not required.

12.6.2.8 Interference to Fishing Activities
As discussed for the construction phase, maintenance vessels could interfere with fishing vessels or cause loss or damage to static gears. The impact is therefore deemed to be **broadly acceptable** for towed gear and **tolerable with additional controls** for static gear.

12.6.2.9 Proposed Mitigation and Management
As mentioned previously during the construction phase, maintenance vessel transit routes should be planned in consultation with the fishing industry to avoid conflict with deployed static gears. In addition, crews should be made aware of the surface markers used to mark gear positions. Fishermen should be kept properly and efficiently informed of the schedules, transit routes and communication channels of construction vessels. With adherence to the above procedures, conflicts between construction works and fishing activities should not occur and the risk to static gear is considered to be **tolerable with monitoring** (see Chapter 14: Shipping and Navigation).

12.6.2.10 Displacement of Fishing Vessels into other Areas
As described previously, displacement of fishing vessels into other areas will be a function of loss or restricted access to traditional fishing grounds.

With respect to the Tidal Site, no fishing activity has been identified within the site boundary to date. It therefore follows that displacement of fishing vessels cannot occur and the impact is not assessed further.

Regarding the operational phase of the export cable, significant effects were identified for the loss of grounds for both creel and local scallop dredge fisheries.

Creel vessels were assigned **high** receptor sensitivity. In the creel fishery, permanent loss of fishing area may occur if skippers are unwilling to fish in the vicinity of the cable due to the risks associated with loss of gear. This in turn may lead to displacement of effort and if adjacent areas of the grounds are already covered by static gear, could lead to conflict between vessels. Conflict between towed and static gears may also occur if fleets are moved closer to adjacent scallop grounds in order to avoid conflict within the creel fishery. The area of ground lost is however small and the magnitude of the effect is assessed as **minor**. Potential displacements effects within the creel fishery are therefore assessed to be of **moderate** significance.

As previously described, the local scallop fleet has been assigned sensitivity of **medium** on the basis of their dependence on grounds in the vicinity of the Project.

The potential for displacement of local scallop activity relates primarily to the availability of grounds and operational range. As described previously, local vessels, particularly thoseunder-15m, are likely to depend on grounds intersected by the Western Cable Route. Displacement may occur if the safety risks associated with fishing the vicinity are too high or the location of the cable causes alterations to operating practices. The magnitude is therefore assessed to be **moderate** and the impact is assessed to be of **moderate** significance.

12.6.2.11 Proposed Mitigation and Management

The mitigation discussed loss or restricted access to traditional fishing grounds (Section 12.5.2.1) will apply here.

12.6.3 Decommissioning

As the exact details of the project design and the installation method are not yet finalised, a detailed decommissioning plan will be submitted for approval by the regulatory authorities prior to construction, as required by section 105 to 111 of the Energy Act 2004 (Chapter 5: Project Description)

In the absence of a detailed decommissioning plan, activities which require the removal of infrastructure are considered to result in impacts which are commensurate with those incurred during construction. In the event that infrastructure is left 'in situ', impacts are considered to be commensurate with those incurred during operation.

12.6.4 Cumulative Assessment

An assessment of potential cumulative impacts on commercial fisheries receptors is given below. The assessment approach adopted takes account of the following:

- For the assessment of impacts on commercially exploited fish and shellfish populations, no significant cumulative effects were identified for fish and shellfish receptors (including species of commercial interest) within Chapter 11: Natural Fish. In light of this further assessment of cumulative impacts is not considered necessary;

- Only fisheries stakeholder groups with activity recorded within the Tidal Site and/or along the Export Cable Route could potentially sustain a cumulative impact from the offshore construction, operation and decommissioning phases of the Project;

- Only impacts assessed as significant have the potential to contribute to cumulative effects;

- The premise that installed infrastructure and regulated activities form part of the existing environment to which receptors have adapted is appropriate for the assessment of cumulative effects on ecological assessments. This is not, however, wholly applicable to certain potential impacts and commercial fisheries receptors. The following assessment therefore also considers existing infrastructure where relevant;

- It is assumed that developers and operators of other infrastructure will adhere to the required standard to ensure that fishing vessels safety is not compromised by a cumulative effect in respect of fishing vessel safety;

- Similarly, it is assumed that the same obligations will apply in respect of objects on the sea bed post construction, and as such there being no potential for cumulative effects to occur;

- Due to the lack of sufficient information on other infrastructure and measures combined with the uncertainties of the future of the fisheries baseline, it is considered unfeasible to undertake a reliable assessment of cumulative impacts arising from the decommissioning of the Project;

- Similarly, it is not considered feasible to undertake an assessment of displacement of fishing activities into other sea areas during all phases of the development as the level of displacement from other developments and measures is unknown.

It is therefore considered that the only cumulative impacts that can be assessed are loss of or restricted access to traditional fishing grounds and increases in steaming times during the construction and operational phases.

It should be recognised that uncertainties exist in respect of the future installations, measures and regulated activities which could contribute to the overall cumulative impact on commercial fisheries. For example, the final construction schedules considered for cumulative assessment have yet to be determined. Future changes to conservation measures and fisheries controls in ICES area VIa (and indeed other sea areas) are also difficult to predict with any degree of accuracy.

The planned projects which do not constitute part of the existing baseline and are considered for cumulative assessment are listed in Table 12.6 and illustrated in Figure 4.2 Volume 3 figures.

Project Name	Project Developer	High Level Description of Project	Project Status	
Islay offshore wind	SSE Renewables	Located 13km of west coast of Islay. 690MW capacity – up to 138 5MW wind turbines	Scoping	Expect to submit consent application towards end of 2014.
Argyll Array Scheme. Offshore wind	Scottish Power Renewables	Located 5km off the coast of the island of Tiree. 1800 MW capacity	Scoping	On hold until Dec 2013 to study reports on potential environmental impact on basking sharks and seabirds
Limpet	Voith Hydro	Installed in 2002 to generate 75 kw of electricity	Operational	
Sound of Islay	Scottish Power Renewables	10 x 1 MW turbines	Consented	Installation 2013 to 2015
Argyll Tidal	Nautricity Ltd/Argyll Tidal Ltd	Mull of Kintyre. 10MW capacity	TCE lease	TCE for 6 tidal turbines in the Mull of Kintyre
Sanda Sound, South Kintyre, Wave	OceanFlow	1/4th Scale demonstrator at Sanda Sound	Consented	plan to deploy a 1/4 scale Evopod device in the Sound in the 4th quarter of 2012

Table 12.6: Details of Projects Considered for Cumulative Assessment

Regarding existing infrastructure, the Voith Hydro Limpet (see Figure 4.2 Chapter 4: Environmental Impact Assessment and Consultation) is a shoreline based development. As such, the development has not had any significant effect on commercial fisheries in the area and will not contribute to cumulative effects on these receptors.

12.6.4.1 Construction Phase

Loss or Restricted Access to Traditional Fishing Grounds

The baseline description for the Project identified no significant fishing activity within the Tidal Site boundary. As such its construction is not expected to contribute to any cumulative effects on commercial fisheries receptors.

With respect to installation of the Western Export Cable Route **moderate** impacts were identified for the creel and local scallop fisheries. On the basis of existing available information, it is not expected that there will be other planned developments which would further impact these receptors within the timeframe of the export cable installation. As such the cumulative effect on the creel and local scallop fisheries will be, at worst, **moderate** which is significant in EIA terms.

It is noted that the Sound of Islay Tidal development may cumulatively contribute to an impact on the creel fishery, however it is expected that this will be a small. Therefore the cumulative effect on the creel fishery will be, at worst, **moderate**, which is significant in EIA terms.

It should be noted that the mitigation suggested previously to reduce the residual impacts on all fisheries to **minor** would also reduce the cumulative impacts to **minor**, which is not significant under EIA legislation.

12.6.4.2 Increased Steaming Times

Construction phase related cumulative impacts as a result of increased steaming times will only occur if 500m safety zones are imposed around construction activities of other offshore developments.

Significant impacts were not identified for increased steaming times for either the Tidal Site or Western Export Cable Route. The Project is not therefore expected to make a significant contribution to cumulative effects.

12.6.4.3 Operational Phase

Loss or Restricted Access to Traditional Fishing Grounds

As described previously, there is currently no fishing activity within the Tidal Site boundary. In addition, due to safety risks it is considered that the site will effectively be closed to fishing during operation. Further assessment of the impact of loss or restricted access to traditional fishing is not therefore necessary.

With respect to the operational phase of the Western Export Cable, significant impacts were identified only for the creel and local scallop fisheries (in both cases of **moderate** significance). On the basis of existing available information, it is not expected that there will be other planned developments which would further impact these receptors within the timeframe of the export cable installation. As such the cumulative effect will be at worst, **moderate,** which is significant in EIA terms.

It is noted that the Sound of Islay Tidal development may cumulatively contribute to an impact on the creel fishery, however it is expected that this will be a small contribution and therefore the cumulative effect on the creel fishery will be, at worst, **moderate**, which is significant in EIA terms.

It should be noted that the mitigation suggested previously to reduce the residual impacts on all fisheries to **minor** would also reduce the cumulative impacts to **minor**, which is not significant in EIA terms.

12.6.4.4 Increased Steaming Times

Due to the small sea area covered by the Tidal Site and the sub-sea Export Cable, no significant impacts were identified in relation to increased steaming times during operation. The Project is not therefore expected to make a significant contribution to cumulative effects.

12.6.4.5 Trans-boundary Effects

The project is located within the 6 nm limit. Therefore, vessels from other EU nations do not have historic rights to fish within the area of the development. Trans-boundary effects are therefore not anticipated to occur within the lifetime of the project.

12.7 Chapter Summary

Commercial fishing activity within the Tidal Site has historically been low. As a result no significant impacts were identified for the construction, operation or decommissioning phases. Similarly, the Tidal Site was not assessed to contribute to cumulative impacts on any commercial fisheries receptors. Significant effects were identified for the local creel, Scallop and Nephrops fisheries during construction and operational phases. These were assessed primarily in relation to installation and operation due to the surface laid Export Cable. These were at worst moderate, and implementation of suggested mitigation will result in residual effects which are of minor significance.

Summaries of effects on commercial fisheries receptors for the construction and operational phases are provided in Table 12.7 and Table 12.8, respectively. Cumulative effects during construction and operation are summarised in Table 12.9 and Table 12.10.

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Construction Phase					
Temporary Loss of Fishing Grounds, Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Creel Fishery: Western Cable Route	High	Minor	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Temporary Loss of Fishing Grounds, Local Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Local Scallop Fleet: Western Cable Route	Medium	Moderate	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Temporary Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Western Cable Route	Low	Minor	Minor	Not Required	Minor
Temporary Loss of Fishing Grounds, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Construction Phase					
Temporary Loss of Fishing Grounds, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Visiting Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Razor Clam Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Razor Clam Fishery: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Safety Issues For Fishing Vessels: Tidal Site	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Safety Issues For Fishing Vessels: Inter array cables	Not Applicable	Not Applicable	Tolerable with Additional Controls	See Chapter 14: Shipping and Navigation. Cable burial/rock placement, safety zones, Kingfisher Information System	Tolerable with Monitoring
Safety Issues For Fishing Vessels: Western Cable Route	Not Applicable	Not Applicable	Tolerable with Additional Controls	See Chapter 14: Shipping and Navigation. Cable burial/rock placement, safety zones,	Tolerable with Monitoring

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Construction Phase					
				Kingfisher Information System	
Increased Steaming Times: Tidal Site	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Increased Steaming Times: Western Cable Route	Not Applicable	Not Applicable	Tolerable with Additional Controls	See Chapter 14: Shipping and Navigation. Cable burial/rock placement, safety zones, Kingfisher Information System	Tolerable with Monitoring
Interference to Fishing Activity: Towed Gear	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Interference to Fishing Activity: Static Gear	Not Applicable	Not Applicable	Tolerable with Additional Controls	See Chapter 14: Shipping and Navigation. Construction Management Plan	Tolerable with Monitoring
Displacement of Fishing Vessels Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels , Creel Fishery: Western Cable Route	High	Minor	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Displacement of Fishing Vessels , Local	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Construction Phase					
Scallop Fleet: Tidal Site					
Displacement of Fishing Vessels , Local Scallop Fleet: Western Cable Route	Medium	Moderate	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Displacement of Fishing Vessels , Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Visiting and Nomadic Scallop Fleet: Western Cable Route	Low	Minor	Minor	Not Required	Minor
Displacement of Fishing Vessels, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Fishing Vessels, Visiting: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Construction Phase					
Displacement of Fishing Vessels, Razor Clam Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Razor Clam Fishery: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Table 12.7 Summary of Assessed Potential Effects on Commercial Fisheries Receptors for the Project, Construction Phase

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Operational Phase					
Permanent Loss of Fishing Grounds, Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Creel Fishery: Western Cable Route	High	Minor	Moderate	Cable burial/rock placement, Kingfisher Information System	Minor
Permanent Loss of Fishing Grounds, Local Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Local Scallop Fleet: Western Cable Route	Medium	Moderate	Moderate	Cable burial/rock placement, Kingfisher Information System	Minor
Permanent Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Western Cable Route	Low	Minor	Minor	Not Required	Minor
Permanent Loss of Fishing Grounds, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Operational Phase					
Permanent Loss of Fishing Grounds, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Visiting Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Razor Clam Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Razor Clam Fishery: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Safety Issues For Fishing Vessels: Tidal Site	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Safety Issues For Fishing Vessels: Inter array cables	Not Applicable	Not Applicable	Tolerable with Additional Controls	Cable burial/rock placement, Kingfisher Information System	Tolerable with Monitoring
Safety Issues For Fishing Vessels: Western Cable Route	Not Applicable	Not Applicable	Tolerable with Additional Controls	Cable burial/rock placement, , Kingfisher Information System	Tolerable with Monitoring
Increased Steaming Times: Tidal Site	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Increased Steaming Times: Western Cable	Not Applicable	Not Applicable	Tolerable with	Cable burial/rock placement,	Tolerable with

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Operational Phase					
Route			Additional Controls	Kingfisher Information System	Monitoring
Interference to Fishing Activity: Towed Gear	Not Applicable	Not Applicable	Broadly Acceptable	Not Required	Broadly Acceptable
Interference to Fishing Activity: Static Gear	Not Applicable	Not Applicable	Tolerable with Additional Controls	Operational Management Plan	Tolerable with Monitoring
Displacement of Fishing Vessels Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels , Creel Fishery: Western Cable Route	High	Minor	Moderate	Cable burial/rock placement, Kingfisher Information System	Minor
Displacement of Fishing Vessels , Local Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels , Local Scallop Fleet: Western Cable Route	Medium	Moderate	Moderate	Cable burial/rock placement, Kingfisher Information System	Minor
Displacement of Fishing Vessels , Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Visiting and Nomadic Scallop Fleet: Western Cable	Low	Minor	Minor	Not Required	Minor

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Operational Phase					
Route					
Displacement of Fishing Vessels, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Fishing Vessels, Visiting: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Razor Clam Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Displacement of Fishing Vessels, Razor Clam Fishery: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Table 12.8 Summary of Assessed Potential Effects on Commercial Fisheries Receptors for the Project, Operational Phase

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Cumulative Assessment: Construction Phase					
Temporary Loss of Fishing Grounds, Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Creel Fishery: Western Cable Route	High	Minor	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Temporary Loss of Fishing Grounds, Local Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Local Scallop Fleet: Western Cable Route	Medium	Moderate	Moderate	Construction management plan cable burial/rock placement, safety zones, Kingfisher Information System	Minor
Temporary Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Western Cable Route	Low	Minor	Minor	Not Required	Minor
Temporary Loss of Fishing Grounds, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Cumulative Assessment: Construction Phase					
Temporary Loss of Fishing Grounds, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Temporary Loss of Fishing Grounds, Visiting Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Increased Steaming Times: Tidal Site	Low	Minor	Minor	Not Required	Minor
Increased Steaming Times: Western Cable Route	Low	Negligible	Negligible	Not Required	Negligible

Table 12.9 Summary of Assessed Cumulative Effects on Commercial Fisheries Receptors for the Project, Construction Phase

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Cumulative Assessment: Operational Phase					
Permanent Loss of Fishing Grounds, Creel Fishery: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Creel Fishery: Western Cable Route	High	Minor	Moderate	Cable burial/rock placement, Kingfisher Information System	Minor
Permanent Loss of Fishing Grounds, Local Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Local	Medium	Moderate	Moderate	Cable burial/rock placement,	Minor

Description of impact	Receptor Sensitivity	Magnitude of Impact	Significance of Impact	Potential mitigation measures	Residual effect
Cumulative Assessment: Operational Phase					
Scallop Fleet: Western Cable Route				Kingfisher Information System	
Permanent Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Visiting and Nomadic Scallop Fleet: Western Cable Route	Low	Minor	Minor	Not Required	Minor
Permanent Loss of Fishing Grounds, Local Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Local Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Visiting Nephrops Fleet: Tidal Site	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Permanent Loss of Fishing Grounds, Visiting Nephrops Fleet: Western Cable Route	Not Assessed	Not Assessed	Not Assessed	Not Assessed	Not Assessed
Increased Steaming Times: Tidal Site	Low	Minor	Minor	Not Required	Minor
Increased Steaming Times: Western Cable Route	Low	Negligible	Negligible	Not Required	Negligible

Table 12.10 Summary of Assessed Potential Effects on Commercial Fisheries Receptors for the Project, Operational Phase

12.8 References

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WESTISLAY TIDAL

ENERGY PARK

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13. Marine Archaeology and Cultural Heritage

13.1 Introduction

This Chapter of the Environmental Statement (ES) describes the potential impacts associated with the proposed West Islay Tidal Energy Park (The "Project") and associated western export cable route upon marine archaeology and cultural heritage assets, and proposes a strategy to mitigate any such impacts.

The proposed development may have both direct and indirect impacts upon the physical fabric of offshore assets. The assessment has considered the projects impact on the following cultural resources;

- Designated cultural heritage assets, comprising proposed Historic Marine Protected Areas/ designated wrecks, scheduled monuments and other designated cultural heritage assets;
- Undesignated cultural heritage assets, including maritime losses such as wrecks, aircraft and their associated debris; and,
- Submerged archaeology and palaeoenvironmentally significant deposits.

The assessment of potential impacts is based on maximum design parameters, known as the "Rochdale principle.

A gazetteer of all known or identified maritime cultural heritage sites and potential maritime cultural heritage sites included in this report are presented in Appendix 13.1. All figures referred to in this Chapter can be found in ES Volume 3: Figures. This chapter should be read in conjunction with the baseline report (Volume 4: Technical Appendix 13.1 - Marine Cultural Heritage Baseline Technical Report).

This chapter has been written with reference to Chapter 5 (Project Description) and has links with Chapter 6, Marine Physical Environment and Coastal Processes and Chapter 15, Seascape Landscape and Visual Impact Assessment.

13.2 Assessment Methodology

13.2.1 Policy, Legislation & Guidance in Relation to Archaeology & Cultural Heritage
This assessment has been compiled in line with industry best practice and the relevant offshore renewables and marine historic environment guidance. These include:

- Institute for Archaeologists (IfA) guidelines: Standard & Guidance for Archaeological Desk Based Assessment (2008);
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (2008);

- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (2007);
- COWRIE Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore renewable Energy (2008);
- COWRIE Guidance for Offshore Geotechnical Investigations and Historic Environment Analysis: guidance for the renewable energy sector (forthcoming);
- The Crown Estate (2010). Offshore Renewables Protocol for Archaeological Discoveries;
- The Crown Estate (2010). Round 3 Offshore Renewables Projects Model Clauses for Archaeological Written Schemes of Investigation; and
- Towards a Strategy for Scotland's Marine Historic Environment (Historic Scotland 2009).

This assessment takes account of the following legislative procedures and guidelines:

- Marine (Scotland) Act 2010;
- Protection of Wrecks Act 1973;
- The Protection of Military Remains Act 1986;
- Ancient Monuments and Archaeological Areas Act 1979;
- Merchant Shipping Act 1995;
- Valetta Convention
- ICOMOS;
- UNESCO;
- Ancient Monuments and Archaeological Areas Act 1979;
- Historic Scotland's Marine Heritage Strategy 2012-15;
- Scottish Planning Policy (2010);
- The Scottish Historic Environment Policy (SHEP);
- Listed Buildings and Conservation Areas (Scotland) Act 1997;
- Planning Advice Note 2/2011.

Full details of these legislative and guidance procedures are given in the baseline report (Volume 4: Technical Appendix 13.1 - Marine Cultural Heritage Baseline Technical Report).

13.2.2 Study Area

The Study Area for the marine cultural heritage assessment incorporates three spatial scales as shown in (Figure 13.1). These include;

- Immediate Study Area (ISA) – this comprises the Tidal Site, western export cable route and a 500 m buffer zone;

- Wider Study Area (WSA) – comprising a further arbitrary 5km buffer zone around the Project in order to identify the archaeological potential of the ISA;
- Setting Study Area (SSA) – established using the 'zone of theoretical visibility' or ZTV established as part of the Landscape, Seascape and Visual assessment and extending 15 km from the tidal farm boundary (see Chapter 15: Landscape, Seascape and Visual in this ES).

13.2.3 Field Survey Methodology

Targeted walkover surveys of the intertidal area and to sites under consideration for potential setting impacts were carried out in October 2012 guided by hand held GPS and mapping. The intention of this walkover was to assess the presence / absence, character, extent and condition of known sites and to identify any previously unrecorded sites. The surrounding area was toured and visits made to cultural heritage features in order to establish the potential for impacts upon their setting.

13.2.4 Geophysical Survey Data Analysis

A geophysical survey was undertaken by ESG and was subsequently made available for archaeological analysis and assessment (Volume 4, Technical Appendix 13.1- Marine Cultural Heritage Baseline Technical Report). The aim of the archaeological analysis and assessment of marine geophysical data was to identify any cultural heritage assets and potential cultural heritage assets recorded from the surveyed area to inform the baseline study and EIA for the proposed development. Marine geophysical survey data was collected using sidescan sonar, multibeam echo sounder, magnetometer and sub bottom profiler. Anomalies were identified as targets of possible archaeological interest and given a high, medium or low archaeological potential rating, based on the characteristics of the anomalies and their surroundings.

13.2.5 Data Sources

The desk-based study has been based on readily available and relevant documentary sources. The following archives were referred to:

- National Monuments Record of Scotland (NMRS) held by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS), including maritime losses;
- Vertical aerial photographs held by RCAHMS;
- Edinburgh City Council's Sites and Monuments Record (SMR);
- Historic Scotland Schedule of Ancient Monuments, Designated Wrecks and List of Listed Buildings;
- Maps held by National Library of Scotland;
- UK Hydrographic Office (UKHO) Wrecks and Obstructions Database;
- Ministry of Defence (military remains only);
- Receiver of Wreck (ROW);
- Admiralty Charts; and

- Other readily accessible published sources.

13.3 Assessment Criteria

13.3.1 Assessment Criteria for Predicted Impacts

Potential impacts could be direct or indirect on the physical fabric of heritage assets and on their settings. Construction works and preparation associated with the same have the potential to damage or destroy cultural heritage assets. Physical impacts on the fabric of assets may occur either as a result of the design of the development or as an accidental consequence of construction plant or vessel movement. The impacts may be direct, for instance where an archaeological deposit or wreck is removed or damaged during foundation installation; or indirect, for example where changes in hydrology lead to waterlogged archaeological deposits becoming desiccated and degraded; or where changes in tidal currents and sedimentary regimes cause marine assets to become damaged or exposed. The location and extent of disturbance, and the likely physical impacts on both known and unknown assets, have been predicted from the footprint of the proposed development.

Operational impacts onshore relate largely to effects on the setting of heritage assets and are primarily (though not exclusively) a result of visual intrusion. Plans of the proposed development, ZTVs, wirelines and photomontages have been examined in relation to the cultural heritage baseline to predict the likely visual effects on designated heritage assets.

Operational impacts offshore relate to changes to tidal currents, sedimentary regimes, or water quality during operation (Chapter 6- Marine Physical Environment and Coastal Processes).

Impact Type	Definition
Direct Impact	Direct impacts on archaeology and cultural heritage assets during construction could comprise damage, disturbance, or destruction of submerged prehistoric archaeology, shipwrecks, and crashed aircraft from seabed preparation prior to installation; installation of turbine device foundations and collector platform; placing of grout/ scour protection; installation of the inter array cabling; seabed preparation and installation of export cable; cable protection; installation of cable in the intertidal zone and directional drilling ducts around Mean High Water Springs (MHWS). Direct impacts might also include the direct effects of the deployment of jack-up legs or anchoring of vessels during construction, operation and decommissioning activities.
Indirect Impact	Indirect impacts are those which are not a result of the Project directly and can be associated with other induced changes, for example changes to wave and tidally induced currents or sediment transport regimes, which can result in increases in erosion of, or disturbance to archaeological sites. Indirect effects also include the disturbance or destruction of relationships between structures, features, deposits, and artefacts and their wider surroundings, such as effects on the setting of onshore and island cultural heritage assets.
Cumulative Impact	Cumulative impacts include those within the Project such as interference through development activities upon a relict landscape surface or deposit. Impacts outside the offshore site and export cable route may include the effects of several developments within the same locality on the cultural heritage resource.

Table 13.1: Cultural heritage asset impact description

13.3.2 Maximum Design Parameters- Rochdale Principle

The design options and maximum parameters which have been selected for EIA purposes are presented in Chapter 5 - Project Description. The maximum design parameters relevant to cultural heritage have been considered in relation to foundation options for tidal energy convertors (TEC's) and for inter array and export cable installation techniques, presented below. It is noted that the turbine array design is based on an indicative layout.

Two models of TEC are being considered, the Marine Current Turbines (MCT) SeaGen Mark 2, a twin rotor 2MW machine and the Tidal Generation Ltd (TGL) single rotor 1MW turbine. The maximum design and Rochdale principle parameters considered for each effect assessed in this Section are set out in Table 13.2.

Potential Effect	**Realistic worst case**
Construction and Decommissioning Phases	
Direct physical effects on the sea bed as a result of TEC device structures mooring and foundation construction,	MCT and TGL- drilled and pinned support structures; MCT 2MW turbine- with 4 pin piles diameter of 1.5m and depth at 11m, and scour protection.
Direct physical effects on the sea bed as a result of floating platform/ moorings installation	Floating platform measuring 60m x 35m x 7m will require piles with a footprint of 4m buried to a depth of 10m.
Direct physical effects on the sea bed as a result of Inter array and export cables	Trenching all cabling is assessed as the worst case construction method.
Direct physical effects on the sea bed as a result of installation vessel movements/ anchoring activity	Large size Jack up barge as installation vessel with 4 triangular lattice spuds with circa 140m² spud area
Operational Phase	
Effects on the setting of onshore cultural heritage assets	15 no turbines MCT surface piercing at 21m above LAT

Table 13.2: Rochdale principle realistic worst case

13.3.3 Sensitivity

The sensitivity of a cultural heritage asset reflects the level of cultural significance assigned to it by statutory designation or, in the case of undesignated assets, the professional judgement of the assessor. 'Cultural significance' is a concept defined in SHEP Annex 1, Section 3, which should not be confused with the unrelated usage of 'significance' in referring to effects in EIA. Assets of National Importance (as defined in SHEP Annex 1, 7-10), which include Scheduled Monuments, non-designated assets considered to be of schedulable quality, Category A Listed Buildings, Inventory Gardens and Designed Landscapes and Inventory Battlefields, are assigned the highest level of cultural significance and their sensitivity is high. Assets of regional or more than local importance are considered of medium sensitivity, while assets of local importance are considered of low sensitivity. Category B and C(S) Listed Buildings are categorised, respectively, as being of regional and local importance (Historic Scotland 2011, 12).

Offshore, designated wrecks and submerged prehistoric landscapes are considered to be cultural heritage assets of high sensitivity in this assessment. Unknown and potential wreck sites and seabed debris are treated on a case by case basis according to professional judgement. Known wrecks and seabed debris of regional importance are considered of medium sensitivity, while modern wrecks and obstructions of local importance and debris associated with the same are considered of low or negligible sensitivity.

13.3.4 EIA Methodology for the Assessment of Sensitivity of Cultural Heritage Assets

The sensitivity of a cultural heritage asset to an effect reflects the level of importance assigned to it. This is the product of a number of factors, including;

- The potential of the asset as a resource of archaeological data;
- The association of the asset with significant historical events;
- The role of the asset as a local focal point with cultural associations; and
- The aesthetic value of the asset.

Official designations applied respectively to cultural heritage assets have been taken as indicators of importance as they reflect these factors. Sensitivity is assigned to undesignated cultural heritage assets according to the professional judgment of the assessor.

The criteria used for defining a cultural heritage asset's sensitivity to direct and indirect physical impacts is summarised in Table 13.3 below.

Value / Sensitivity	Definition
High	Proposed Historic Marine protected Areas/ Designated wrecks; Scheduled monuments; Category A-listed buildings; Inventory gardens and designed landscapes; Inventory battlefields; Undesignated assets of national importance; Maritime losses where the position is known and positively identified; and Targets of high archaeological potential identified in the geophysical survey
Medium	Category B listed buildings; Conservation areas; Targets of medium archaeological potential identified in the geophysical survey; Obstructions that could be indicative of wreckage or submerged features; and Undesignated assets of regional importance
Low	Category C(S)-listed buildings; Undesignated assets of local importance; and Targets of low potential identified in the geophysical survey.
Negligible	Assets of less than local importance

Table 13.3: Definition of Terms Relating to the Sensitivity to an Effect

In determining the magnitude of impact, the values of the assets affected are first defined. This allows the identification of key assets and provides the baseline against which the magnitude of change can be assessed; the magnitude of impact being proportional to the degree of change in the asset's baseline value.

The magnitude of the impact may be large, for instance where there is a total loss or major alteration of the cultural heritage asset; medium, for example the loss or alteration to one or more key elements or features of a cultural heritage asset; or small, where there is a slight but perceptible alteration of the cultural heritage asset. The criteria used for assessing the magnitude of impacts on cultural heritage is summarised in Table 13.4 below.

Magnitude	Definition
High	Total loss or major alteration of the cultural heritage asset. Impact certain or likely to occur.
Medium	Loss of, or alteration to, one or more key elements of the cultural heritage asset. Impact certain or likely to occur.
Low	Slight alteration of the cultural heritage asset. Impact will possibly occur.
Negligible	Very slight or negligible alteration of the cultural heritage asset. Impact unlikely or rarely to occur.

Table 13.4: Definition of Magnitude upon Receptors

13.3.5 EIA Methodology for the Assessment of Historical Setting

During the construction, operation and decommissioning phases of developments, the setting of cultural heritage assets may be affected. There is considerable debate over definitions of setting and approaches to the assessment of setting impacts (Lambrick, 2008), with no standardised industry-wide approach. Historic Scotland has produced a guidance note on setting as part of its 'Managing Change in the Historic Environment' series of documents. This states that

"Setting should be thought of as the way in which the surroundings of a historic asset or place contribute to how it is experienced, understood and appreciated".

Hence setting is not simply the visual envelope of the asset in question. Rather, it is those parts of the asset's surroundings that are relevant to the cultural significance of the asset. In general, there will be an appreciable historical relationship between the asset and its setting, either in terms of a physical relationship, such as between a castle and the natural rise that it occupies, or a more distant visual relationship, such as a designed vista or the view from, for example, one Roman signal station to another. Some assets' cultural significance will relate to an aesthetic relationship with their surroundings which may result from design or be fortuitous. In such instances the relevant landscape elements will be considered to form part of the asset's setting. The cultural significance of assets has been considered in terms of the values described in Scottish Historic Environment Policy (SHEP Annex 1, para 5):

- Intrinsic - those inherent in the monument;
- Contextual – those relating to the monument's place in the landscape or in the body of existing knowledge; and
- Associative – more subjective assessments of the associations of the monument, including with current or past aesthetic preferences.

- Most setting impacts will relate to contextual and associative values.

The sensitivity of a cultural heritage asset to changes in its setting can be evaluated in the first instance by reference to any relevant designation, whereby assets designated as nationally important will generally be considered the most sensitive. Consequently, the assessment has focussed on nationally important cultural heritage assets in the study areas, which are considered in relation to impacts upon setting, with other assets being considered where, in the assessor's professional opinion, there is potential for significant impacts or where they have been raised by consultees. Following reference to the designation of the asset, sensitivity can be more finely assessed by reference to the importance of the asset's surroundings, to its character and value as a cultural heritage asset and the appreciation of its value. Also taken into account is the extent to which an asset is visible on the ground. Some assets may have a well-defined and appreciable setting but the asset itself is barely perceptible; such assets will generally be less sensitive than those that are readily appreciable.

Table 13.5 is a general guide to the attributes of cultural heritage assets of high, medium, low or negligible sensitivity to setting impacts. It should be noted that not all the qualities listed need be present in every case and professional judgement is used in balancing the different criteria.

Sensitivity	Guideline Criteria
High	The asset has a clearly defined setting that is readily appreciable on the ground and is vital to its significance or the appreciation thereof. The asset will generally be readily appreciable on the ground.
Medium	The asset's significance and the appreciation thereof relate to some extent to its setting. The asset will generally be appreciable on the ground.
Low	The asset's surroundings have little relevance to its significance or the appreciation thereof. The asset is difficult to identify on the ground or its setting is difficult to appreciate on the ground.
Negligible	The asset is imperceptible in the landscape and its significance or the appreciation thereof does not relate to its surroundings.

Table 13.5: Criteria for Assessment of Sensitivity of a Cultural Heritage Asset to Impacts on its Setting

The magnitude of an impact reflects the extent to which relevant elements of the cultural heritage asset's setting are changed by the development and the effect that this has upon the character and value of the asset and the appreciation thereof. Guideline criteria for magnitude defined as high, medium, low or negligible magnitude are described in Table 13.6. As with other criteria presented, this is intended as a general guide and it is not anticipated that all the criteria listed will be present in every case.

The following are guides to the assessment of magnitude of impact:

- Obstruction of or distraction from key views. Some assets have been sited or designed with specific views in mind, such as the view from a Roman signal station to an associated fort or a country house with designed vistas. The obstruction or cluttering of such views would

reduce the extent to which the asset could be understood and appreciated by the visitor. Developments such as that proposed outside a key view may also distract from them and make them difficult to appreciate on account of their prominence. In such instances the magnitude is likely to be greatest where views have a particular focus or a strong aesthetic character.

- Changes in prominence. Some assets are deliberately placed in prominent locations in order to be prominent in the surrounding landscape, for example prehistoric cairns are often placed to be silhouetted against the sky and churches in some areas are deliberately placed on ridges in order to be highly visible. Developments can reduce such prominence and therefore reduce the extent to which such assets can be appreciated.
- Changes in landscape character. A particular land use regime may be essential to the appreciation of an asset's function, for instance the fields surrounding an Improvement Period Farmstead are inextricably linked to its appreciation. Changes in land use can leave the asset isolated and reduce its value. In some instances, assets will have aesthetic value or a sense of place that is tied to the surrounding landscape character.
- Duration of impact. Impacts that are short term are generally of lesser magnitude than those that are long term or permanent.
- Reversibility of Impacts Readily reversible impacts are generally of lesser magnitude than those that cannot be reversed.
- Impacts upon a defined setting will be of greater magnitude than those that affect unrelated elements of the asset's surroundings or incidental views to or from an asset that are unrelated to the appreciation of its value.

It should be noted that the assessment of magnitude will be based on the interplay of these factors. No single factor will be taken to over-ride other factors, for instance an adverse impact that would be of high magnitude will not generally be reduced to low magnitude, simply on the grounds that it is reversible. It should also be noted that whilst the development may be present within the visual envelope of an asset this does not automatically mean there is an impact on the setting of the asset. Where this is the case, the reasoning behind this will be given.

Magnitude	**Guideline Criteria**
High beneficial	The contribution of setting to the cultural heritage asset's significance is considerably enhanced as a result of the development; a lost relationship between the asset and its setting is restored, or the legibility of the relationship is greatly enhanced. Elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance are removed.
Medium beneficial	The contribution of setting to the cultural heritage asset's significance is enhanced to a clearly appreciable extent as a result of the development; as a result the relationship between the asset and its setting is rendered more readily apparent. The negative impact of elements of the surroundings that detract from the asset's cultural heritage significance or the appreciation of that significance is appreciably reduced.
Low beneficial	The setting of the cultural heritage asset is slightly improved as a result of

Magnitude	Guideline Criteria
	the development, slightly improving the degree to which the setting's relationship with the asset can be appreciated.
Negligible	There are changes in the surroundings of the asset, however these do not affect its cultural significance.
Low adverse	The contribution of the setting of the cultural heritage asset to its significance is slightly degraded as a result of the development, but without adversely affecting the interpretability of the asset and its setting; characteristics of historic value can still be appreciated, the changes do not strongly conflict with the character of the asset, and could be easily reversed to approximate the pre-development conditions.
Medium adverse	The contribution of the setting of the cultural heritage asset to its significance is reduced appreciably as a result of the development and cannot easily be reversed to approximate pre-development conditions. Relevant setting characteristics can still be appreciated but less readily.
High adverse	The contribution of the setting of the cultural heritage asset to its significance is effectively lost or substantially reduced as a result of the development, the relationship between the asset and its setting is no longer readily appreciable.

Table 13.6: Criteria for Assessment of Magnitude of an Impact on the Setting of a Cultural Heritage Asset

The significance of an effect on a cultural heritage asset is assessed by combining the magnitude of the effect and the sensitivity of the cultural heritage asset. The Evaluation of Significance matrix presented in Table 13.7 below, provides a guide to decision making, but is not a substitute for professional judgment and interpretation, particularly where the sensitivity or effect magnitude levels are not clear or are borderline between categories. Predicted effects of major or moderate significance are considered significant for the purpose of the impact assessment on cultural heritage.

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

Table 13.7: The Level of Significance of an Impact Resulting from Each Combination of Sensitivity & Magnitude

13.4 Desk Based Review

The baseline environment has been sub-divided into the following categories, each of which is addressed individually below. These are as follows:

i. Known wrecks and obstructions from UKHO Database/ Receiver of Wreck and from the RCAHMS;
ii. Documented maritime sites and losses listed by the RCAHMS/ HER (position unconfirmed);

iii. Maritime archaeological sites, features and deposits identified through the assessment of marine geophysical data.
iv. Onshore key receptors.
vi. Archaeological potential.

13.4.1 Known Wrecks & Obstructions

The desk based assessment established that there are no Historic Marine Protected Areas, Designated Wrecks or other cultural heritage assets with legal designations within the ISA. Similarly, no known wrecks, obstructions or any other cultural heritage assets have been identified within the ISA.

13.4.2 Documented Maritime Sites & Losses Listed by the RCAHMS/HER

There is one NMRS record from the RCAHMS within the Islay immediate study area (Table 13.8, Figure 13.2). The State Of Florida is a 19th century steamship that was lost in 1888 in Laggan Bay. The record states that the wreck (or at least its cargo) was reputedly recovered to a great extent so it was not recorded as a maritime 'loss', in the absolute sense of the phrase. The position is vague but the wreck was specifically mentioned to be in Machrie Bay, into which the proposed export cable route passes to its landfall. There is therefore the possibility of this ship's remains or debris associated with the same being encountered.

HA No.	Name	Description	NMRS No.	Easting (UTM29N)	Northing (UTM29N)
26	State of Florida	19th c. steamer	269610	671326	6171464

Table 13.8: NMRS Records in the Immediate Study Area

13.4.3 Maritime Archaeological Sites, Features and Deposits Identified through the Assessment of Marine Geophysical Data.

Anomalies of High Archaeological Potential

One target of high archaeological potential was identified from the geophysical datasets (HA1, Figure 13.2). An uncharted wreck located within the western export cable route corridor 80m in length, 29m wide and with a height of at 6m proud from the seabed. It lies in a north/south orientation to the north of the cable route as it passes Rinns of Islay. At its closest, the wreck is approximately 250m from the cable route centreline. The wreck appears fully in the sidescan imagery (Table 13.9 below).

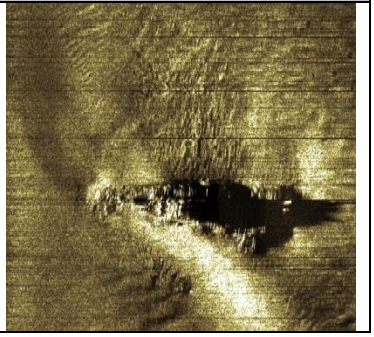
HA	Description	Position UTM29N (m)	Position WGS84 (Long/Lat)	Image
01	Uncharted wreck	657052 6170857	55°39.4859' -6°30.2127'	

Table 13.9: Anomalies with High Archaeological Potential in the Immediate Study Area

Anomalies of Medium Archaeological Potential

Four targets of possible archaeological interest considered to be of medium archaeological potential have been identified within the ISA. These are presented in Table 13.10 below and illustrated on Figure 13.2.

HA	Description	Position UTM29N (m)	Position WGS84 (Long/Lat)
011	Debris/ possible debris/ feature	661132E 6171119N	55°39.5467' -6°26.3165'
013	Debris/ possible debris/ feature	656992E 6170639N	55°39.3697' -6°30.2774'
025	Debris/ possible debris/ feature	659770E 6171050N	55°39.5387' -6°27.6162'
026	Debris/ possible debris/ feature	657477E 6170753N	55°39.4236' -6°29.8114'

Table 13.10: Anomalies with Medium Archaeological Potential in the Immediate Study Area

Anomalies of Low Archaeological Potential

In total, 20 targets that are considered to be of low archaeological potential have been identified within the immediate study area. They have the characteristics of natural features e.g. shape or locality, but have some unusual aspect to their form that stands them out from their surroundings. These sites are presented in full along with descriptions of in the baseline report in Volume 4, and will not be considered further in this assessment.

13.4.4 Onshore Key Receptors

The assessment of key onshore receptors has identified five Scheduled Monuments, one category A listed building and one Conservation Area within the Zone of Theoretical Visibility (ZTV). These have been examined in detail for potential impacts on their setting.

Ref No	Name	Designation
SM2334	Tobar an-t Sagairt,chapel,Tockmal	Scheduled Monument
SM2367	Eathain,chapel 370m NE of Lower Killeyan	Scheduled Monument
SM2337	Kilchoman Church, Cill Chomain Cross and tombstones	Scheduled Monument
SM3814	Cultoon stone circle	Scheduled Monument
SM2315	Orsay Island, Chapel	Scheduled Monument
HB11944	Rinns of Islay Lighthouse	Category A Listed Building
C488	Portnahaven / Port Wemyss	Conservation Area

Table 13.11. Assets Assessed for Setting Impacts

13.4.5 Archaeological Potential

It is considered that there is low to moderate potential for the discovery of unexpected cultural heritage remains within the Immediate Study Area. The volume of maritime traffic historically within the North Channel and the Clyde approach is noted, and the unpredictable weather and sea state conditions in this area of the North Channel is reflected in the large number of documented maritime losses recorded in the National Monument Record of Scotland (see Volume 4-, many of which with unknown exact locations. Further, this area is noted for wartime activity due to the number of aircraft operating in the vicinity as well as shipping losses in this area of the North Channel. However, the proposed tidal farm area and export cable route has been informed by a geophysical survey and the seabed conditions within the tidal farm site and across the export cable route site is well understood. To the central and southern areas of the tidal farm where the turbines are proposed and the bedrock is often exposed, there is considered to be low archaeological potential. In the north-western area of the site where significant depths of finer gravelly sands that could conceal sites or deposits of archaeological interest are recorded there is considered to be moderate archaeological potential. Similarly, inshore along the export cable route on the approach to and within the intertidal area, there is considered to be moderate potential.

13.5 Impact Assessment

13.5.1 Potential Impacts During Construction Phase

Site HA26 (wreck site, State of Florida) is a 19th century steamship of at least regional importance and has been identified as a site of medium sensitivity in this assessment. While the coordinates of the wreck are unconfirmed, the geophysical survey did not extend to the purported location of this site. In the absence of mitigation the magnitude of the impact on this site could be high. Therefore the significance of the impact could be **major**.

Site HA1 (geophysical target of high archaeological potential) is an uncharted wreck identified by Headland Archaeology in the geophysical survey dataset. The site is of unknown sensitivity and is therefore assessed as high unless further investigation establishes otherwise. In the absence of mitigation the magnitude of the impact on this site could be high. Therefore the significance of the impact could be **major**.

Sites HA2, HA3, HA4 and HA5 (geophysical targets of medium archaeological potential) are sites of unknown sensitivity in this assessment, and are therefore assessed as high unless further investigation establishes otherwise. In the absence of mitigation the magnitude of the impact on these sites could be high. Therefore the significance of the impact could be **major**.

The archaeological potential within the Site Area is considered to be low and therefore the potential for the discovery of hitherto unrecorded cultural heritage remains within the Site Area is low. However the potential within the western export cable route, particularly on the approach to the nearshore and intertidal area is considered to be moderate, with medium potential for the discovery of unknown sites. Should sites be discovered in the offshore area one would expect

them to be of high or medium sensitivity. In the absence of mitigation the magnitude of the impact could high. Therefore the significance of the impact could be **majo**r.

Offshore Study Area: Suggested Mitigation
All sites of cultural heritage interest included in this assessment will be avoided where possible. At present the following mitigation is proposed: 1. Where cultural heritage assets or potential cultural heritage assets may be subject to direct impacts, infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as devices and inter-array cable installation, and anchoring or deployment of jack-up legs. 2. In order to mitigate the risk of damage to any previously unrecorded archaeological remains, a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland/ Argyll and Bute Council to mitigate construction effects and to ensure procedures are in place in the event of any unexpected archaeological discoveries during installation (see **Appendix 13.1** for more information). 3. These measures will form part of the Construction Method Statement (CMS).

13.5.2 Residual Impact

Following the application of the mitigation measures outlined above it is likely that cultural heritage assets can be avoided, where known, and in the event that unrecorded assets are uncovered, appropriate measures are in place to deal effectively with any such eventuality. As such, the residual impacts of the Project on the archaeology and cultural heritage resource during construction would be reduced to negligible significance. Effects of negligible significance are not significant in the terms of the EIA Regulations.

13.5.3 Potential Impacts During the Operation Phase

Potential direct and indirect impacts on archaeology and cultural heritage assets considered here include those highlighted in the construction impact assessment above

The offshore operation phase may result in direct impacts on the sites of cultural heritage interest identified in the direct impacts during construction noted above and on any previously unrecorded sites that may be uncovered during the pre-installation or installation phases. Potential effects may include anchoring of maintenance vessels although this is unlikely. In line with the construction phase, the identified sites are of high to medium sensitivity and in the absence of mitigation the magnitude is considered to be high. The significance of the potential effect in the absence of mitigation is therefore regarded as major adverse.

The possibility of alterations to the tidal and wave regimes leading to long-term effects on patterns of sediment transport within the proposed development area are assessed and reported in Chapter 6 (Marine Physical Environment and Coastal Processes) of this ES. The potential for indirect effects on archaeology and cultural heritage assets through change and alterations in sedimentary regimes

caused primarily by the development is considered to be low. Within the vicinity of the indicative device locations no cultural heritage remains have been identified and the seabed is predominantly composed of bedrock and rock outcrop. It is therefore unlikely that the physical disturbance to the seabed will have any significant impact on sediment distribution patterns and effects will be limited to local disturbance of the exposed bedrock within the immediate confines of the seabed works (see Chapter 6, Marine Physical Environment and Coastal Processes).

13.5.4 Indirect Setting Impacts

The assessment of operational indirect impacts upon setting is summarised below. Only those assets where there is potential for an impact, i.e., those were views relevant to setting might be affected, are included. Potential impacts during the operational phase of the Project comprise changes to the setting of cultural heritage assets with statutory designations within the study area caused by the presence of the devices. The devices will be visible from five Scheduled Ancient Monuments (SM2334 Tobar an-t Sagairt Chapel; SM2357 Cill Eathain Chapel; SM2315 Orsay Island, Chapel); one Category A Listed Building (HB11944 Rinns of Islay Lighthouse); and also on Portnahaven /Port Wemyss Conservation Area. All impacts are considered to be reversible in nature and will cease upon decommissioning of the Project. The assessment is summarised in Table 13.12 below and presented in full in the baseline report.

Ref	Asset Name	Sensitivity to Setting Effects	Magnitude of Effect	Significance
SM2334	Tobar an-t Sagairt Chapel, Tockmal	High	No effect	Not significant
SM2367	Eathain,chapel 370m NE of Lower Killeyan	High	No effect	Not significant
SM2337	Kilchoman Church, Cill Chomain Cross and tombstones	High	No effect	Not significant
SM3814	Cultoon stone circle	High	No effect	Not significant
SM2315	Orsay Island, Chapel	High	Negligible	Minor
HB11944	Rinns of Islay Lighthouse	High	Negligible	Minor
C488	Portnahaven / Port Wemyss	Medium	Negligible	Not Significant

Table 13.12 Assets Assessed for Indirect Setting Impacts

13.5.5 Potential Impacts During the Decommissioning Phase

Direct and indirect impacts arising from the decommissioning are considered to be analogous to those arising in the construction phase and are not discussed further.

13.5.6 Cumulative Effects

This section presents the results of the assessment of the potential cumulative effects upon cultural heritage assets arising from the Project in conjunction with other existing or reasonably foreseeable marine developments and activities in the region. The approach to the assessment of cumulative effects is described in Chapter 4, EIA/ES & Consultation.

There are no operational, consented or proposed (with submitted planning application) developments within the 15km Study Area. The proposed Islay Offshore Wind Farm (currently at scoping-stage, with a planning application scheduled for submission at the end of 2013) is the only development in proximity to the Study Area that is considered for cumulative impacts.

In combination there could be significant cumulative effects on a number of key onshore cultural heritage receptors within the SSA. However, these would be primarily associated with views of the proposed Islay Offshore Wind Farm alone. As described in Chapter 15 (Seascape Landscape and Visual Impact Assessment), the Project would represent a discreet background feature with limited cumulative influence and in the majority of cases, the two developments would be located in completely different sectors of the view, with sufficient separation distance between them to prevent coalescence. Overall, the additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm would not be significant.

13.6 Summary

The known cultural heritage assets within the study area have been identified, and the archaeological potential for the discovery of previously unknown remains has been considered. Impacts of negligible to major significance have been identified.

Offshore - Site HA26 (State of Florida) has been identified as a site of medium sensitivity in this assessment. In the absence of mitigation the magnitude of the impact on this site could be high. Therefore the significance of the impact could be major. The mitigation measures for this asset are; that infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as devices and inter-array cable installation, and anchoring or deployment of jack-up legs.

Site HA1 (geophysical target of high archaeological potential) has been identified as a site of unknown sensitivity in this assessment, and therefore it will be treated as high unless further investigation proves otherwise. In the absence of mitigation the magnitude of the impact on this site could be high. Therefore the significance of the impact could be major. The mitigation measures for these assets are; that infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as devices and inter-array cable installation, and anchoring or deployment of jack-up legs.

Sites HA2, HA3, HA4 and HA5 (geophysical targets of medium archaeological potential) have been identified as sites of unknown sensitivity in this assessment and therefore will be treated as unless further investigation proves otherwise. In the absence of mitigation the magnitude of the impact on this site could be high. Therefore the significance of the impact could be major. The mitigation measures for these assets are; that infrastructure will be micro-sited and temporary exclusion zones will be implemented to prevent invasive activities, such as devices and inter-array cable installation, and anchoring or deployment of jack-up legs.

The archaeological potential within the Offshore Study Area is considered to be low to moderate and there is low to medium potential for the discovery of hitherto unrecorded cultural heritage remains within the offshore study area. Should sites be discovered in the offshore area one would expect them to be of high/ medium sensitivity. In the absence of mitigation the magnitude of the impact could be medium to high. Therefore the significance of the impact could be moderate to major. The mitigation measures for these impacts are; to implement a Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) for the approval of Historic Scotland/ Highland Council Archaeological Service to mitigate construction effects in the event of any unexpected archaeological discoveries during installation.

Setting - The devices will be visible from five Scheduled Ancient Monuments (SM2334 Tobar an-t Sagairt Chapel; SM2357 Cill Eathain Chapel; SM2315 Orsay Island, Chapel); one Category A Listed Building (HB11944 Rinns of Islay Lighthouse); and also on Portnahaven /Port Wemyss Conservation Area. The potential impacts on the setting of these sites is considered to be minor to not significant.

Impact description	Receptor	Initial impact	Mitigation	Residual impact
Construction phase				
1: Direct impact on archaeology and cultural heritage due to installation of infrastructure and cabling	All marine cultural heritage features	Major-moderate significance	Temporary exclusion zones will be implemented and infrastructure will be micro-sited to prevent invasive activities. Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Argyll and Bute Council to mitigate construction effects in the event of any unexpected archaeological discoveries during installation. These measures will form part of the CEMP	Negligible significance
2: Indirect impact on archaeology and cultural heritage due to physical processes	All marine cultural heritage features	Negligible significance	Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Argyll and Bute Council to mitigate construction effects in the event of any unexpected archaeological discoveries during installation.	Negligible significance
Operational phase				
3: Indirect impact on setting of archaeology and cultural heritage sites	All terrestrial cultural heritage assets	Minor to Negligible significance	None.	Minor to Negligible significance

due to siting of infrastructure				
4: Indirect impact on archaeology and cultural heritage due to physical processes	All marine cultural heritage features	Negligible significance	Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) will be prepared for the approval of Historic Scotland and Argyll and Bute Council to mitigate construction effects in the event of any unexpected archaeological discoveries during installation	Negligible significance
Decommissioning phase				
5: Direct impact on archaeology and cultural heritage due to removal of infrastructure	All marine cultural heritage features	Negligible significance	Same as construction	Negligible significance
6: Indirect impact on archaeology and cultural heritage due to physical processes	All marine cultural heritage features	Negligible significance	Same as construction	Negligible significance

Table 13.13. Summary of Impacts

13.7 References

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WESTISLAY TIDAL

ENERGY PARK

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14.0 Shipping and Navigation

14.1 Introduction

14.1.1 Chapter Content

This chapter describes the current shipping and navigation activity within and in the vicinity of the proposed project and associated study area and considers the potential impacts of the project on that activity. It also provides a summary of the Navigational Safety Risk Assessment (NSRA) [(1)] undertaken as part of the Environmental Impact Assessment.

The impact of the potential interaction between the Project and vessel activity is assessed for the installation, operation (and maintenance) and decommissioning phases of the Project. Where appropriate, mitigation measures are proposed to ensure the identified effects are avoided, removed or minimised, where possible. Potential cumulative impacts are also considered.

The treatment of the Shipping and Navigation topic can be taken to encompass a number of very different elements from navigational interaction with vessels – (military, recreational, fishing or commercial ships), to the noise impacts of construction or maintenance vessels on marine mammals or other species. For this reason and following scoping opinion feedback from stakeholders, the commercial and military shipping and navigational assessments have been separated due to the specific nature of the issues raised whilst specific species interactions and acoustic impacts are dealt with under separate chapters.

14.1.2 Recommended Associated Chapter References

When reviewing this chapter it is recommended to reference the following:

- Navigational Safety Risk Assessment [(1)];
- Preliminary Hazard Analysis – Technical Appendix 14.1;
- Baseline Noise Assessment – Technical Appendix 7.8;
- Acoustic Modelling Reports MCT and TGL – Technical Appendices 7.4 & 7.5;
- Project Description – Chapter 5;
- Commercial Fishing – Chapter 12;
- Traffic and Transport – Chapter 15; and.
- Noise – Chapter 19

14.1.3 Rochdale Envelope

In order to consider the specific Shipping and Navigational impacts the maximum ('worst case') Project parameters in line with the Rochdale Envelope approach need to be considered. These are defined in Table 14.1.

Element	Characteristic	Turbine		Justification
		MCT	TGL	
Turbine				
	Number of Rotors	2	1	Noise signature variable between both devices requiring both turbines to be evaluated
	Width (across stream)	50m	22m	Encounter risk model (ERM) to be device specific due to substantial variation in geometry, swept area and tip clearance
	Rotor Diameter	20m	22m (worst case)	Included as part of ERM
	Swept Area	628m2 (both rotors)	380m2	Included as part of ERM
	Seabed Clearance	3m	6m	Included as part of ERM
	Surface Clearance (LAT)	3.5m	7m	Included as part of ERM
	Protrusion Height (LAT)	21m	n/a	Only applicable to the SeaGen turbine
	Maximum Protrusion	40m	n/a	Only applicable to the SeaGen turbine
Installation & Commissioning				
Foundation	Seabed Preparation	Not Applicable	Not Applicable	None
	Depth of Excavation	12m	6m	Affects size and period of drilling SeaGen has over-riding envelop
Vessel	Type	See vessel spec details section 5.23	Vessel capable of lifting & handling a 120 tonne foundation of 14m x 14m x 16m	Both turbine foundations will require a similar type and size of vessel. See section 5.23 for detail
	GRT			
	Length			
	Draft			
	Noise			
	Fuel Usage			
	Waste/litter			
Moorings	Type	Gravity based anchors (GBA), steel and concrete, OR Drilled, piled steel anchors grouted into drilled holes		Drilled, piled steel anchors considered to have larger envelop due to the potential for contamination from drill cuttings, hydraulic oil from the cutter and grout overburden plus noise

Element	Characteristic	Turbine		Justification
		MCT	TGL	
				from cutting operation
	Dimensions	GBA: 8x8x3m each OR Drilled pile 1m diameter x 10m depth		Gravity base has higher area of coverage but considered to have lower potential impact
	Attachment	TBA		Method of attachment unlikely to have an environmental impact
Marker Bouys	Type	Consult with statutory authorities		
	Dimensions	Consult with statutory authorities		
	Attachment	Consult with statutory authorities		
Operation & Maintenance Turbine	Noise	See section 9	Part of ReDAPT	Noise signature variable between both devices requiring both turbines to be evaluated
Vessel	Type	See vessel spec details section 5.23	A suitable workboat greater than 30m length capable of towing the floating turbine & of the deck transportation & lifting of 4 tonne floating winch unit of dimensions 2.5m x 2.5m x 2.5m	Both turbine foundations will require a similar type and size of vessel. See section 5.23 for detail
	GRT			
	Length			
	Draft			
	Noise			
	Fuel Usage			
	Waste/litter			

Element	Characteristic	Turbine		Justification
		MCT	TGL	
Decommissioning Turbine		Removal will generally be reverse of installation methodology	Removal as per standard O&M procedure	SeaGen S will require large vessel for a longer period to remove turbine and additional steelwork. TGL will only require large vessel for foundation removal
Foundation		Use pile cutter to cut through piles close to seabed	Use pile cutter to cut through piles close to seabed	Both turbine foundations will require a similar type and size of vessel. See section 5.23 for detail
Vessels		Similar vessels to those used for installation	Use O&M vessel & installation vessel with subsea cutter for pile removal close to seabed	Both turbine foundations will require a similar type and size of vessel. See section 5.23 for detail

Table 14.1: Rochdale Envelope Parameters for Shipping & Navigational Assessment

14.2 Study Area

The study area considered for the shipping and navigation assessment included both the tidal site and export cable to landfall at Kintra on the west coast of Islay as illustrated in Figure 14.1.

14.3 Overview of Potential Impacts

14.3.1 Commercial Shipping

The main commercial shipping effects of the Project are considered to be:

- obstruction to vessel navigation potentially resulting in changes to shipping routes and increased steaming time;
- increased risk of vessel collision, between vessels and the devices whether surface or subsea; and
- increased risk of vessel to vessel collision due to reduced sea room.

Other than during cable laying when the project construction vessels are in operation it is unlikely that the cabling element of the project would have any

effect on commercial shipping. The selected cable route and in fact the west coast of Islay in general is extremely exposed to westerlies and other than in some small harbours, does not provide any safe vessel anchorage for large vessels. It is extremely unlikely that any commercial vessel would chose to anchor in this area and along the cable route or for the cables to provide any potential anchoring hazard.

14.3.2 Military Vessels

There are no surface vessel live firing areas in the vicinity.

Navigational impacts to military surface vessels are similar to those described above for commercial shipping. However, as described in Technical Appendix 14.1, the Project area lies within the MoD Practice and Exercise Area (PEXA) "Orsay". The key MoD activity in this area consists of a major Royal Navy submarine sub-surface transit route through the North Channel between the submarine base at Faslane (on the eastern shore of Gare Loch) and the North Atlantic.

There are understood to be two potential impacts resulting from the project development firstly one of restriction on submerged vessel navigation although this is considered unlikely given the relatively shallow nature of the project area, and secondly the potential impact of noise emitted from the turbines affecting submarine acoustic sensors used in navigation and detection.

14.3.3 Fishing Vessels

The potential impacts of the development on fishing vessels is similar to that on commercial shipping and other surface vessels although there are clear differences in respect of vessel manoeuvrability due to size when steaming between fishing grounds, and their restricted ability to manoeuvre with deployed gear. In respect of the cable route there is also the potential that fishing vessels might choose to deploy gear or fish close to the cable and therefore potentially risk fouling the subsea cable.

14.3.4 Recreational Vessels

The potential impacts of the development on recreational vessels is largely the same as that on other surface vessels including commercial shipping although like fishing boats there are obviously differences in respect of vessel manoeuvrability due to size, and particularly for small sailing craft differences in speed (both under sail and under power). In respect of the cable route there is also the potential that small craft might choose to anchor close to shore for a short stop anchorage even on an exposed shore under favourable weather conditions.

14.3.5 Principal Safety Requirements

The principal safety requirements for the proposed array to mitigate potential impacts and particularly navigational risks are as follows:

- All significant hazards associated with the installation, operation, maintenance and decommissioning of the proposed array shall be identified and the risks assessed as tolerable and As Low As Reasonably Practicable (ALARP).

- The site will comply with Maritime and Coastguard Agency (MCA) Marine Guidance Note MGN 371 (M+F): Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues (Reference 2);
- The installation shall co-exist safely with other marine users with minimum increase to the baseline level of navigational risk during construction, operation, maintenance and decommissioning. The devices should not cause or contribute to an unacceptable obstruction of, or danger to, navigation or marine emergency services; and
- The risks presented by the array devices and their operation will be effectively managed by an appropriate Safety Management System meeting the requirements of the MCA's Guidance.

14.4 Policy Legislation and Guidance

The assessment in relation navigational risk was carried out in accordance with the following primary guidance:

- MCA Marine Guidance Note (MGN) 371 (M+F) Offshore Renewable Energy Installations (OREIs). Guidance on UK Navigational Practice, Safety and Emergency Response Issues (MCA, 2008a); and
- Department for Energy and Climate Change (DECC) Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms (DTI, 2005).

Other relevant guidance and references used in the assessment included:

- MCA Marine Guidance Note 372 (M+F) Offshore Renewable Energy Installations (OREIs). Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008b);
- DECC Guidance Notes on Safety Zones (DECC, 2011);
- International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Recommendation O-139 on the Marking of Man-Made Offshore Structures (IALA AISM, 2008); and
- International Maritime Organisation (IMO), Guidelines for Formal Safety Assessment (FSA) For Use in the IMO Rule-Making Process MSC/Circ. 1023 and MEPC/Circ. 395 (IMO, 2002).

14.5 Methodology

The methodology was based on the MCA and DECC guidance listed above. The key elements are detailed below.

14.5.1 Consultation

A number of users and other relevant bodies, including local vessel operators, emergency services and national organisations have been consulted about the

Project. The following stakeholders have been contacted and issues raised have been taken into consideration in the preparation of this chapter and the NSRA:

- Scottish Fishermen's Federation;
- Clyde Fishermen's Association;
- Independent fishermen in Portnahaven;
- RYA Scotland;
- Chamber of Shipping;
- Caledonian Maritime Assets Ltd (CMAL);
- Defence Estates;
- Northern Lighthouse Board;
- The Maritime Coastguard Agency; and
- SSE Renewables (the adjacent Offshore wind developer).

14.5.2 Formal Scope Responses - Commercial and Recreational

Detailed comments regarding navigation were made in response to the Request for a Scoping Opinion [(2)]. Feedback responses from the original scoping document are summarised in Table 14.2 below, with additional consultation responses highlighted in the NSRA.

Responses Received – Scoping Opinion (2009)	**Response**
RYA Scotland 18th June 2009: "This site appears well suited to purpose. It is not heavily frequented by shipping or recreational craft. We agree this is the case but a more precise location than 8km SW of Islay would enable a more objective comment. It appears to be in quite deep water and is not in a major shipping or small craft route."	NSRA
Maritime & Coastguard Agency 16th July 2009: Page 4 Reference should also be made to the existence or absence of any other routeing/reporting measures of which Traffic Separation Schemes are but one. Page 7 The statement "It would not be essential to permit shipping movement over the devices" is not understood. Page 8 As a 400MW installed capacity this would be considered as a High Risk or Large Scale Development within the context of the DECC/DfT/MCA Guidelines on the Assessment of the Impact of Offshore Wind Farms publication. Page 11 the statement "it is unlikely that there would be any potential for the safe navigation for large vessels over the site" is not understood. Page 47 No mention is made of the West Islay, Argyll and Bute Marine Environmentally High Risk Areas (MEHRA) Page 102 This section requires enhancement to reflect the increasing importance of strategic pipelines and cables following the "Young Lady" incident. Page 110 The DECC guidance should be properly referenced as the DECC/DfT/MCA Guidelines on the Assessment of the Impact of Offshore Wind Farms publication which should be followed, as appropriate to the project. MGN 275 had now been replaced by MGNs 371 and 372 which should also be followed as appropriate to the project. Page 111 The results of the traffic survey may help to inform the consultation process by identifying other marine users. The navigational risk assessment will be assessed against the requirements in MGN 371, appropriate to the project, and not	NSRA

Responses Received – Scoping Opinion (2009)	Response
just Annex 1 Section 1 as indicated in the scoping document.	
Chamber of Shipping 28th July 2009: Information about the construction and related activities including mitigation measures is sought within the EIA at a later date. We would like to highlight that the provisions should include detailed arrangements to ensure minimum disruption for the existing vessels using Port Ellen. The construction and support activities will also need to be properly co-ordinated. … so in view of this Chamber of Shipping believe that the proposed site does not pose significant risk to the shipping activities ,, routes and safety and we have no objection to submit against the proposal. Having said that, in order to ensure the accuracy of the statement made in the scoping report, it is recommended that shipping related "AIS" data analysis/information is also included in the EIA. 1. Minimum clearance between the device and the mean sea level surface should be approximately 25m (if the device blades stay underwater). In our view this is warranted in order to mitigate various environmental hazards prevalent for most of the year in that region. However, we do appreciate the fact that the design has not yet been finalized and we might give due consideration to lesser clearances from the mean sea level. But that will be based on the finalization of details in the EIA and confirmation of exact location (if it is to be mounted well away from shipping traffic). One of the statements suggests a clearance from the mean sea surface of around 5m from the tip of the rotor blade and that in our view is not acceptable. 2. As suggested in the scoping document that the technology to be installed in the proposed location is still in the development stages and in fact untested. So, we will not be in position to provide detailed comments on the chosen design. But, we would like to raise our concern on the fact that the risks posed to shipping are significant in case the device was to break loose and float on the sea surface. So based on that fact we are concerned with one of the suggestions made in the report that the device will be gravity mounted. In our view that poses significant risk and therefore would seek assurance to ensure that the device will be made fast to the sea bed. 3. Construction Phase - Information about the construction and related activities including mitigation measures is sought with the EIA at a later date. We would like to highlight that the provisions should include detailed arrangements to ensure minimum disruption for the existing vessels using Port Ellen. The construction and support activities will also need to be properly coordinated. 4. Use of AIS technology to mark the proposed site from the outset, thereby reducing some of the navigation risk to mariners. 5. Cumulative Impact study – In light of recent announcements by the Crown Estates to award further zones in future for wind farm, wave and tidal developments in Scotland, we recommend that the EIA takes account of all the developments proposed in close proximity. The study report should include information on the overall impact of future proposals on shipping safety and navigation related issues (if any).	NSRA
Northern Lighthouse Board 10th July 2009: We would advise that the following should be considered as our initial response to the scope and methods proposal and that any formal recommendations for lighting and marking will be given through the Coast Protection Act 1949 – Section 34 consultation process. We would likewise advise that you may wish to refer to MCA document MGN 371 which supersedes MGN 275 and that in addition to the Electricity Act 1989 section 36, the Scottish Government S.I. Electricity Works (Environmental Impact Assessment (Scotland) Regulations 2000. We note that the site will be initially planned as a demonstrator project before	NSRA

Responses Received – Scoping Opinion (2009)	Response
progressing to a full production site contained within the consented area. We would require that the Navigation Risk Assessment must be specific with regard to reduced clearance depths between the device or devices (including any installed subsea infrastructure) and Lowest Astronomical Tide levels, taking into account the effects of adverse weather conditions which will further reduce this clearance, and the resulting impact on safe navigation in this area. The NRA should also include sections relating to the promulgation of Navigation Warnings both local and national due to the international use of this area of UK sea. The warnings should be promulgated before any commencement of survey, exploration and testing, also any installation, operation, maintenance and decommissioning periods. We would anticipate that a Method Statement would form part of the CPA Application, and note that the number and pattern of any devices deployed either as part of your technology assessment, permanent installation and eventual de-commissioning will require careful planning to minimise the hazards posed by any permanent moorings, or temporary moorings deployed during any installation and de-commissioning activities. The requirement to install cables to shore would need separate comment contained within the Navigational Risk Assessment. We would ask that the Hydrographic Office be informed of the route and landfall location in order that the Admiralty Chart is updated to give information of the installation. We note that the concept design for connection to the near shore/shore does not indicate as to whether the entire cable route will remain sub-sea or require intermediate platforms supporting transformer stations. Any platform would create an increased danger to surface navigation and would therefore be required to have marking and lighting as per the relevant regulation and guidelines. We would comment that any vessels involved in the project are capable of operating in the conditions commonly experienced around the west coast of Islay with a suitable margin of additional operational and safety capacity. Consideration should also be given to the deployment of a guard or safety vessel with recovery capability for personnel, equipment and device components should any unexpected failure or incident require intervention. The barges and vessels used should be lit and marked as per the International Regulations for the Prevention of Collisions at Sea 1972. We do however have an area of particular concern in respect to any device proposed for the demonstrator site, in that any turbine component(s) considered as being buoyant under a failed condition would require that an indication of any catastrophic device failure should it have the ability to float free or be mobile in a sub-surface state. Any components becoming detached and which are not in negative buoyancy shall be communicated to the MCA to ensure the mariner is informed immediately. The design of the device should incorporate a monitoring capability or deployable/activated transmission and signalling system in this event	

Table 14.2: Summary of Commercial Shipping Scoping Responses (2009).

14.5.2 Formal Scope Responses – Military Vessels

In a letter dated 21st July 2009 Defence Estates (now the Defence Infrastructure Organisation (DIO)) the main stakeholder representing all military interests, outlined their concerns in response to the Request for a Scoping Opinion [(2)]:

"On assessment the proposed development falls within Naval Exercise Areas X5538 Islay and X5539 Orsay, these Naval Exercise Areas facilitate submarine, aircraft and HM Ship training.

The proposed location lies directly across the coastal route for ships proceeding north to the Minch thus having navigational safety implications which will require ships to divert around the project. The location will also impinge on naval manoeuvre space required by submarines causing strategic implications.

In light of the above, the MoD has concerns due to there being only one exit route from the North Channel for deploying submarines that has sufficient depth of water for it to be conducted whilst dived. It is therefore essential the navy maintain this dived route as any encroachment into this area would prevent its use".

Further dialogue with Defence Estates and MoD from May 2009 through to the 7th December 2012 resulted in the following, most recent statement.

"The MOD is concerned that the deployment of submerged and, or, semi-submerged wave and tidal generator devices in this area may create acoustic emissions that impede the effective operation of submarine navigational systems....

Further data on the high and low acoustic wave emissions produced by the proposed devices would be beneficial in evaluating whether the development will have a detrimental effect upon submarine operations.

At this stage the MOD is not able to verify that the proposed tidal energy development will not have an unacceptable impact upon MOD submarine operations. The MOD is gravely concerned by the potential for the proposed development to inhibit or degrade national defence capabilities. At present, should an application be submitted to obtain the necessary consent(s) to commence this development the MOD is inclined to register objections until this concern can be resolved".

Further data collection, noise modelling and consultation is currently ongoing to address these concerns in parallel with the current submission.

14.5.3 Formal Discussion – Fishing

With respect to shipping and specifically navigational safety, a meeting was held with The Scottish Fishermen's Federation (SFF) and the Clyde Fishermen's Association (CFA) during the week of the 26th September 2012. The main purpose of the meeting was to discuss the navigational safety aspects of the proposed development and determine whether the proposed controls are appropriate and what operational and emergency procedures are appropriate in the case of an event occurring. This resulted in a hazard log being constructed and actions taken to ensure that all identified risks were reduced to a tolerable level. Stakeholder involvement in the consultation process was an integral part of the data gathering exercise and provided much of the data for the Hazard Identification and Risk Assessment (HIRA).

14.5.4 Site Data Collection

The main data sources used to identify the baseline navigational features and activity in the Project area are presented in detail in the NSRA Section 7.1, Sources of Data.

14.6 Baseline Assessment

14.6.1 Existing Marine Environment

A detailed description of the existing marine environment for both commercial and military shipping containing the tidal site is provided in the NSRA Section 4.0, Description of the Marine Environment including key locations, other renewable developments, bathymetric, tidal stream, height, wave data and weather conditions.

There are 32 Marine Environment High Risk Area's (MEHRA's) established around the UK which identify areas of high environmental sensitivity. This identification and designation of specific important areas was a result of the late Lord Donaldson's recommendations in his report Safer Ships, Cleaner Seas. The designation was intended to identify areas of the coastline which, taking account ship routing data, size and type of vessel, traffic density and analysis of past accidents, were at high risk of pollution. The proposed development lies off such an area designated as a High Category MEHRA (see Figure 4 of NSRA).

14.6.2 Vessel Traffic Analysis

14.6.2.1 General Observations

A vessel traffic analysis was undertaken to define shipping activities in terms of current traffic patterns, densities and types. To complement the availability of existing AIS data an onshore radar survey was carried out for two weeks in the winter and two in the summer to capture all traffic movements within these periods.

The overview of all AIS traffic captured in the two survey periods (march/April and July /August 2012) was carried out and it can be seen that the proposed development area lies in an area where traffic is heading to, or coming from, the North Channel Traffic Separation Scheme (TSS) and routes to the north-west and the Minches.

Traffic density using the criteria of vessels journeys per km2 highlights "Hot spots" which can be seen on the ferry routes into the Sound of Islay and to Port Ellen. In addition, general traffic 8 n miles south of Islay where the west going traffic emerges from the Traffic Separation Scheme (TSS) can be observed. In the vicinity of the proposed development there is a concentration of traffic of routes between the Minches/Oban and the North Channel or the Sound of Jura. This concentration shows densities of between less than 10 and up to 40 vessel journeys per square kilometre over the total survey period. This is equivalent to 0.5 – 2 vessels per day per km^2. The data further shows that there is, on average, some 10 transits per day within 10 n miles of the area or ~1.5 transits per day through the proposed area.

14.6.2.2. Military Vessels

Military usage of the area to the west of Islay consists of Practice and Exercise Areas (PEXAs) mainly used for surface vessel activities. Discussions with Ministry of Defence (Royal Navy) (MoD RN) staff responsible for water-space management have established that the site presents no significant concerns with regard to surface navigation in the area. The specific area of the site is not used for exercise activities and vessels transiting to and from the PEXAs will, generally, keep to routes further offshore. Hence, any hazard presented by the development would be treated as a normal navigational hazard when route planning.

Concerns have been raised by MoD RN and Defence Infrastructure Organisation (MoD DIO) – the body responsible for safeguarding Defence interests – concerning underwater noise and its potential impact on submarine navigation. This issue requires further understanding of the noise outputs and signatures of the tidal devices in order to be resolved. Discussions between MoD DIO, facilitated by The Crown Estate (TCE) are on-going.

14.6.2.3. Commercial Vessels

Commercial traffic within 10 n miles of the area consists of a mix of all vessel types including oil, gas and product tankers; general cargo vessels, passenger (cruise) vessels and support vessels.

The cargo vessels consist mainly of range of different size vessels plying between Northern Ireland/Irish Sea Ports and East coast of UK and Scandinavian/Russian destinations. Those small to medium size general cargo vessels generally draw around 6m draught whilst large cargo vessels (e.g. MV Red Queen, 40,040gt) can draw up to13.8m according to AIS message data.

There is also a significant number of large cruise vessels drawing, in the case of the MV Saga Ruby, up to 8.6m. These vessels are sailing between Irish Sea ports (Liverpool, Dublin) and the Hebrides or Scandinavia.

Oil, gas and product tankers comprise a significant proportion of the traffic by type. These range from medium size product tankers, drawing 5 – 7m, operating around UK ports to larger tankers drawing up to 13m plying between major UK and foreign terminals.

14.6.2.4 Ferries

There are no scheduled ferry routes to the west of Islay and, hence, no potential for interaction between ferries and devices / vessels during the construction, operation and decommissioning phases including for the cable route to Kintra.

14.6.2.5 Fishing Vessels

In the general area to the west of Islay, fishing activity by vessels greater than 15m in length would appear to be confined to an area to the southwest of the current proposed development area where the overfalls and tidal rates are less and there is an area of shallow banks. The radar and AIS survey showed little if

any fishing activity beyond that which correlated with the VMS data. All fishing vessels in both survey periods within 10 n miles of the site were in transit (an assumption based on their speed being greater than 6kn) with the exception of one vessel during the summer period which appeared to be engaged in fishing activity on the Rhinns Bank to the south west of the proposed development area. A total of twelve fishing vessels were observed during the winter period and three during the summer period.

Discussions with representatives from the fishing industry (27th Sep 2012) indicated static fishing was the major activity which takes place off the Rhinns with some scalloping activity to the south west mainly between March to November. Whilst there is considerable crabbing activity to the north-west this does not directly affect the proposed development area except so far as fishing vessels in transit to the grounds may pass through the area from the south east.

14.6.2.6 Recreational Craft

It is noted that, for both winter and summer survey periods, one recreational craft per period were recorded, one of which loiters in the area of the proposed development.

14.6.2.7 Details and Figures

A detailed assessment of vessel movements including relevant figures is listed in the NSRA Section 8: Vessel Traffic Analysis.

14.7 Commercial Shipping - Major Hazards Summary

The following information summarises the findings of the impact assessment undertaken as part of the NSRA.

The major hazards are contained within the Hazard and Risk Control Log at Appendix 1 of the NSRA. The top level risks for the proposed development are considered as the following:

- Vessels entering the Energy Park due to human error;
- Collision between transiting vessel and the installation "spread";
- Creel fishing boats gear snagging on the devices or foundations;
- Scallop dredgers snagging on export cables; and
- Mooring failure of moored devices if such were to be used such that the device became a hazard to shipping outside of the Energy Park area.

The major hazard and consequent risks are considered to arise from the surface piercing turbines presenting a collision hazard to all traffic and the sub-surface turbines presenting a hazard to vessels of a certain draught in specific sea-states. Vessels entering the area due to human error are considered to be more likely than vessels Not Under Command (i.e. "drifting") due to the low levels of traffic and the low incidence of recorded incidents involving vessel adrift in the area.

The risk of collision can, it is believed, be adequately mitigated to an As Low As Reasonably Practicable (ALARP) level by the application of appropriate controls as described in Section 9 of the NSRA and derived from the Hazard and Control Log.

The risks arising from the installation activities are not considered novel and can be mitigated by the application of standard controls for offshore construction work being undertaken by specialist vessels.

Cable laying activities are, in the main, well understood and can be controlled through normal practice (i.e. compliance with the ColRegs, Notices to mariners etc).

The risk to vessels engaged in creeling is a considered to be an issue in that that creel fishing would take place as close to the area as would be allowed by whatever means is used to chart the hazard. It is quite probable that the array area would, to an extent, act as a nursery for the target species thus encouraging fishing activities close to the area. In the event of a gear malfunction, there is a possibility of the fishing vessel drifting into the array with gear deployed over the side leading to entanglement and capsize. Whilst it is recommended that the charted area showing the hazard is of a size that just encompasses the hazards (devices), it is considered that a "No Fishing" area should be considered that provides a greater "buffer" area around the array such that the risk of entanglement is reduced. The exact size of the area would require to be agreed with the fishermen and their representatives. It is understood that such an area would require Scottish Government assent.

14.8 Military Shipping – Major Hazards Summary

According to DIO from their most recent correspondence on the 7th December 2012, the potential major hazard to military operations is that the deployment of submerged and, or, semi-submerged wave and tidal generator devices in this area may create acoustic emissions that impede the effective operation of submarine navigational systems.

Previously DPME provided measured noise emissions data from the SeaGen S [(3)] operating at Strangford Lough to illustrate to DIO that there were no substantial noise emissions from the turbines in the frequency range previously identified by DIO as of interest.

With reference to Chapter 19 Noise and its associated Technical Appendices listed above, it is noted that there are two sources of noise emissions from tidal turbines. Hydrodynamic noise results from the interaction between the turbine and the water flowing over it, this noise tends to be broadband consisting in a variety of variable frequency noise emissions. Drivetrain noise on the other hand is generated by the components of the drive train like the gearbox and as such produce specific discrete frequencies usually associated with gear meshing frequencies.

Based on modelling works as reported in Technical Appendix 7.4 the model "scaled up" the operating turbine at Strangford Lough to reflect the design changes associated resulting in a predicted noise spectrum for the SeaGen S Mark 2 as one of the turbines proposed for operation on the site.

The noise report identifies the following operational gear meshing frequencies

Gear Mesh	SeaGen S (Strangford) (Hz)	SeaGen S (2MW) Predicted (Hz)
1st	33	24
2nd	110	140
3rd	729	750

Table 14.3: Gear Meshing Frequencies for SeaGen S

The higher torque and gear meshing frequencies in the 20m MCT relative to the 18m MCT results in higher sound power level (SPL) modelled 30m from the turbine and a shift in the gear meshing tones to higher frequency. The 1st Gear Stage produces a tone at 24 Hz that has an average SPL at 30m of 96 dB. The sound field related to the 1st Gear Stage is strongly directional with higher levels directly up- and down-stream from the turbine. High SPL were modelled within the 5m surrounding the nacelle and support structure with levels between 120 and 128.3 dB. The highest noise levels are associated with the 2nd Gear Stage meshing at 140 Hz with average SPL at 30m from the turbine of 147.5 dB. Highest noise levels are concentrated around the nacelles, boom and support structure and the blade tips with levels between 165 and 173.8 dB. The sound field related to the 3rd Gear Stage meshing at 750 Hz is also directional with high levels up-stream from the rotor. The average SPL at 30m for the turbine at 750 Hz is 134 dB. The highest noise levels associated with the 3rd Gear Stage meshing is localised within 5m of the nacelle where it is between 150 and 157 dB.

14.9 Conclusions on NSRA Findings

The intent of this chapter has been to summaries the findings of the NSRA and resulting Hazard and Control Log.

Other potential impacts resulting from the potential impact of the project on shipping are assessed in their relevant chapters. However, it was considered important to report on the potential impact of turbine acoustics on military interest in the area as this element was only briefly reported in the NSRA.

The NSRA has concluded the following with respect to commercial shipping and navigation:

1. That the risks to navigation from the cable laying and device installation operations are considered to be "Tolerable with monitoring" subject to the application of such risk controls as are identified in the NSRA;

2. The risk to navigation arising from the proposed clearance depths over the rotors of the MCT SeaGen and Alstom-TGL devices (which present a hazard to shipping in a range of tidal and sea-state conditions to a significant proportion of vessels currently operating in the immediate vicinity of the proposed area if they were to enter the Energy Park) can be considered as "Tolerable with Monitoring" subject to the application of such risk controls as are identified in the NSRA;

3. The risk from vessels drifting into the site is considered as sufficiently low as to be considered "Tolerable with Monitoring" given the vessel traffic levels and the numbers of recorded incidents from RNLI and MAIB data;

4. That the development area should be charted appropriately as a "Marine Limit in General, implying physical obstructions". This does not exclude navigation but, along with appropriate annotation showing that limiting depths apply (either against the individual devices or as a chart note), provides the mariner with adequate information on the hazards presented by the project.

5. Whilst pelagic and demersal fishing activities do not take place in the area or its immediate vicinity, creeling vessels do operate off the Rinns in the local area. As such there is a risk to such small vessels due to the potential for gear entanglement when recovering or laying static gear. This would require the imposition of a "No Fishing" area coincident with the charting of the area as a "Marine Limit in General containing hazards";

6. The export cable presents a hazard to scallop dredging activities between the site and Kintra.

7. That the individual devices/sub arrays require to be charted appropriately subject to the limitations of the scale of the chart and the need to avoid congestion of information;

8. That the extent of the sub-sea devices may not be adequately indicated by the lighting and marking applied to any surface devices in the array and will, therefore, require to be marked with buoys or other devices;

9. The in-combination effects from the SSE Renewables have not been able to be established fully due to the lack of appropriate data on vessel traffic for the windfarm area.

10. That the scale and nature of the risks requires the development of a Safety Management System of which an ERCoP is an integral part.

14.9 Recommendations

The following actions are recommended:

1. That the risk controls as are identified in the NSRA with regard to preventing vessels from entering the project area are implemented in order to ensure that the risk is reduced to a level considered as "Tolerable with Monitoring";

2. That the project area should be charted as a "Marine Limit in General, implying physical obstructions" along appropriate annotation showing that limiting depths apply (either against the individual devices or as a chart note);

3. That a "No Fishing" area coincident with the charting of the area as a "Marine Limit in General containing hazards" is imposed following consultation with local fishing interests and Marine Scotland;

4. That the cable route is charted and information on its position provided to Kingfisher;

5. That the individual devices/sub arrays are charted appropriately subject to the limitations of the scale of the chart and the need to avoid congestion of information;

6. That where the extent of the sub-sea devices is not adequately indicated by the lighting and marking applied to any surface devices in the array, the area shall be marked with buoys meeting the requirements of the IALA MBS;

7. The in-combination effects from the SSE Renewables proposed wind farm site require to be examined in conjunction with SSE Renewables when they have sufficient data with regard to vessel traffic data for the windfarm area.

8. That an appropriate Safety Management System is put in place prior to the start of construction operations. This shall include an ERCoP.

Further consultation is required with DIO to agree specific areas of concern and to take appropriate measures to ensure that the concerns are addressed.

14.10 References

1. Navigational Safety Risk Assessment for West Islay Tidal Energy Park – DP Marine Energy: PMSS (June 2013)
2. Request for a Scoping Opinion: DPME (May 2009)
3. SeaGen S Noise Report from Strangford Lough

WESTISLAY TIDAL

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15. Seascape and Landscape Visual Impact Assessment (SLVIA)

15.1 Introduction

This Seascape, Landscape and Visual Impact Assessment (SLVIA) of the proposed West Islay Tidal Energy Project (the "Project"), Argyll and Bute, has been prepared by Stephenson Halliday Ltd, a firm of independent Environmental Consultants and Landscape Architects. The SLVIA has been undertaken to address the specific details of the proposed development and its context, with the aim of identifying the predicted seascape, landscape and visual effects which would result from the construction and operation of the proposed development.

The following seascape, landscape and visual receptors have been assessed:

- Seascape / landscape character,
- designated landscapes, and
- views and visual amenity experienced by local residents, users of transport routes, and tourists / visitors.

The assessment has been informed by the Seascape, Landscape and Visual Baseline Study (within Volume 4: Technical Appendices 15.1) which should be read in conjunction with this chapter. In addition; the SLVIA makes reference to the project description set out in Chapter 5 of the ES, which defines the overall parameters of the proposed development.

The SLVIA has been undertaken following the 'Rochdale Envelope' approach. The 'Rochdale Envelope' approach tries to address some of the issues associated with projects where there are uncertainties over the final details of a proposed development, while ensuring compliance with environmental legislation. These uncertainties could include scale, type of device, elements and dimensions of the device and/or other factors, if there remain limitations in the amount of detail that is available on the project at the time at which consent is being sought (see www.scotland.gov.uk). On this basis, the SLVIA considers the 'worst case' option for the proposed development, which equates to 15 surface-piercing tidal energy convertors (TECs) as this would represent the most 'visible' development option. In reality, the final development may constitute fewer than 15 surface piercing TECs, and instead incorporate a mix of surface piercing and non-surface piercing TECs, all non-surface piercing TECs, or floating platforms. Regardless of this, the final seascape, landscape and visual effects would be equivalent to, or less than, those described in this chapter.

Note: all distances quoted in this SLVIA are measured based on distance to the closest TEC, unless otherwise specified.

15.2 Consultation and Scope

Consultation with Argyll and Bute Council (ABC) and Scottish Natural Heritage (SNH) was undertaken by Stephenson Halliday Ltd with regard to the agreement of the Study Area, viewpoint locations for inclusion in the viewpoint analysis, and cumulative development to include within the cumulative assessment. As agreed with ABC and SNH, the SLVIA (and cumulative SLVIA) is based on a 15km radius Study Area, the extent of which is shown in Figure 1 of the Seascape, Landscape and Visual Baseline Study (Volume 4: Technical Appendices 15.1).

The potential landscape, seascape and visual effects of the proposed development are regarded as a key issue for assessment and are organised in the following sections:

- Guidance and Methodology – an outline of general assessment methodology, with reference to established guidance;
- Design and Mitigation – a description of the aspects of the proposed development which have the potential to cause a seascape, landscape and / or visual effect, and the measures which have been incorporated into the project design to mitigate these potential effects;
- Viewpoint Analysis – comprising analysis of the magnitude of the change in the view from a selection of viewpoint locations that represent the main receptors within the Study Area;
- Construction Phase: Assessment of Effects – an assessment of the temporary effects on seascape, landscape and visual amenity during construction;
- Operational Phase: Assessment of Seascape and Landscape effects – an assessment of the effects arising from the proposed development on the fabric, character and quality of the seascape and landscape types and designated areas within the Study Area;
- Operational Phase: Assessment of Visual Effects – an assessment of the effects arising from the proposed development on the visual amenity, receptors and viewpoints in the Study Area;
- Decommissioning Phase: Assessment of Effects – an assessment of the temporary effects on seascape, landscape and visual amenity during decommissioning;
- Cumulative Seascape, Landscape and Visual Effects: to establish whether there are likely to be any cumulative effects on seascape, landscape and visual amenity as a result of the proposed development in conjunction with other operational, consented or proposed projects in the planning process;
- Conclusions – a summary of the assessment results; and
- References – guidance documents referred to during the SLVIA.

15.2.1 Viewpoint Selection

The SLVIA is illustrated with reference to viewpoint photographs and *photomontages*. In total, 7 viewpoints (agreed through consultation) have been

included in the assessment. Their locations are illustrated in Figure 15.1. A summary of the viewpoints considered as part of the assessment, and the reason for their selection is provided in Table 15.1.

Viewpoint	Reason for Inclusion
1. View south west from Portnahaven (Queen Street)	Representative of views experienced by local residents in the settlement of Portnahaven, 5.6km to the north east of the proposed development.
2. View south west from Port Wemyss	Representative of views experienced by local residents in the settlement of Port Wemyss, 5.9km to the north east.
3. View south west from the local road, Claddach	Representative of views experienced by road users on the local road / walkers on the Core Path near Claddach, 6.0km to the north east (located within the Area of Panoramic Quality).
4. View south west from the A847	Representative of views experienced by road users on the A847 (primary transport route within the Study Area, linking Portnahaven and Port Wemyss with the rest of Islay), 6.2km to the north east of the proposed development.
5. View south west from local road, Ben Cladville	Representative of views experienced by road users from an elevated section of the minor road near Ben Cladville, 8.1km to the north east.
6. View south west from Lossit Bay	Representative of coastal views experienced by recreational visitors to the sandy beach on Islay's north western coast (8.6km to the north east of the proposed development, within the Area of Panoramic Quality).
7. View north west from the American Monument, Mull of Oa	Representative of coastal views experienced by recreational visitors to the monument located 17.4km to the south east of the proposed development. This viewpoint is located outside the 15km Study Area, albeit is included upon request by Argyll and Bute Council.

Table 15.1 SLVIA Viewpoints

15.3 Guidance and Methodology

15.3.1 Approach

This section provides a summary of the methodology that has been used to undertake the SLVIA. The proposed Project has the potential to affect the landscape and seascape resource of its surroundings and the purpose of the assessment is to evaluate and assess the potential landscape and visual effects. The SLVIA has been undertaken in accordance with guidance provided in the following documents:

- Guidelines for Landscape and Visual Assessment: Third Edition *(Ref.15.1)*
- Landscape Character Assessment: Guidance for England and Scotland *(Ref. 15.2)*
- Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape, Guidance for Scoping an Environmental Statement *(Ref. 15.3)*
- The siting and design of aquaculture in the landscape: visual and landscape considerations *(Ref. 15.4)*
- Assessing the Cumulative Impact of Onshore Wind Energy Developments *(Ref. 15.5)*

- Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape *(Ref. 15.6)*
- Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report *(Ref. 15.7)*
- Guide to Best Practice in Seascape Assessment *(Ref. 15.8)*
- Photography and Photomontage in Landscape and Visual Assessment *(Ref. 15.9)*
- Visual Assessment of Windfarms: Best Practice *(Ref. 15.10)*
- Visual Representation of Windfarms: Good Practice Guidance *(Ref. 15.11)*

Landscape and visual assessments are separate, though linked procedures. The assessment of the potential effect on the landscape is carried out as an effect on the environmental resource (i.e. the landscape). Visual effects are assessed as an inter-related effect on population.

Landscape effects derive from changes in the physical landscape which may give rise to changes in its character and how this is experienced.

Visual effects relate to changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes and to the overall effects with respect to visual amenity. The aim of the landscape and visual assessment is to identify, predict and evaluate potential key effects arising from the proposed development. Wherever possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement. In order to provide a level of consistency to the assessment, the prediction of magnitude and assessment of significance of the residual landscape and visual effects have been based on pre-defined criteria.

Seascape assessment is concerned with the interaction of the sea, coast and land and how a proposed development relates to this combination. Without exception 'seascape' will exist in a coastal landscape context and influence its character. This approach has been adopted in Department of Trade and Industry Guidance which notes that every seascape comprises three components.

- the seaward = an area of sea
- the coastline = a length of coastline
- the landward = an area of land

The term SLVIA is commonly used to refer to Seascape, Landscape and Visual Assessment, but it must be emphasised that the process of LVIA – Landscape and Visual Assessment, remains the accepted methodology underpinning the assessment (see *Ref.15.3*).

15.3.2 Methodology for the Assessment of Landscape Effects

The sensitivity of the landscape to change resulting from a proposed development is not absolute and varies according to the existing landscape, the

nature of the proposed development and the type of change being proposed. Best practice guidance differentiates between baseline sensitivity of the landscape and the sensitivity of a landscape to a specific development proposal; see Landscape Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity[(Ref. 15.12)]. Accordingly, the concept of 'sensitivity to change' to new development, as described within the baseline published landscape character assessments, is distinct from the consideration of landscape sensitivity to the specific development proposal.

The baseline for consideration of landscape impacts is the established landscape character. The landscape effects of the proposed development are considered against the key characteristics of the receiving landscape. The degree to which the proposed development may change 'the distinct and recognisable pattern that makes one landscape different from another, rather than better or worse' (see *Ref. 15.2*), enables a judgement to be made as to the significance of the effect in landscape character terms. This involves consideration of where the proposed development may give rise to a different landscape character type or sub-type.

In general terms, a distinctive landscape of acknowledged value (e.g. covered by a designation) and in good condition is likely to be more sensitive to change than a landscape in poor condition and with no designations or acknowledged value. General guidance on the evaluation of sensitivity is provided below, however the actual sensitivity would depend on the attributes of the landscape receiving the proposals and the nature of those proposals.

In addition, consideration of the following parameters together with the nature of the proposals, are made where appropriate:

- Landscape value: The importance attached to a landscape, often as a basis for designation or recognition which expresses national or regional consensus, because of its distinctive landscape pattern, cultural associations, scenic or aesthetic qualities. It should be noted that, in virtually all circumstances, landscapes are valued (frequently highly valued) in the local context by various if not all sectors of the community.
- Landscape condition: The state of repair or condition of elements within a particular landscape, its integrity and intactness, and the extent to which its distinctive character is apparent.
- Landscape key characteristics: The sensitivity to change of the key characteristics and the ability of a particular type of landscape to accommodate change brought about by development without material effects upon its integrity, reflecting key aspects of landscape character including scale and complexity of the landscape and degree of 'wildness' or 'remoteness'.

Landscape sensitivity is based on the combination of value, condition and key characteristics and the overall sensitivity is determined by professional judgement. The following definitions are adopted in relation to sensitivity:

Sensitivity	Description
High Sensitivity	Areas that exhibit a very strong, positive character and which are in excellent or very good condition with valued features that combine to give an experience of unity, richness and harmony. As a result, these landscapes may also demonstrate a high scenic quality. These are landscapes that may be considered to be of particular importance to conserve and which may be particularly sensitive to change if inappropriately dealt with.
Medium Sensitivity	Areas that exhibit positive character and are considered to be in good condition with some valued features but which may have evidence of alteration to / degradation / erosion of features resulting in areas of more mixed character. Scenic quality and attractiveness may not be as high as for 'High' quality landscape. Change may not necessarily be detrimental nor require special attention to detail.
Low Sensitivity	Areas generally negative in character, in poor condition with a weak landscape structure with few, if any, valued features. There is often scope for positive enhancement.

Table 15.2 Landscape Sensitivity Criteria

The significance of landscape effects is not absolute and can only be defined in relation to each development and its location. It is for each assessment to determine the assessment criteria and the significance thresholds using well informed and reasoned judgements.

Initially it is necessary to establish if, and to what extent, the proposed change would exert a locally characterising effect. Would the introduced element be the principal element / feature which determined seascape and landscape character.

The magnitude of landscape effect arising from the proposed development at any particular location is described as substantial, moderate, slight or negligible based on the interpretation of a combination of largely quantifiable parameters, as follows:

- degree of loss or alteration to key landscape features, elements or characteristics;
- distance from the development;
- duration of effect;
- landscape backdrop to the development; and
- landscape context of other built development, particularly vertical elements.

In order to differentiate between different levels of magnitude the following definitions are provided:

Magnitude	Description
Substantial	Total loss or major alteration to key landscape elements / features / characteristics such that post development the landscape character area would be fundamentally changed.
Moderate	Partial loss or alteration to one or more key landscape elements / features / characteristics such that post development the landscape character area would be partially changed.
Slight	Minor loss or alteration to one or more key landscape elements / features / characteristics such that post development the change / loss would be discernible but the landscape character area would be similar to the baseline.
Negligible	Very minor loss or alteration to one or more key landscape elements / features / characteristics of the baseline conditions. Change would be barely distinguishable, approximating to no change.

Table 15.3 Landscape Magnitude of Change Definitions

Having established where the observation of varying levels of change to the landscape baseline may occur, the geographical extent of the change can be identified and a judgement made as to whether or not the change is significant in landscape character terms at varying scales.

15.3.3 Methodology for the Assessment of Visual Effects

In order that the significance of a visual effect can be assessed, it is necessary to establish the relative sensitivity of the viewers and the magnitude of the change. In this case sensitivity can be reasonably assumed in advance. Those living within view of the scheme are usually regarded as the highest sensitivity group as well as those engaged in outdoor pursuits for whom landscape experience is the primary objective. If appropriate, outdoor recreation activities that are more activity focussed, but which are also landscape-dependent for complementary enjoyment (such as golf, sailing or fishing) may be placed in the 'high' category to avoid under assessment of significance.

The sensitivity of potential visual receptors will vary depending on the location and context of the view, the activity of the receptor and importance of the view.

Visual receptor sensitivity is defined as high, medium, or low in accordance with the criteria in Table 15.4.

Sensitivity	Description
High Sensitivity	Residents; users of outdoor recreational facilities including footpaths, cycle ways and recreational road users; people experiencing views from important landscape features of physical, cultural or historic interest, beauty spots and picnic areas.
Medium Sensitivity	Road users and travellers on trains experiencing views from transport routes; and people engaged in outdoor sport other than appreciation of the landscape.
Low Sensitivity	Workers, users of facilities and commercial buildings (indoors) experiencing views from buildings.

Table 15.4 Visual Sensitivity Criteria

The magnitude of change arising from the proposed development at any particular viewpoint is described as substantial, moderate, slight or negligible based on a number of interrelated and largely quantifiable parameters, including:

- distance of the viewpoint from the development;
- duration of effect;
- extent of the development in the view;
- angle of view in relation to main receptor activity;
- proportion of the field of view occupied by the development;
- background to the development; and
- extent of other built development visible, particularly vertical elements.

It is assumed that the change would be seen in clear visibility and the assessment is carried out on that basis. Where appropriate, comment may be made on lighting and weather conditions. The definitions set out in Table 15.5 are used to differentiate between different levels of magnitude:

Magnitude	Description
Substantial	Substantial change, where the proposals would have a defining influence on the view. Change very prominent leading to substantial obstruction or complete change in character and composition of the baseline existing view.
Moderate	Moderate change in the view would occur where the proposals would be clearly noticeable and an important new element in the view. It may involve partial obstruction of existing views or partial change in character and composition of the baseline existing view.
Slight	The proposals would be partially visible or visible at sufficient distance to be perceptible and result in limited or minor changes to the view. The character and composition, although altered will be similar to the baseline existing situation.
Negligible	Change would be barely perceptible. The composition and character of the view would be substantially unaltered, approximating to little or no change.

Table 15.5 Visual Magnitude of Change Definitions

15.3.4 Significance of Landscape and Visual Effects

Ref. 15.1 provides guidance on determining the threshold for significant effects which has been followed in relation to this assessment:

> *Professional judgement is a very important part of the LVIA."' (GLVIA3 paragraph 2.23) "In all cases there is a need for the judgements that are made to be reasonable and based on clear and transparent methods so that the reasoning applied at different stages can be traced and examined by others." (GLVIA3 paragraph 2.24) "There are no hard and fast rules about what effect should be deemed 'significant' but LVIAs should always distinguish clearly between what is considered to be the significant and non-significant effects." (GLVIA3 paragraph 3.32)".*

This is the approach which has been followed within the assessment.

The significance of the effect on the landscape and visual resource may be determined by correlating the magnitude of change (substantial, moderate, low or negligible) with the sensitivity of the landscape resource / visual receptor (high, medium or low).

15.3.5 Significance of Landscape Effects

The following table sets out the correlation between magnitude and sensitivity in the assessment of landscape effects.

		Magnitude of Change			
		Substantial	Moderate	Slight	Negligible
Landscape Sensitivity	High	Major	Major/ Moderate	Moderate	Moderate/ Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible

Table 15.6 Assessment of Landscape Effects – Matrix

Where the landscape effect has been classified as Major or Major/Moderate this is considered to be significant in terms of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011. This matrix has not been used as a prescriptive tool and professional judgement has been used. Whilst the assessment adopts a matrix approach, careful consideration is also given to moderate effects to test whether (in the professional opinion of the landscape architect) they are significant or not. As such, if effects are significant this is clearly stated in each case.

In this way, the assessment is carried out transparently and systematically. It establishes at what level in the assessor's opinion 'significant' effects arise in terms of the EIA Regulations. It also permits the reader to follow the approach and determine whether or not there is agreement with the judgements made.

15.3.6 Seascape Effects

Ref. 15.1 sets out accepted and well established assessment methodology for LVIA. The character assessment process for seascapes and coastal landscapes is essentially the same. However, in applying the guidelines it is important to consider the key qualities and issues that are specific to the marine and coastal environment, for example the conjunction of land, intertidal areas and open seas; the shape and scale of coastline; views from the coast and views from the sea whether from ferries, sailing boats or sea-kayaks. These are the key issues that differ from those usually considered in a landscape and visual assessment; **it is not the method of impact assessment itself that differs** (see *Ref. 15.6*).

The baseline coastal landscape and seascape character are both the 'seaward' and the 'landward' elements which includes elements and experiential qualities that are distinctive and typify the place. Seascape effects are the changes in the character and quality of the seascape as a result of development. Hence

seascape assessment is concerned with direct and indirect effects upon specific seascape elements and features; more subtle effects on seascape character; and effects upon acknowledged special interests such as designated landscapes for their scenery, wildness or tranquillity. With offshore renewable projects the majority of the development is not on a landscape, so consideration has been given to the indirect visual effects on the setting or perception of coastal landscapes as a result of offshore development, as well as the landscape effects arising from the land based development components such as the substation and grid connections.

15.3.7 Significance of Visual Effects

The threshold for significance of visual effects relies to a great extent on professional judgement. Criteria and local circumstances require close study and careful judgement.

The following table sets out the correlation between magnitude and sensitivity in the assessment of visual effects.

		Magnitude of Change			
		Substantial	Moderate	Slight	Negligible
Visual Sensitivity	High	Major	Major/ Moderate	Moderate	Moderate/ Minor
	Medium	Major/ Moderate	Moderate	Moderate/ Minor	Minor
	Low	Moderate	Moderate/ Minor	Minor	Minor/ Negligible

Table 15.7 Assessment of Visual Effects - Matrix

Where the visual effect has been classified as Major or Major/Moderate this is considered to be equivalent to likely significant effects referred to in the EIA Regulations 2011. In carrying out the assessment, this assumption is based upon the previous experience of the assessor that those levels of effect may be equivalent to 'significant' effects. This however needs to be tested during and at the conclusion of the assessment process.

As with many aspects of landscape and visual assessment, significance of effect also needs to be qualified with respect to the scale over which it is experienced. An effect may be locally significant, or significant with respect to a small number of receptors, but not significant when judged in a wider context.

The conclusion that some effects are 'significant' must not be taken to imply that the proposed development is unacceptable or should warrant refusal in any decision-making process which is informed by this assessment.

15.3.8 Nature of Effects

Full compliance with the EIA Regulations requires that likely significant effects should be described as to type (direct, indirect, secondary or cumulative), timeframe (short, medium, long term, permanent, temporary) and whether they are positive or negative. The various types of effect are described as follows:

15.3.8.1 Temporary/Permanent Effects

If a proposal would result in an alteration to an environment whose attributes can be quickly recovered then judgements concerning the significance of effects should be tempered in that light. The Project application is for a 25 year operational period, and while this is not permanent it can properly be described as long term. Seascape, Landscape and visual effects can be reversed and following decommissioning there would be no residual landscape/seascape and visual effects. The TECs should, therefore, be regarded as a long term reversible addition to the seascape.

15.3.8.2 Direct/Indirect

Direct and indirect landscape and visual effects are defined in GLVIA3 (*Ref 15.1*).

Direct effects may be defined as those which:

> *"result directly from the development itself". (GLVIA3 paragraph 3.22)*

An indirect (or secondary) effect is one that results:

> *"from consequential change resulting from the development". (GLVIA3 paragraph 3.22)*

Indirect (or secondary) effects are often produced away from the site of the proposed development or as a result of a complex pathway or secondary association.

With particular reference to the proposed Project; the direct or physical effects would generally be limited to an area around the TECs. The indirect seascape / landscape effects are concerned with the visual effects associated with introduction of the TECs in the context of the existing seascape / landscape and visual character of the view.

15.3.8.3 Positive/Negative (Beneficial/Adverse)

Landscape and visual effects can be negative or positive and in some instances may be considered neutral. Positive effects upon landscape receptors may result from changes to the landscape involving positive enhancement measures or through the addition of well-designed elements, which add to the landscape experience or sense of place in a complementary manner.

The landscape and seascape impacts of the Project have been considered against the landscape baseline, taking account of landscape strategies or objectives where such exist. Taking a precautionary approach, changes to rural and coastal landscapes involving construction of man-made objects of a large scale are generally considered to be negative, and therefore in the assessment of landscape effects they are assumed to be adverse, unless specified otherwise in the text.

It is important to recognise that for the same development, some may consider the visual effects of renewable developments as adverse, some as positive and others as neutral. This depends to some extent on the viewer's predisposition towards landscape change but also the principle of renewable energy

development. Taking a precautionary approach in making an assessment of the 'worst case scenario', the assessment considers that all effects on views which would result from the construction and operation of the proposed development to be adverse, unless specified otherwise in the text.

15.4 Design and Mitigation

This section identifies the aspects of the proposed Project with the potential to cause an effect on seascape, landscape or visual amenity in the Study Area.

15.4.1 Proposed Development

The proposed development is described in detail in Chapter 5 of the ES. In summary, the proposed development incorporates several options to ensure enough flexibility is built into the EIA process. This SLVIA considers the 'worst case' option for the offshore tidal site, comprising 15 surface-piercing tidal energy convertors (TECs) as shown in Figure 5.13a.

Based on this scenario; each of the TECs would comprise a central tower, with a movable turbine assembly (including 20m diameter rotors on either side of the tower, mounted on a cross beam, connected to the tower by a collar). The central tower would house the transformer and power conditioning equipment, whilst a pod enclosure on top of the tower would house other electrical and control equipment. During operation the central tower would always be visible above the surface of the sea; the maximum height of the structure (including tower and pod) would be 21m above sea-level based on LAT. Conversely, the turbine assembly would be raised above the water during routine maintenance procedures, albeit would primarily be located below sea-level (3.5m below LAT). Each tower would be pinned to the sea-bed by means of a quadrapod foundation, and linked to the onshore grid network via armoured cables anchored to the sea-bed.

Note: In reality, the final development may constitute fewer than 15 surface piercing TECs (and instead incorporate a mix of surface piercing and non-surface piercing TECs, all non-surface piercing TECs, or floating platforms). Furthermore, the precise position of the TECs will inevitably be affected by site-specific seabed conditions and localised flow effects. Consequently the final detailed TEC locations will be confirmed following geotechnical survey of the seabed and confirmation of the specific location of each device. As such, there is a degree of uncertainty in terms of the final development form (i.e. the type of TEC) and the precise layout of the TEC array.

Initial discussions with the Northern Lighthouse Board (NLB) suggested that all the MCT turbines would probably be required to be lit. Those on the "corners" (i.e. major changes of direction between rows) with a flashing yellow light (with a characteristic different from cardinal marks) having a nominal range of not less than 5 n miles, whilst the other/intermediate turbines would have lights flashing yellow with a nominal range not less than 2 n miles, with a different characteristic again. The height of the light would be around 20m (if on top of the turbine tower). The lights would possibly be required to be synchronised. The MCT structures would be required to be painted yellow – from the level of HAT to

~15m (around platform level). Alternative schemes could be horizontal yellow bands not less than 2m in height. The yellow colour should conform to IALA Recommendation E-108 (See Navigational Risk Assessment).

The individual tower structure would also require to be marked with unique alpha-numeric identifiers lit with down lighters such that they are visible at a range of 150m by both day and night.

The Project would comprise four distinct phases; a temporary Installation phase, a temporary commissioning phase, an operational phase and a temporary decommissioning phase. Those elements of the development with the potential to cause an effect on seascape and landscape character and visual amenity are described in the paragraphs below.

15.4.2 Installation Phase

The final method of installation (and the associated timescale) would vary dependant on the final development parameters (including the selected TEC technology and foundation type to be installed). Based upon the 'worst case' scenario of 15 surface piercing TECs; the temporary activities and features with the potential to cause an effect on the seascape, landscape and visual amenity include the following:

- Jackup vessels (up to 150m x 45m) / DP2 vessels or Heavy Lift vessels to execute seabed drilling works;
- Jackup vessel Innovation / Flat-top barge to transport / temporarily store the TEC units;
- Install vessel (100m x 50m);
- Crew change support vessel (up to 26m long);
- Cable installation vessel, to undertake rock dumping along the western export cable route;
- Temporary buoys around the perimeter of the construction area; and
- Temporary lighting.

The number of vessel movements would depend on the size and type of vessel and the selected turbine technology.

15.4.3 Commissioning Phase

Once the TEC`s have been installed, they would be subjected to a commissioning phase, which is planned to last up to 2 weeks per device. During this phase the TEC`s would be subjected to various trials, including operation checks and calibration of instrumentation.

Based on the 'worst case' scenario the elements with the potential to cause an effect on the seascape, landscape and visual amenity during the commissioning phase include the visible parts of the 15 TEC array, i.e. the surface-piercing pods and upper sections of towers above sea-level (21m above LAT).

On the basis that they are located below sea-level; the quadrapod foundations and offshore cable are not anticipated to have any significant residual effects on the seascape, landscape or visual amenity of the area, thus have not been considered in any further detail in this assessment. There would be temporary views of each of the turbine assemblies, which would be raised and lowered in turn above sea-level as part of the operation checks. However this would have limited effect on the locality and has not been considered further as part of this assessment. Similarly, an installation vessel would be present during all manned commissioning operations (for rapid egress of the crew), however this would have extremely limited effect on the locality and is not considered further.

15.4.4 Operational Phase

The proposed Project would have an expected operational life of 25 years. Based on the 'worst case' scenario; the surface piercing pods and upper sections of the TEC towers would represent the main element of the development with the potential to affect the landscape, seascape and visual amenity of the Study Area during the operational phase.

At night / during periods of darkness, the navigational marker lighting associated with the TEC array would be visible from the surrounding area, including parts of the Islay mainland during periods of clear weather / visibility. However, the lights would be visible in the distance as distinct points within a seascape that incorporates light from the settlements of Portnahaven and Port Wemyss, as well as the Orsay Lighthouse, which spills out onto the sea. As such, the impact associated with the navigational marker lighting would have limited effect on the local seascape, particularly when viewed from Islay, at a distance of 5.4km or more. Overall, the 'night time' effects associated with views of the navigational lighting would be reduced in comparison to the 'day time' views of the TEC array, hence have not been considered further as part of this assessment.

Scheduled maintenance is likely to be carried out one TEC at a time, once a year, at which time the turbine assemblies would be raised and lowered above sea-level as part of the maintenance procedures. The likely maintenance period per turbine is two days and would be performed using small personnel craft operated from a local harbour (most likely Port Ellen on Islay). There would be a short term temporary impact associated with these scheduled maintenance activities; however this would have limited effect on the locality and has not been considered further as part of this assessment.

On the basis that the elements with the potential to cause an effect on the seascape, landscape and visual amenity during the Commissioning Phase and Operational Phase would essentially be the same (i.e. the surface piercing upper section of the tower); these two phases have been assessed together within the SLVIA as 'operational effects' (and as such, no further distinction is made between the commissioning phase and the operational phase).

15.4.5 Decommissioning Phase

The expected operational life of the development is 25 years from the date of commissioning. When the Project is decommissioned, the towers, pods and turbine assemblies would be removed (with the possible exception of the quadrapod foundation structure and sections of the cables, to minimise possible

disturbance to sediment on the sea-bed. The foundations and cables would be located below sea-level hence residual effects on the seascape, landscape and visual amenity of the area are not considered further.

It is likely that the method of removing the proposed Project would be the reverse of that used to install it, and similar vessels would be used. On this basis, the effects on seascape, landscape and visual amenity associated with the decommissioning phase would be similar to those associated with the construction phase, and (in the interests of brevity) are not assessed in detail.

15.4.6 Mitigation Measures

By its nature, the proposed Project would result in visual effects which it would not be feasible to fully mitigate through the adjustment of siting, or by providing screening. The lighting and marking of the TECs would be to a specification required by Trinity House Lighthouse Service (THLS) and the Maritime and Coastguard Agency (MCA), and would be in accordance with International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) standards, hence would be yellow in colour (RAL 1003), with synchronised flashing yellow lights. The TECs would therefore not 'blend in' with the colour of their surroundings, but would instead serve as cardinal markers as an aid to navigation (a statutory requirement). It is also likely that the devices will be equipped with either automatic identification system (AIS), radar reflectors / transponders or both. Proposals for marking would be designed in conjunction with, and authorised by, THLS and the MCA and be dependent on the specific type and positions of the TEC devices.

In terms of structure; based on the 'worst case' scenario, the design of the TEC would comprise a simple tubular tower topped by a pod. The transformer, power conditioning equipment and control equipment would be housed inside the tower and pod, thus ensuring the structures would retain a relatively simple, uncluttered external appearance. All the other elements of the proposed development would be located below sea-level and would not be visible.

15.5 Viewpoint Analysis

Viewpoint analysis has been carried out on a selection of key viewpoint locations to assess the likely magnitude of seascape, landscape and visual effects arising as a result of the proposed development during the operational period, taking into account the development design and in-built mitigation measures. Viewpoint locations have been agreed with ABC and SNH (with reference to Zone of Theoretical Visibility maps) and are illustrated in Figure 15.1.

In total, 7 viewpoints have been selected as being representative of key seascape, landscape and visual receptors; 6 are located within the 15km Study Area, whilst the 7th viewpoint is located just outside, at a distance of 17.4km (Viewpoint 7: View North West from the American Monument, Mull of Oa) as requested by ABC. Visualisations from these viewpoints are illustrated in Figures 15.2 to 15.8, with the findings of the viewpoint analysis described below in Tables 15.8 to 15.14.

In addition, cumulative viewpoints showing the wider seascape context (to a 180° angle of view) as experienced at Portnahaven and the local road at Claddach are illustrated in Figures 15.10 and 15.11.

Note: Given that there is a degree of uncertainty in terms of the final development form and precise layout of the TEC array (subject to confirmation based on geotechnical survey of the seabed; detailed comment in relation to the design composition of the TEC array at each viewpoint is not included.

Viewpoint 1	**View south west from Portnahaven (Queen Street)**	
Existing View (see Figure 15.2)	This viewpoint is located in the settlement of Portnahaven, on the western coastal edge (Queen Street). The existing view to the south west is characterised by a semi-enclosed bay in the foreground that is demarcated by the islands of Orsay and Eilean an Mhic Coinnich in the near-to-middle distance. The lighthouse on Orsay extends above the skyline, forming a notable vertical feature in the seascape. The distant horizon is formed by the Donegal Headland (at a distance of approximately 57km) and open water.	
Predicted View	The proposed development would be visible on the horizon, beyond the island of Eilean an Mhic Coinnich at a distance of 5562m. The TECs would be visible against the skyline, albeit accounting for a relatively narrow angle of view (approximately 10° of the horizontal angle of view). The TECs would represent a new element of human influence within the view, albeit the Orsay lighthouse would remain the most notable feature due to its closer proximity and elevated position on the skyline. By contrast, the project would represent a relatively distant feature.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium to High (Rubha na Faing to Rinns Point sub-type)
	Magnitude of change	Slight
	Level of Effect	Moderate/Minor to Moderate (not significant)
Assessment of effects on Visual Amenity	Sensitivity	High (Residents)
	Magnitude of change	Slight
	Level of Effect	Moderate (not significant)
Cumulative Analysis	No other cumulative developments would be visible within this view, although there would be successive cumulative views of the Islay Offshore Wind Farm to the north west (see the Cumulative Visualisation illustrated in Figure 15.10, which shows the wider seascape context within an 180° angle of view). Considered together, the cumulative magnitude of change would be Moderate at this viewpoint, resulting in a Moderate to Major/Moderate level of effect on seascape character (significant) and a Major/Moderate level of effect on visual amenity (significant). However, this would be primarily attributed to views of the Islay Offshore Wind Farm. Conversely, the Project would be located in a different sector of the view (resulting in no coalescence) and would be of much more limited scale by comparison. As a result, the proposed TECs would have a relatively minor cumulative influence upon the view, and the additional effect of the Project would not be significant.	

Table 15.8 Assessment of Visual Effects at Viewpoint 1

Viewpoint 2	**View south west from Port Wemyss**	
Existing View (see Figure 15.3)	This viewpoint is located on the minor road on the edge of Port Wemyss. The existing view is characterised by residential development in the foreground, surrounded by rough grassland. The island of Orsay is visible beyond the settlement, with the Orsay lighthouse forming a prominent vertical feature on the skyline. The island of Eilean an Mhic Coinnich is visible on the right hand side of the view, beyond a row of telecom posts extending outward from Port Wemyss (extending the spread of built form across the surrounding landscape).	
Predicted View	The proposed development would be partly visible on the horizon at a distance of 5887m, beyond the settlement of Port Wemyss and the island of Orsay (accounting for approximately 11° of the horizontal angle of view). The TECs would be experienced within a semi-developed context (incorporating residential property, farm sheds and telecoms posts), and would be partially screened. The TECs would represent a new element of human influence within the view, albeit would be background features. The existing built form within Port Wemyss would be more prominent.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium to High (Rubha na Faing to Rinns Point sub-type)
	Magnitude of change	Slight to Negligible
	Level of Effect	Minor to Moderate (not significant)
Assessment of effects on Visual Amenity	Sensitivity	High (Residents)
	Magnitude of change	Slight to Negligible
	Level of Effect	Moderate/Minor to Moderate (not significant)
Cumulative Analysis	There would be simultaneous cumulative views of the West Islay Tidal Project and Islay Offshore Wind Farm, albeit there would be clear separation between the developments and no coalescence. Overall, the cumulative magnitude of change would be Moderate to Substantial, resulting in a Moderate to Major level of effect on seascape character (significant) and a Major/Moderate to Major level of effect on visual amenity (significant). However, this would be based on views of the Islay Offshore Wind Farm which would represent a relatively prominent feature due to its horizontal spread, in combination with the visible movement of the rotors above the horizon. Conversely, the Project would represent a static background feature and would have a relatively minor additional cumulative influence. In summary, the additional cumulative effect of the Project would not be significant.	

Table 15.9 Assessment of Visual Effects at Viewpoint 2

Viewpoint 3	**View south west from the local road, Claddach**	
Existing View (see Figure 15.4)	This viewpoint is located on the local road / Core Path extending from Portnahaven, near Claddach (within the APQ). The existing view incorporates expansive views across a predominantly open seascape. The island of Eilean an Mhic Coinnich is just visible on the left hand side of the view, whilst the headland at Donegal forms the distant horizon. Human influence within the view is limited, and primarily associated with field-boundary post and wire fencing / dry stone dyke.	
Predicted View	The project would be visible at a distance of 5997m, accounting for approximately 11° of the horizontal angle of view within an expansive context. The TECs would be predominantly below the horizon and back-clothed by the rising landform of Donegal, thus limiting their influence on the existing skyline.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium to High (Rubha na Faing to Rinns Point sub-type)
	Magnitude of change	Negligible
	Level of Effect	Minor to Moderate/Minor (not significant)
Assessment of effects on Visual Amenity	Sensitivity	Medium (Road Users) to High (walkers on Core Path)
	Magnitude of change	Negligible
	Level of Effect	Minor to Moderate/Minor (not significant)
Cumulative Analysis	There would be simultaneous cumulative views of the Islay Offshore Wind Farm with the Project, albeit no coalescence, as illustrated in the Cumulative Visualisation in Figure 15.11 (which shows the wider seascape context at this viewpoint – i.e. 180° angle of view). The cumulative magnitude of change would be Moderate to Substantial, resulting in a Moderate to Major level of effect on seascape character (significant) and a Moderate to Major level of effect on visual amenity (significant). However, this would be primarily based upon views of the Islay Offshore wind farm, which would represent a notable feature due to its horizontal spread (and height), in combination with the visible movement of the rotors. Conversely, the Project would represent a background feature that would have a relatively minor additional cumulative influence upon the view. Overall, the additional effect of the Project would not be significant.	

Table 15.10 Assessment of Visual Effects at Viewpoint 3

Viewpoint 4	**View south west from the A847**	
Existing View (see Figure 15.5)	This viewpoint is located on the A847 to the east of Portnahaven (and north of Port Wemyss). The existing view is heavily influenced by human development including scattered built form / properties and rows of telegraph posts in the foreground, and properties on the eastern edge of Portnahaven (Crown Street), which align to form a row in the middle distance. The island of Orsay (and the lighthouse) are visible beyond, although do not represent overly prominent features within the view. The Donegal headland forms part of the distant skyline.	
Predicted View	The Project would be visible at a distance of 6168m, beyond built form / infrastructure in the foreground (accounting for approximately 11^{o} of the horizontal angle of view). The tips of the TECs would break the skyline, albeit they would represent relatively distant features set within a semi-developed context, thus limiting their influence on the existing view.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium to High (Rubha na Faing to Rinns Point sub-type)
	Magnitude of change	Negligible
	Level of Effect	Minor to Moderate/Minor (not significant)
Assessment of effects on Visual Amenity	Sensitivity	Medium (Road Users)
	Magnitude of change	Negligible
	Level of Effect	Minor (not significant)
Cumulative Analysis	There would be successive cumulative views of the Islay Offshore Wind Farm at this viewpoint, albeit views of the wind farm would be subject to screening by the underlying topography and intervening built form. Overall, the cumulative magnitude of change would be Slight resulting in a Moderate/Minor to Moderate level of effect on seascape character (not significant) and a Moderate/Minor level of effect on visual amenity (not significant). The Project would have a minor additional cumulative influence upon the view (not significant).	

Table 15.11 Assessment of Visual Effects at Viewpoint 4

Viewpoint 5	**View south west from the local road, Ben Cladville**	
Existing View (see Figure 15.6)	This viewpoint is located on an elevated section of the local road that extends around the summit of Ben Cladville. The existing view is characterised by broad, expansive areas of open moorland / rough grassland. Human influence is predominantly limited to built form within Portnahaven and Port Wemyss, as well as scattered residential properties aligned along the minor road to Claddach in the middle distance. The Orsay Lighthouse forms a focal point within an expansive seascape context, which incorporates uninterrupted, long distance views of the coast of Ireland.	
Predicted View	The Project would be visible at a distance of 8116m, accounting for approximately 8-9^{o} of the horizontal angle of view within an expansive context. The TECs would be situated entirely below the horizon, thus would have no effect on the existing skyline.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Low to Medium (Rocky Moorland LCT)
	Magnitude of change	Negligible to Slight
	Level of Effect	Minor to Moderate/Minor (not significant)
Assessment of effects on Visual Amenity	Sensitivity	Medium (Road Users)
	Magnitude of change	Negligible to Slight
	Level of Effect	Minor to Moderate/Minor (not significant)
Cumulative Analysis	There would be simultaneous cumulative views of the Islay Offshore Wind Farm with the Project at this viewpoint. Views of the wind farm would be subject to screening by the rising landform to the west. There would be no coalescence. Overall, the cumulative magnitude of change would be Slight resulting in a Minor to Moderate/Minor level of effect on seascape character (not significant) and a Moderate/Minor level of effect on visual amenity (not significant). The Project would have limited additional cumulative influence upon the view (not significant).	

Table 15.12 Assessment of Visual Effects at Viewpoint 5

Viewpoint 6	**View south west from Lossit Bay**	
Existing View (see Figure 15.7)	This viewpoint is located on the beach at Lossit Bay (within the APQ). The existing view is characterised by a sandy beach enclosed by raised rocky headlands on either side. Towards the west, the open seascape forms a simple horizon that is interrupted by Frenchman's Rocks on the left hand side. The rising landform of Donegal forms a distant feature.	
Predicted View	The Project would be viewed on the horizon at a distance of 8993m, extending between the headland at Rubha na Faing and Frenchman's Rocks. The TECs would represent a human influence within an undeveloped seascape, although would account for a relatively narrow angle of the overall view (approximately 7^{o} of the horizontal angle of view). The majority of the skyline would be completely unaffected.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium to High (Lossit Bay sub-type)
	Magnitude of change	Negligible to Slight
	Level of Effect	Minor to Moderate (not significant)
Assessment of effects on Visual Amenity	Sensitivity	High (Recreational Visitors)
	Magnitude of change	Negligible to Slight
	Level of Effect	Moderate/Minor to Moderate (not significant)
Cumulative Analysis	No other cumulative developments would be visible at this viewpoint (hence there would be no cumulative effects). Views of the proposed Islay Offshore Wind Farm would be completely screened by the headland of Lossit Point on the northern side of the bay. There would be clearer views of the wind farm from other areas nearby (i.e. further south within the Bay), although visibility of the Project would correspondingly reduce within these areas.	

Table 15.13 Assessment of Visual Effects at Viewpoint 6

Viewpoint 7	**View north west from the American Monument, Mull of Oa**	
Existing View (see Figure 15.8)	This viewpoint is located on the Mull of Oa, next to the American Monument. The view is characterised by the Monument itself in the foreground (situated in open grassland), with an expansive, open seascape beyond. The Rinns Peninsula rises above the skyline on the right hand side of the view, forming a distant feature on a broad, simple horizon.	
Predicted View	The Project would be located at a distance of 17381m, accounting for approximately 3-4^{o} of the horizontal angle of view within an expansive context. The TECs would be situated entirely below the horizon, thus would have no effect on the existing skyline. The TECs would be barely perceptible and only visible in in clear conditions.	
Assessment of effects on Seascape / Landscape Character	Sensitivity	Medium
	Magnitude of change	Negligible
	Level of Effect	Minor (not significant)
Assessment of effects on Visual Amenity	Sensitivity	High (Recreational Visitors)
	Magnitude of change	Negligible
	Level of Effect	Moderate/Minor (not significant)
Cumulative Analysis	There would be simultaneous cumulative views of the West lslay Tidal Project and the Islay Offshore Wind Farm, which would coalesce to form 'one' continuous development in the distance. Overall the cumulative magnitude of change would be Slight resulting in a Moderate/Minor level of effect on seascape character (not significant) and a Moderate level of effect on visual amenity (not significant). This would be predominantly associated with the Islay Offshore wind farm (due to its horizontal spread in combination with the visible movement of the rotors). The Project would have extremely limited additional cumulative influence upon the view (not significant).	

Table 15.14 Assessment of Visual Effects at Viewpoint 7

15.6 Construction Phase: Assessment of Effects

Whilst it is the operational stage of the proposed development that would give rise to prolonged seascape, landscape and visual effects; temporary effects at the construction stage would also occur.

As described in Section 15.4.2, the final method of installation (and the associated timescale) would vary dependant on the final development parameters. Based on the 'worst case' scenario, construction phase effects would be primarily associated with temporary views of the large-scale vessels that would be used to execute seabed drilling works, transport / temporarily store and install the TEC units and lay the associated cables (the size of the largest vessel would be up to 150m x 45m in size).

The effect of these temporary elements on the baseline seascape, landscape and visual resource would largely depend upon the key characteristics of the receiving environment; the degree to which they may be considered to be consistent with or at odds with it; and how they would be perceived within its setting, with perceptions being influenced by:

- Distance to the site;
- Weather conditions; and
- The appearance and 'fit' of the element in question.

Although relatively large in scale; the temporary construction vessels would be viewed at distances of approximately 4.8km (measured from Orsay), or 5.4km from the mainland of the Rinns Peninsula at the closest point. The vessels would be experienced in a seascape context within which they would not represent 'uncharacteristic features'. As such, effects on the baseline seascape, landscape and visual resource associated with these temporary elements would be limited, and typically result in Negligible to Slight magnitudes of change at most. Allowing for effects on High sensitivity receptors, the level effect associated with the temporary addition of these vessels to views of the existing seascape would be Moderate at most and therefore would not be significant.

In addition to views of large scale vessels; there would also be views of the smaller-scale crew change support vessel (up to 26m long) during the construction period, as well as temporary buoys around the perimeter of the site. However, these elements would be of lesser scale and correspondingly would result in lesser effect upon the existing Seascape / Landscape and Visual Amenity. As such, these temporary elements would not result in significant effects to the seascape, landscape or visual resource.

15.7 Operational Phase: Assessment of Seascape and Landscape Effects

This section examines the seascape and landscape effects arising as a result of the proposed Project with reference to the potential operational effects on seascape and landscape character, including consideration of any effects within designated areas.

The following assessment is undertaken with reference to the Seascape, Landscape and Visual Baseline Study (see Volume 4: Technical Appendices);- in particular Figures 1 – 9 and the descriptions of local Seascape Character Unit (SCU) sub-types contained within, which are based upon guidance provided in the following documents:

- Argyll and Bute Landscape Wind Energy Capacity Study *(Ref. 15.13)*
- An Assessment of the Sensitivity and Capacity of the Scottish Seascape in relation to Windfarms, SNH Report No.103 *(Ref. 15.14)*
- Landscape Assessment of Argyll and the Firth of Clyde, SNH Review No 78 *(Ref. 15.15)*

15.7.1 Effects on the Rubha na Faing to Rinns Point SCU sub-type

The proposed Project would be located off the coast of this seascape character unit sub-type, leading to direct effects on its existing character. Table 15.15 outlines the effect of the proposed development on its existing key characteristics. Representative views from this SCU sub type are illustrated in Viewpoints 1, 2, 3 and 4 (Figures 15.2 to 15.5).

Characteristic	Effect of the Proposed Development
South west facing section of rocky coastline, from which the landform rises to approximately 20-30m AOD across a relatively short distance.	There would be direct views in the direction of the Project, particularly from more elevated sections of the coastline. However, the proposed development would be viewed at distance of 4.8km (as measured from Orsay) or greater; i.e. 5.4km from the coast of the Rinns Peninsula at the closest point.
The coastline incorporates some minor sandy bays and gullies, as well as a number of islands and rocky outcrops which add to the overall level of intricacy and complexity of the seascape	The proposed development would represent a new element within the view at selected vantage points, leading to a slight increase in the level of complexity. However, the TECs would be subject to screening by the intervening islands of Orsay and Eilean Mhic Coinnich from localised areas (particularly within the local area surrounding Port Wemyss) and would affect a relatively small proportion of the overall view.
There are clear, long distance views out to the open sea from some areas, leading to a sense of exposure (indeed, the coast of Ireland is visible in clear weather). However, from lower lying areas, views are partially curtailed by the islands of Orsay and Eilean Mhic Coinnich to the west, which interrupt / foreshorten views and increase the sense of exposure. Overall, this is a relatively intricate	The proposed development would contrast with the horizontal-nature of the surrounding open sea. However, the development would protrude 21m above the water at most (dependant on tide) and would account for a limited horizontal angle of view. From some locations, the islands of Orsay and Eilean Mhic Coinnich would screen views of the proposed development, reducing the level of effect. The proposed development would not notably affect the existing sense of exposure.

Characteristic	Effect of the Proposed Development
seascape with partial enclosure.	
Human influences include agricultural landuse and the settlements of Portnahaven and Port Wemyss (which represent primary areas of settlement on the peninsula), as well as scattered farmsteads linked by a minor road network and associated telecoms routes, which add to the overall level of visual complexity within this sub-type and also partly diminish the sense of remoteness.	The proposed development would represent a new element of infrastructure within the view, hence would diminish the sense of remoteness. However, the development would be experienced at distances of 4.8km or more, with limited protrusion above the surrounding water / distant horizon, thus would represent a background feature. Existing built form and associated infrastructure within Portnahaven and Port Wemyss would frequently represent more prominent features.
The lighthouse on Orsay represents a prominent vertical feature with cultural value.	The proposed development would form a background feature within some outward views. However, the Orsay Lighthouse would remain the prominent feature based on its height, elevated position and closer proximity to the coastline.
At night, light from the settlements of Portnahaven and Port Wemyss, as well as the Orsay Lighthouse spill out onto the sea.	The proposed development would incorporate cardinal markers (flashing lights on the TECs) to aid navigation, albeit these would be located at considerable distance from the coastline, thus would have limited incremental effect on the existing resource.

Table 15.15: Effect upon the Rubha na Faing to Rinns Point SCU sub-type

The proposed Project would represent the addition of a new element of infrastructure off the coast of this SCU sub-type. The colouring and lighting requirements would contrast with the existing seascape, adding to the level of complexity and partly diminishing the sense of remoteness as experienced in outward views across the sea. However, the proposed development would be located at a distance of 4.8km from Orsay / 5.4km from the coast of the Rinns Peninsula, hence effects associated with the colour and lighting of the TECs would be tempered by the distance of view. Furthermore, the proposed development would be viewed within a broad-scale seascape context, accounting for a relatively small proportion of the view to the south west. The distance of view in combination with the relatively limited height of the proposed TECs (21m above LAT) would also restrict the perceived vertical scale of the development in relation to the surrounding seascape.

The sensitivity of this Seascape Character Unit sub-type in relation to the proposed development is considered to be Medium to High. The magnitude of change would be Slight, resulting in a Minor/Moderate to Moderate level of effect that would not be significant.

15.7.2 Effects on the Rubha na Faing to Machir Bay SCU sub-type

ZTV coverage is mixed across this SCU sub-type, with theoretical visibility predominantly focused within the south western section (in closest proximity to the proposed development). Table 15.16 outlines the effect of the proposed development on the existing key characteristics of this sub-type.

Characteristic	Effect of the Proposed Development
North west facing section of rocky	This SCU sub-type primarily faces away from the proposed

coastline, which generally rises steeply from the coast. There are clear, long distance expansive views out to the open sea, particularly from more elevated sections of the coast (e.g. Cnoc Breac, which rises to 139m AOD).	development. The TECs would be visible at an oblique angle in (some) views along the coast, rather than 'out to sea'. The proposed development would be viewed within an expansive broad-scale context, accounting for a limited horizontal and vertical angle of view.
The seascape is relatively simple in character and broad scale.	The proposed development would add the level of complexity, although would be located at distance and would represent a background feature.
Strong sense of exposure.	No / very limited change to the existing sense of exposure.
There is little in the way of onshore settlement (with the exception of the masts at Cnoc nam Muc-chlach), leading to a sense of remoteness. Public accessibility is limited.	The proposed development would represent a new element of infrastructure in some views to the south west. However, the development would represent a distant feature and there would be limited change or loss of the existing sense of remoteness.

Table 15.16 Effect upon the Rubha na Faing to Machir Bay SCU sub-type

Overall, the proposed Project would represent a distant feature, oblique to the primary direction of view, from selected parts of the Rubha na Faing to Machir Bay SCU sub-type. Extended sections of the coastline would be completely unaffected (particularly more northern parts). The sensitivity of this SU sub-type in relation to the proposed development is considered to be Low Medium. The magnitude of change would be generally be Negligible, resulting in a Minor/Negligible to Minor level of effect (not significant).

15.7.3 Effects on the Lossit Bay SCU sub-type

ZTV coverage is near-continuous across this relatively compact SCU sub-type, reflecting its open outlook to the west / south west. Table 15.17 below outlines the effect of the proposed development on its existing key characteristics. A representative view from this SCU sub type is illustrated in Viewpoint 6 (Figure 15.7).

Characteristic	**Effect of the Proposed Development**
Small-scale, enclosed sandy bay.	The proposed development would be viewed at distances of 8.6km or more. It would account for a relatively limited horizontal and vertical portion of the view, hence would not be 'out of scale' with the small bay.
Outward views are more focused / directional as a result of the surrounding headlands (Lossit Point in the north and Airigh Sgallaidh to the south), hence primarily face west. There are clear, uninterrupted, long distance views across the sea in this direction.	Views are focussed to the west / south west. The proposed development would be located at distance to the south west, on the 'edge' of this visual envelope (beyond Frenchman's Rocks and Rubha na Faing). The proposed development would not foreshorten outward views, and would have no effect on westerly views.
The surrounding headlands (which rise steeply from the coast) limit the expansive nature of the view to some extent, as well as the sense of exposure. There is an increased feeling of shelter, within relatively enclosed surroundings.	Given the distance of view and the relatively limited visual extent of the proposed development (vertically and horizontally), there would be limited change to the existing sense of enclosure, or exposure.
There is little in the way of onshore	The proposed development would represent a new element

Characteristic	Effect of the Proposed Development
settlement / built form (other than the farmhouse at Lossit), leading to a sense of remoteness. Public accessibility is limited.	of infrastructure within the view, hence would diminish the sense of remoteness. However, the development would represent a distant background feature, and the bay would retain a strong sense of remoteness.

Table 15.17 Effect upon the Lossit Bay SCU sub-type

Overall, the proposed Project would be visible from Lossit Bay, leading to indirect changes to existing character. However, views would be limited by distance (approximately 8.6km or more) and the relatively limited horizontal and vertical spread of the proposed TECs, which would account for a limited angle in south westerly views along the coastline. The sensitivity of this SCU sub-type in relation to the proposed development is considered to be Medium to High. The magnitude of change would be Negligible to Slight, resulting in a Minor to Moderate level of effect (not significant).

15.7.4 Effects on the Kilchiaran Bay SCU sub-type

This SCU sub-type is located outwith the ZTV. There would be no view of the proposed Project from landward areas and no effect on its existing characteristics (not significant).

15.7.5 Effects on the Rinns Point to Port Charlotte SCU sub-type

The proposed Project would have a very limited relationship with this predominantly south east facing SU sub-type. ZTV coverage is extremely limited, restricted to scattered ZTV coverage across Cnoc Undail, near Rinns Point, on the western edge of the SCU sub-type (where public accessibility is very limited). Table 15.18 outlines the effect of the proposed development on its existing key characteristics.

Characteristic	Effect of the Proposed Development
South east facing section of rocky coastline.	The SU sub-type primarily faces away from the proposed development.
The coastline is relatively simple in form, with no notable islands or intricate bays / gullies.	Visibility of the proposed development would be extremely limited, resulting in no notable change or increase in complexity of the coastline.
Human influences include the A847 transport route, which extends parallel to the coast, as well as expansive coniferous plantations located further inland.	The proposed development would represent additional human influence, albeit visibility would be extremely limited, resulting in minimal change to the existing perceived human influences.
In outward views to the south east; the Mull of Oa forms a distant backdrop.	No effect.

Table 15.18 Effect upon the Rinns Point to Port Charlotte SCU sub-type

The proposed Project would have very minor influence on the existing perception of seascape character across the Rinns Point to Port Charlotte SCU sub-type. The sensitivity of this SCU sub-type in relation to the proposed development is considered to be Low to Medium. The magnitude of change would be Negligible to Zero and the level of effect would be Minor to None (not significant).

15.7.6 Indirect Effects on the Rocky Moorland LCT (LCT9)

There would be no direct effects on the Rocky Moorland LCT. However, indirect effects would occur based on potential views of the proposed development, which would potentially influence the perceived character of this LCT. Potential effects on landscape character would depend upon the degree to which the seascape in the vicinity of the proposal site plays an influencing role on the landscape experience within this 'onshore' area. ZTV coverage is fragmented across the Rocky Moorland LCT, and is generally focussed across coastal areas on the south western edge of the peninsula, as well as more elevated inland areas / summits. ZTV coverage is absent altogether from lower-lying central / inland areas, particularly further to the north east, as well as coastal areas that faces onto Loch Indaal, indicating that the proposed Project would be experienced from a relatively small proportion of this LCT overall.

Table 15.19 outlines the indirect effect of the proposed development on the existing key characteristics of the Rocky Moorland LCT (as defined in *Ref. 15.15*).

Characteristic	Effect of the Proposed Development
A rocky upland plateau dissected by deep gullies.	There would be no effect on existing topography. Furthermore, the underlying landform (which rises steeply from the coast) limits the extent of ZTV coverage across the upland plateau and therefore the extent of visual effects.
The plateau slopes to the east, with a sequence of craggy summits along the upper western edge.	There would be views of the proposed development from more elevated summits (such as Ben Cladville and Beinn Tart a' Mhill), albeit at distance and accounting for a narrow angle of view, hence the development would represent a background feature.
Rocky coastline with steep cliffs and narrow inlets.	The proposed development would add to the visual complexity of the coastline in certain places. However, the development would also be subject to screening by the intervening offshore islands of Orsay and Eilean Mhic Coinnich.
Extensive grassland, broken by rocky outcrops and occasional patches of blanket bog and small lochs.	There would be no direct effect on existing ground cover.
Extensive conifer plantations on eastern slopes of plateau.	There would be no direct effect on existing forestry. The existing conifer plantations would screen outward views of the proposed development from some parts of the plateau.
Scattered, isolated farms reached by narrow, winding moorland roads.	The proposed development would represent a new element of infrastructure within the surrounding seascape, therefore contrasting with the predominantly rural, nature of the LCT. However, the development would be located 5.4km offshore (measured from the Rinns Peninsula), hence would result in extremely limited 'urbanisation' of the LCT.
Exposed and windswept.	The proposed development would represent a new element of infrastructure, visible from some of the more open and 'exposed' parts of the LCT. However, open areas (and larger scale landscapes) are typically better able to accommodate development of the type proposed.
Numerous archaeological sites.	The scattered cultural heritage features are typically located inland, and / or outwith the ZTV (e.g. on the eastern coastline of the Rinns Peninsula, facing onto Loch Indaal.

Table 15.19 Indirect Effect upon the Rocky Moorland LCT

Overall, the proposed development would result in no direct effects on the Rocky Moorland LCT. Indirect effects would be restricted by the underlying topography, which would typically limit views to the south western coastal edge of the Rinns Peninsula, as well as scattered elevated vantage points located further inland (see Figure 15.6 – Viewpoint 5: View south west from the local road, Ben Cladville). From these areas, the Project would be viewed at a distance of 5km or more, set within a wide seascape context.

The sensitivity of the Rocky Moorland LCT to the proposed development is considered to be Low to Medium. The magnitude of change would be Negligible, resulting in a Minor/Negligible to Minor level of effect that would not be significant. At greater distances, further to the north east, views of the proposed development would be increasingly infrequent based upon reduced ZTV coverage and increased levels of intervening screening, and as a result the level of effect would decline to None (no change).

15.7.7 Potential Effects on Landscape Designations

15.7.7.1 Indirect Effects on the Area of Panoramic Quality

The APQ extends across the islands of Orsay and Eilean Mhic Coinnich, as well as the north western coastline of the Rinns Peninsula, Islay (north of Portnahaven). At its closest point, the APQ extends within 4.8km to the north east of the Project (as measured from the Isle of Orsay). ZTV coverage across the APQ is fragmented, and primarily focused within 10.5km (extending as far north as Rubna Ghlamraidh). Beyond 10.5km, ZTV coverage is generally limited to occasional elevated vantage points and coastal outcrops, hence visibility would be very limited.

The clearest (and closest proximity) views would be from the isles of Orsay and Eilean Mhic Coinnich, particularly the western shores. There would be no intervening screening, hence the proposed Project would be visible in its entirety, representing a new feature in the western seascape. The vertical form of the TECs would contrast with the horizontal nature of the open water, albeit the development would be viewed at a distance of 4.8km or more, set within a simple, broad-scale seascape context.

Views from the APQ on the Rinns Peninsula of Islay (5.4km to the north east of the proposed development at the closest point) would be more varied, and subject to localised screening from the undulating landform on the peninsula itself, as well as the intervening islands of Orsay and Eilean Mhic Coinnich (to the south west). Viewpoints 3 and 6 illustrate views of the proposed development from the local road near Claddach, and the beach at Lossit Bay (approximately 6.0km and 9.0km to the north east of the proposed development respectively). These viewpoints illustrate that whilst the proposed Project would be visible from certain areas, it would represent a relatively distant feature, accounting for a relatively narrow angle of view (i.e. 11^{o} and 7^{o} of the horizontal angle of view at Viewpoints 3 and 6 respectively). As a result, it would represent a relatively minor background feature in outward views.

Overall, the proposed Project would result in no direct effects on the 'physical landforms' of the APQ, or the 'flora and fauna, which they support'. Indirect effects (based upon outward views of the proposed development) would be experienced at a distance of 4.8km or more. In views from Orsay and Eilean Mhic Coinnich, the proposed development would be viewed within a simple, open seascape context. Views from the Rinns Peninsula would be more intricate and variable as the proposed development would be located within a seascape context incorporating the islands of Orsay and Eilean Mhic Coinnich within the foreground (as well as the smaller islands / rocky outcrops of Sgeirean Dubha, Bogha Ladhrach, and Frenchman's Rocks). Views from the peninsula would also be at greater distance and subject to greater levels of intervening screening. The sensitivity of the APQ to the proposed development is considered to be Medium. The magnitude of change on the APQ would be Slight, resulting in a Moderate/Minor level of effect that would not be significant. At greater distances (further to the north east) the level of effect would decline to Minor or None (Negligible magnitude of change or no change), based on reduced ZTV coverage and increased levels of intervening screening.

15.8 Operational Phase: Assessment of Visual Effects

This section draws on the results of the ZTV baseline figures and the description of seascape and landscape context within the Seascape, Landscape and Visual Baseline Study (within Volume 4: Technical Appendices), as well as the viewpoint analysis described in Section 15.5 of this chapter. It considers the potential effects of the proposed development on the visual amenity of the following groups of potential receptors:

- Residents within settlements and dispersed properties,
- Motorists and other road users on A class, B class and minor roads, and
- Recreational Receptors – walkers, cyclists and horse riders on promoted routes (including local-level Core Paths), visitors to recreational attractions, and recreational passengers within sea-going vessels.

The following assessment considers the extent of predicted and actual visibility, magnitude of change, and the overall effect on changes in views that would be experienced.

15.8.1 Residents within Settlements

Settlements are listed below in order of increasing distance from the proposed Project. The sensitivity of residential receptors is considered to be High in all cases. For residents of all of these settlements, visibility would be in part restricted by the height of buildings, orientation of streets and density of adjacent development, and as such would not be experienced uniformly. Indeed, the most likely places for clear visibility would typically be from the outer edge of the settlements, closest to the proposed development.

15.8.1.1 Portnahaven

The settlement of Portnahaven is located 5.5km to the north east of the proposed development and comprises a mixture of traditional white-washed single storey, 1.5 storey and two storey properties. ZTV coverage is generally continuous across the settlement, indicating that there would be clear views of the proposed development, subject to screening by built form. Viewpoint 1 (Figure 15.2) illustrates a coastal view from the edge of the town closest to the proposed development (Queen Street), looking south west across Orsay and Eilean Mhic Coinnich. The proposed development would be visible beyond these islands, set within a relatively intricate seascape context that also incorporates the Orsay Lighthouse, as well as several smaller islands / rocky outcrops.

There would be comparable views from other parts of the settlement, subject to screening by built form. The proposed development would represent a new element of infrastructure that would contrast with the existing features within the view, and add to the level of complexity within the seascape. However, the proposed development would be viewed at a distance of 5.5km or greater and account for a limited angle of view (approximately 10^{o}). The existing lighthouse located on Orsay would remain the more prominent focal point within the view.

In terms of orientation, there would be relatively direct views from the row of single storey, 1.5 storey and two storey properties along Queen Street (located at the water front on the western edge of the town – where Viewpoint 1 is situated). Conversely, the majority of properties within Portnahaven (including those on Shore Street, High Street, King Street and Crown Street) are situated around the bay and face predominantly to the north west or south east. As a result, views towards the proposed development would be at an oblique angle from many of these properties. Similarly, properties on Church Street (on the northern edge of the settlement) are east-west facing, hence the proposed development would be oblique to the primary direction of view.

Overall, the magnitude of change would be Slight for those residents with clear, direct views of the proposed development (such as those located along Queen Street), decreasing to Negligible or less from the majority of other properties based on increased levels of intervening screening and the oblique nature of view. The level of effect would be Moderate or less, and not significant.

15.8.1.2 Port Wemyss

The settlement of Port Wemyss is located 5.5km to the north east of the proposed development. ZTV coverage across the settlement is mixed, and is most concentrated across more elevated north easterly parts of the village reflecting the underlying topography, which rises steadily from the coast. Conversely, ZTV coverage is completely absent from the south western edge of the settlement.

From elevated vantage points on the north eastern edge of the settlement, the proposed development would be visible in the wider seascape beyond intervening built form and infrastructure in the foreground, and the island of Orsay in the middle distance (see Viewpoint 2 – Figure 15.3). The proposed development would represent a distant feature, accounting for a relatively minor angle of view. Views from other parts of the village (including the south western edge, which is located in closest proximity to the proposed development) would be more limited

and subject to increasing level of screening in relation to the rising landform of Orsay in the foreground; hence would be restricted to upper floor windows.

Overall, the magnitude of change would be Slight to Negligible, dropping to Zero for many residents. The level of effect would be Moderate to Moderate/Minor (reducing to no change for many residents) and not significant.

15.8.1.3 Residents within dispersed properties

In addition to residents within the settlements of Portnahaven and Port Wemyss, there are several residential properties located outwith the settlement boundaries, dispersed across the surrounding countryside of the Rinns Peninsula. This includes several properties situated along the minor road network, as well as more isolated farmsteads as follows:

- dwellings on the minor road to Claddach – including Windyedge, Port-a-Reidhleinn, Poll a Chappuil and Claddach (located at distances of >5.8km to the north east of the proposed development),
- dwellings aligned along the A847 to the north of Port Wemyss – including Brookfield, An Sabial and the Old School House (>6.0km to the north east),
- dwellings aligned along the minor road from Portnahaven to Port Charlotte (via Kilchiaran) – including Ballymeanach (at distances of 6.7km to the north east), and
- farmsteads at Cladville and Lossit (7.6km and 9.5km to the north east of the proposed development respectively).

In each case, the primary orientation of the view and level of intervening screening varies. For those residents with unobstructed, direct views of the proposed development, the TECs would represent new elements of infrastructure in the seascape to the south west. However, the proposed development would be viewed at a distance of 5.8km or greater and account for a limited angle of view. As a result, the proposed development would represent a background feature. Overall, the magnitude of change would be Slight to Negligible, and the level of effect would be Moderate to Moderate/Minor (not significant). Views from some of these properties (in particular the dwellings at Ballymeanach) would be subject to screening by intervening built form / farm sheds within the curtilage, and as a result there would be no views of the proposed development (and no effect) from ground floor windows.

All other dispersed properties within the Study Area are located at distances of >10km and / or are located outwith the ZTV. As a result, the proposed TECs would be barely discernable or completely screened from view. The level of effect experienced by residents within these properties would therefore be Negligible to no change (not significant).

15.8.2 Motorists and Other Road Users

The potential visual effects of the proposed development experienced by road users have been considered with reference to Figure 8 within the Seascape, Landscape and Visual Baseline Study (within Volume 4: Technical Appendices).

The sensitivity of road users is assessed to be Medium to High in all cases. It is relevant to note that views would be experienced transiently and would be in part restricted by the orientation of different sections of each route, whereby the proposed development would be seen in oblique views or behind the direction of travel. As such, views would not be experienced uniformly.

15.8.2.1 A847

The A847 extends north east from Portnahaven along the eastern coastline of the Rinns Peninsula, via Port Charlotte / Port Sgioba towards Bridgend, and the centre of Islay. Overall, the route extends over 23.5km. At its closest point, the A847 extends within 5.5km of the proposed Project. ZTV coverage is limited to short sections on the western end of the route, accounting for less than 1.4km of the route overall (or approximately 6% overall). From this short section of the route there is little in the way of roadside vegetation, albeit views of the proposed development would be subject to intervening screening by the gently rolling landform, as well as the intervening island of Orsay. As a result, views of the proposed development experienced by road users would be fragmented in nature and often partially screened. From more open sections of the route, the development would be visible beyond telecoms lines and scattered built form within the foreground / middle distance (see Viewpoint 4). Due to the orientation of the route, the clearest views would be experienced by road users travelling west. For road users travelling east, the proposed development would be located opposite to the direction of travel (behind the road user). The remainder of the route is outwith the ZTV, hence road users would experience no effect upon existing views.

Overall, the magnitude of change would be Negligible to Slight from a localised section of the route (i.e. the 1.4km section extending east of Portnahaven, dropping to Zero in other sections due to no ZTV coverage. The level of effect would be Minor to Moderate in localised sections, dropping to no change for the vast majority of the route (not significant).

15.8.2.2 Portnahaven to Port Charlotte via Kilchiaran

This minor road extends over 15.3km between Portnahaven and Port Charlotte, within 5.7km of the proposed development at its closest point. ZTV coverage is limited to relatively short, fragmented sections on the south western end of the route. This includes a 200m long section north of Portnahaven, 1.8km section extending south from Ben Cladville, and a 1.0km section extending south west from Cultoon (accounting for approximately 3.0km overall, or 20% of the route).

Viewpoint 5 (Figure 15.6) illustrates the view from the elevated section of the road near Ben Cladville, at a distance of 8.1km from the closest TEC. From this part of the route, the proposed Project would be visible in the distance, beyond undulating, open grassland / moorland in the foreground. The proposed development would represent a minor component within a broad and expansive landscape / seascape. Views from other parts of the route within the ZTV would be of a similar character. Due to the orientation of the road, fragmented views of the proposed development would be limited to those road users travelling south west, towards Portnahaven (the development would be located behind road users travelling in a north easterly direction).

Overall, the proposed development would have limited impact upon the views of road users travelling on this local road, and there would be no visibility across the majority of the route. The magnitude of change would be Negligible to Slight (dropping to Zero for lengthy sections). The level of effect would be Minor to Moderate (dropping to no change) and not significant.

15.8.2.3 Minor road to Claddach

This minor road extends in a westerly direction from the Portnahaven to Port Charlotte minor road, towards Claddach on the north western fringe of the Rinns Peninsula. The route forms a loop, extending 2.9km, at a distance of 5.9km from the proposed development at its closest point. ZTV coverage is relatively continuous across the route (accounting for approximately 2.2km of the route overall, or 76%). There would be open views of the proposed development beyond Eilean Mhic Coinnich and the nearby cluster of smaller islands / rocky outcrops, representing the introduction of a new element of infrastructure within the broad-scale seascape, partly increasing the level of complexity (see Viewpoint 3 – Figure 15.4). However, the TECs would represent relatively minor, distant features. Scattered properties and the row of telegraph poles aligned along the road would represent more prominent features due to their close proximity to the road. The existing Orsay Lighthouse would remain a strong focal point in seaward views due to its height and elevated position on the skyline.

Overall, the proposed development would represent a distant, background feature with limited vertical scale, accounting for a relatively minor portion of the overall view. The TECs would have relatively limited impact upon the views of road users travelling on this local road. The magnitude of change would be Slight to Negligible, and the level of effect would be Moderate to Minor (not significant).

15.8.3 Recreational Receptors

The potential visual effects experienced by those walking or riding along key recreational routes, visiting key recreational attractions and recreational passengers on sea-going vessels have been considered with reference to Figure 8 within the Seascape, Landscape and Visual Baseline Study (within Volume 4: Technical Appendices). Recreational receptors are set out below in order of increasing distance from the Project and are considered to be of High sensitivity in all cases.

15.8.3.1 Picnic site at Port Wemyss

The picnic site at Port Wemyss is located 5.5km to the north east of the proposed development. It is located entirely outwith the ZTV (views of the proposed development would be completely screened by the rising landform of Orsay to the west / south west). There would be no views and no effect.

15.8.3.2 Core Path (Portnahaven to Port-a-Reidhleinn)

This route extends north from Portnahaven, along the coastline, towards Port-a-Reidhleinn (where it joins the Claddach Core Path). The route is 1.0km in length and extends within 5.5km of the proposed development at its closest point. ZTV coverage is fragmented, and restricted to approximately 0.6km (60%) of the

route, reflecting the screening effect of the intervening island of Eilean Mhic Coinnich. The clearest views of the proposed development would be from the southern-most section of the path (in closest proximity to the proposed development), where there would be filtered views between the islands of Orsay and Eilean Mhic Coinnich. This section of the coastline is relatively complex, and incorporates a mixture of sandy beaches, rocky outcrops and grassy headlands, as well as views of the offshore islands of Orsay and Eilean Mhic Coinnich. The proposed development would represent a new element of infrastructure within the view, adding to the level of complexity, although would be located at distance and represent a minor component within the view. The lighthouse on Orsay would remain the more prominent feature within southerly / south westerly views due to its closer proximity and elevated position. Overall, the magnitude of change would be Slight or less, leading to a Moderate level of effect or less that would not be significant.

15.8.3.3 Core Path (Claddach)

This route follows the same route as the Claddach Minor Road (assessed above), forming a 2.9km loop on the western edge of the Rinns Peninsula, extending within 5.9km from the proposed development at its closest point. Effects experienced by walkers on this Core Path would be the same as those already described above in relation to road users (although would be experienced at lower speeds). Overall, the proposed development would have relatively limited impact upon the views of recreational users. The magnitude of change would be Slight to Negligible and the level of effect would be Moderate to Moderate/Minor, and not significant.

15.8.3.4 Core Path (Portnahaven to Octofad)

This Core Path extends 7.7km from Portnahaven to Octofad, within 5.7km of the proposed development at its closest point. The path shares the same route as the Portnahaven to Port Charlotte via Kilchiaran Minor Road (assessed above) between Portnahaven and Lossit Burn, before diverging east towards Octofad. ZTV coverage is limited to relatively short, fragmented sections on the south western end of the route. This includes a 200m long section north of Portnahaven, 1.8km section extending south from Ben Cladville (equating to approximately 26% of the route).

Viewpoint 5 illustrates the view from the elevated section of the path near Ben Cladville (at a distance of 8.1km). From this part of the route, the Project would be visible in the distance, beyond undulating, open grassland / moorland in the foreground. The proposed development would represent a minor component within a broad and expansive landscape / seascape. Views from other parts of the route within the ZTV would be of a similar character and as such the proposed development would not be overly prominent. Due to the orientation of the route, views of the proposed development would predominantly be experienced by walkers travelling south west, towards Portnahaven (the development would be located behind walkers travelling in a north easterly direction). There would be no views of the proposed development from more easterly sections of the footpath (comprising 74% of the route), which is located outwith the ZTV.

Overall, the proposed development would have limited impact upon the views of walkers travelling on this Core Path, and there would be no visibility across the majority of the route. The magnitude of change would be Negligible to Slight (dropping to Zero for lengthy sections). The level of effect would be Moderate/Minor to Moderate (dropping to no change) and not significant.

15.8.3.5 Summit of Ben Cladville

Ben Cladville is located 8.1km to the north east of the proposed development. There would be elevated views of the proposed development from the summit (130m AOD), as well as the southern and western slopes. The TECs would be experienced within an open, broad-scale landscape / seascape context predominantly characterised by open expanses of rough grassland and moorland stretching out in the foreground to the middle distance, with the open sea visible beyond. In addition, existing infrastructure within the south westerly view includes the transmission mast situated at the summit of Cnoc Mor (visible against the skyline), as well as the lighthouse positioned at a prominent, elevated position on Orsay, and rows of telegraph posts extending outwards from Portnahaven. The proposed development would represent a new element of infrastructure within the south westerly view. However, the TECs would be viewed at distance (beyond all existing elements of infrastructure) and account for a limited angle of the overall view (i.e. 8-9^{o} of the horizontal angle of view within a 360^{o} context). The existing transmission mast at Cnoc Mor and the Orsay Lighthouse would remain the most prominent focal point within the view.

Overall, the proposed development would be experienced as a background feature within a broad-scale, uninterrupted 360^{o} landscape / seascape context. The magnitude of change would be Negligible, leading to a Moderate/Minor level of effect that would not be significant.

15.8.3.6 Beach at Lossit Bay

Lossit Bay is located 8.6km to the north east of the proposed development at its closest point (on the western coast of the Rinns Peninsula). The bay encompasses a sandy beach and series of dunes, from which there are open views across the sea to the west and south west (views to the north west are curtailed by the protruding landform at Lossit Point).

Viewpoint 6 (Figure 15.7) illustrates a typical south westerly view from the beach and shows that the Project would be visible within a seascape context that incorporates the western coastline of Islay stretching out on the left-hand-side of the view, as well as Frenchman's Rocks (the series of small rocky islands located offshore near Rubha na Faing) in front of the proposed TECs. The proposed development would represent a new element of infrastructure within the view. However, the development would be located at distance, accounting for a limited angle of view (7^{o}). There would be no effect on open views across the sea to the west.

Overall, the proposed development would be visible within south westerly views with limited intervening screening, albeit at distance and accounting for a narrow angle of view. The magnitude of change experienced by visitors would be Slight,

to Negligible leading to a Moderate to Moderate/Minor level of effect that would not be significant.

15.8.3.7 Summit of Beinn Tart a' Mhill

The summit of Beinn Tart a' Mhill is located 11.7km to the north east of the Project. There would be elevated views of the proposed development from the summit (232m AOD), as well as the western slopes (eastern slopes would be outwith the ZTV). The proposed development would be visible in the distance beyond expanses of rough grassland and coniferous forestry in the foreground to the middle distance. The existing mast on Beinn Tart a' Mhill would represent the primary focal point within the view due to its close proximity. Conversely, the proposed development would represent a distant background feature accounting for a limited angle of view (4-5^{o}). The magnitude of change would be Negligible, leading to a Moderate/Minor level of effect that would not be significant.

15.8.3.8 Cultoon Stone Circle

Cultoon Stone Circle is located 10.7km to the north east of the proposed development, set upon a slight rise in the local landform. The proposed development would be visible as a background feature within an open, broad-scale landscape context, incorporating extensive areas of open grassland / moorland stretching towards the sea in the distance. The magnitude of change would be Negligible and the level of effect experienced by visitors would be Moderate/Minor and not significant.

15.8.3.9 The Gearach hunting estate

The Gearach hunting estate is located on the north eastern edge of the Study Area (approximately 12-15km from the proposed development). ZTV coverage is extremely limited, and in reality views would be further restricted by coniferous vegetation. The proposed Project would be barely discernable. The magnitude of change would be Negligible to Zero, and the level of effect experienced by visitors would be Moderate/Minor, reducing to no change in some areas, and not significant.

15.8.3.10 Core Path (Kilchiaran to Machir Bay)

Within the Study Area, this Core Path extends 2.1km from Kilchiaran to Machir Bay, at a distance of 13.8km from the proposed development at its closest point. ZTV coverage is extremely limited and highlights that partial and fragmented theoretical visibility would be restricted to a 100m-200m section of the route near Creag Bealach na Caillich (14.4km from the proposed development). From this section of the route, the proposed development would represent a background feature, subject to partial / complete screening, that would be barely discernable. The magnitude of change would be Negligible to Zero. The level of effect would be Moderate/Minor, reducing to no change, and not significant.

15.8.3.11 Boat trips / Fishing / Sailing

Recreational boat trips sail from Port Ellen (outwith the Study Area on Islay's Southern coast) to the distilleries situated on Loch Indaal (including Bowmore / Bogh Mor and Bruichladdich). Views of the proposed Project would be experienced at distance, and would be completely screened by the rising headland at Rinns Point as the boat travels further north into Loch Indaal (where

ZTV coverage is absent). As such, the proposed development would typically represent a background feature. The magnitude of change would be Slight or less, leading to a Moderate level of effect or less, which would not be significant.

It is noted that other recreational vessels would be less consistent in their route, including those being used for informal recreational sailing or fishing purposes. Recreational sailing and fishing vessels sail from Portnahaven and Port Wemyss and as such would extend in closer proximity to the proposed development than boat trips sailing from Port Ellen towards Loch Indaal. Indeed, there would be views of the proposed TECs at distances of less than 4.8km as these vessels sail around the south western side of Orsay and Eilean Mhic Coinnich. The proposed development would be clearly visible from these areas of open water (during periods of fine weather conditions), although the TECs would generally account for a narrow angle of view within an expansive seascape context that would include unobstructed visibility across a 360^{o} arc of view. Whilst the TEC colouring and lighting requirements (in accordance with IALA standards for marine safety) would contrast with the existing seascape; it is a statutory requirement in the interests of mariner health and safety that the TEC devices are visible from sea-going vessels. This includes those vessels being used for recreational sailing and fishing activities. Overall; recreational passengers aboard vessels sailing within 1-2km of the proposed development would experience close proximity views of the TECs which could be perceived as significant. However, it is noted that the site area is not typically used for recreational sailing or fishing activities due to the turbulent nature of the tide within the locality (thus limiting the likelihood of recreational vessels sailing into such close proximity to the TECs). At greater distances, the proposed development would represent a more discreet feature that would be visible within an expansive seascape context. On this basis, the magnitude of change experienced by recreational passengers would generally be Slight, leading to a Moderate level of effect that would not be significant.

15.8.3.12 American Monument, Mull of Oa

The American Monument is located 17.4km to the south east of the proposed development (outside the 15km Study Area). Recreational visitors to the Monument experience elevated, open views over the surrounding seascape from elevated positions near the monument. In open views to the north west, the proposed development would represent a distant, background feature within an open, broad-scale landscape context, incorporating extensive areas of open water (see Viewpoint 7 – Figure 15.8). As such, the proposed Project would be barely discernable. The magnitude of change would be Negligible and the level of effect experienced by visitors would be Moderate/Minor and not significant.

15.9 Decommissioning Phase: Assessment of Effects

As with the construction period, effects during the decommissioning phase would be predominantly associated with the presence of large-scale vessels on site. The effects on seascape, landscape and visual amenity associated with the decommissioning phase would therefore be similar to those associated with the construction phase, and (in the interests of brevity) are not repeated here.

Following completion of the decommissioning phase (including removal of the surface piercing section of the TECs and the departure of the decommissioning vessels from the site), there would be no permanent residual effects on seascape / landscape or visual amenity.

15.10 Cumulative Seascape, Landscape and Visual Effects

This part of the assessment considers the potential cumulative effects of the proposed Project in association with other commercial-scale wave, tidal or wind energy developments within a 15km radius. With reference to the Seascape, Landscape and Visual Baseline Study (within Volume 4: Technical Appendices), there are no operational, consented or proposed (with submitted planning application) developments within the 15km Study Area. The Islay Offshore Wind Farm (which is currently at scoping-stage with a planning application scheduled for submission at the end of 2013) represents the only other cumulative development within the Study Area.

It should be noted that cumulative effects in relation to the proposed Islay Offshore Wind Farm are inherently uncertain; both in terms of the detailed parameters and position of the proposed turbines, as well as whether or not the scheme will subsequently be awarded planning consent and become operational. Current SNH guidance in relation to the cumulative assessment of wind farms (see *Ref. 15.5*) states that cumulative effects in relation to pre-application developments (such as those at scoping stage):

> *"may be regarded as a material consideration and the weight to be accorded to it by the planning authority will depend upon how advanced that proposal is."*

Correspondence with SSE (the developer of the Islay Offshore Wind Farm) in October 2012 revealed that it would be 'several months' before they would be able to issue 'even rudimentary scenarios with indicative turbine and OSP positions'. The cumulative assessment is therefore based on a number of assumptions in relation to the proposed Islay Offshore Wind Farm, based upon information within the publically available Scoping Document dated 19 March 2010 (downloadable from the SSE project website). This information indicates that the proposed Islay Offshore Wind Farm would comprise up to 138 turbines, with blade tip heights of up to 151m to blade tip (88m to hub, with a 126m rotor diameter). Based upon these assumptions, a cumulative ZTV showing theoretical cumulative visibility of the Project in combination with the proposed Islay Offshore Wind Farm is illustrated in Figure 15.9. In lieu of detailed turbine coordinates for the Islay Offshore Wind Farm, the cumulative ZTV is considered as indicative only.

The cumulative assessment draws from the cumulative ZTV, as well as the indicative wireframe illustrations in Figures 15.2 to 15.8 and the Cumulative Visualisations illustrated in Figures 15.10 and 15.11, which show the wider seascape context (i.e. 180^{o} angle of view) as experienced at Portnahaven and the Local Road near Claddach respectively.

With reference to the main assessment of seascape, landscape and visual effects described in the preceding sections of this chapter; receptors assessed as experiencing a Negligible magnitude of change (or less) as a result of the proposed Project have been excluded from further cumulative assessment on the basis that the Project would exert a very minor cumulative influence on such receptors and would never 'tip the balance' making a previously not 'significant' landscape or visual effect into a 'significant' effect. The cumulative assessment is therefore focused on those receptors described within the main assessment as experiencing a Slight magnitude of change or greater.

15.10.1 Cumulative Effects on the Rubha na Faing to Rinns Point SCU sub-type

As described, the proposed Project would be located approximately 4.8km off the coast of the Rubha na Faing to Rinns Point SCU sub-type at the closest point (as measured from Orsay). The proposed Islay Offshore Wind Farm would be located approximately 13.3km to the west / north west. There would be simultaneous and successive view of the two proposed developments from selected vantage points (particularly from north western parts of the SCU sub-type – see Cumulative Viewpoint Figure 15.11, on the Minor Road near Claddach). When considered together, these two developments would spread the extent of visible infrastructure across the seascape to the south west / west / north west. However, there would be clear separation between the two developments, and no coalescence.

Overall, the combined cumulative magnitude of change would be Moderate, leading to a Moderate to Major/Moderate level of effect that would be locally significant. However, these effects would be primarily associated with views of the proposed Islay Offshore Wind Farm, which would represent a new characteristic in north westerly views based on the horizontal spread of the turbine array in combination with the movement of the turbine rotors. Conversely, the Project would represent a background feature with limited additional cumulative effect on the Rubha na Faing to Rinns Point SCU sub-type. The additional cumulative effect of the West Islay Tidal Energy Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.2 Cumulative Effects on the Lossit Bay SCU sub-type

The proposed Project would be located approximately 8.6km to the south west of the Lossit Bay SCU sub-type, whilst the proposed Islay Offshore Wind Farm would be located approximately 14.6km to the west / north west. There would be cumulative views of both developments from parts of the Bay. However, with reference to Viewpoint 6, simultaneous cumulative views would be restricted by the surrounding headlands resulting in partial or complete screening of one or other development from extended areas within the Bay. The proposed Project would be most visible from northern parts of the bay, where the Offshore Wind Farm would be subject to greater screening, and vice versa. Considered together, these two developments would spread the extent of visible infrastructure across the seascape to the south west / west / north west. However, there would be clear separation between the two developments, and no coalescence.

Overall, the combined cumulative magnitude of change would be Moderate to Substantial, leading to a Moderate to Major level of effect that would be locally significant. However, these effects would be primarily associated with views of the proposed Islay Offshore Wind Farm due to the horizontal spread of the turbine array. Conversely, the Project would represent a relatively discreet feature that would have limited additional cumulative effect on the Lossit Bay SCU sub-type. The additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.3 Cumulative Effects on the Area of Panoramic Quality

The proposed Project would be located approximately 4.8km to the south west of the APQ at the closest point (measured from Orsay), whilst the Islay Offshore Wind Farm would be located approximately 13.7km to the west / north west at its closest point. Neither development would result in direct effects on the APQ (i.e. the physical landform, or flora and fauna), albeit both would be visible from selected parts of the designation, resulting in indirect effects based upon changes in the visual resource.

There would be simultaneous and successive cumulative views of both developments from parts of the APQ, particularly from more southern parts (i.e. south of Cnoc Breac). From this part of the APQ, there would be increased spread of visible infrastructure across the seascape to the south west / west / north west, although there would be clear separation between the two developments, and no coalescence. With reference to the cumulative ZTV (Figure 15.9) the proposed Project would not generally be visible north of Cnoc Breac (hence visibility would be restricted to the Islay Offshore Wind Farm alone from more northern parts of the APQ).

Overall, the combined cumulative magnitude of change would be Moderate to Substantial, leading to a Moderate to Major/Moderate level of effect that would be locally significant. However, these effects would be primarily associated with views of the proposed Islay Offshore Wind Farm, which would represent a new characteristic in north westerly views based on the horizontal spread of the turbine array, in combination with the movement of the turbine rotors. Conversely, the proposed Project would represent a background feature that would not be visible continuously across all parts of the APQ. The additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant and extended areas on the APQ would be completely unaffected.

15.10.4 Cumulative Effects on Residents within Settlements: Portnahaven

There would be cumulative views of the proposed Project 5.5km to the south west and the proposed Islay Offshore Wind Farm approximately 14.7km to the north west beyond Eilean Mhic Coinnich, subject to screening by surrounding built form within the settlement. Considered together, the two proposed developments would extend the spread of development across the seascape to the south west / north west, albeit they would be located in completely different sectors of the view with sufficient separation distance between the two schemes to prevent coalescence.

Overall, the cumulative magnitude of change would be Moderate to Substantial for residents with direct, open views across the seascape to the west based on views of the Islay Offshore Wind Farm; although would be Slight or less for other residents. The cumulative level of effect would be Major/Moderate to Major (and significant) for selected residents (based on views of the proposed Islay Offshore Wind Farm), declining to Moderate or less (and not significant) from other parts of the settlement based on increased levels of intervening screening and / or the oblique nature of view. The proposed Project would have very limited cumulative influence upon the visual experience of local residents (the additional cumulative effect of the Project, assuming the prior presence of the Islay Offshore Wind Farm, would not be significant).

15.10.5 Cumulative Effects on Residents within Settlements: Port Wemyss

The proposed Project would be located 5.5km to the south west of Port Wemyss, whilst the Islay Offshore Wind Farm would be located approximately 15.3km to the north west of the settlement at the closest point. Cumulative views of the two developments would be subject to screening by surrounding built form and the underlying / intervening topography, resulting in partial or complete screening of one or both developments across extended parts of the settlement (in particular, views of the TECs would be subject to screening by the rising intervening landform at Orsay). As a result, simultaneous / successive views of both developments at the same vantage point would be relatively rare within Port Wemyss and typically limited to the eastern edge of the settlement (refer to Viewpoint 2 – Figure 15.3). Viewpoint 2 highlights that the proposed Islay Offshore Wind Farm would represent a relatively prominent feature due to the horizontal spread, height and movement of the turbine array above the horizon, whilst the proposed Project would represent a background feature (below the skyline).

Overall, the cumulative magnitude of change would be Moderate to Substantial for a limited number of residents with direct, open views across the surrounding seascape, based on views of the Islay Offshore Wind Farm. However, the magnitude of change would generally be Slight for other residents based on increased levels of screening by topography and surrounding built form. The cumulative level of effect would be Major/Moderate to Major (and significant) for selected residents (based primarily on views of the proposed Islay Offshore Wind Farm), declining to Moderate or less (and not significant) from other parts of the settlement based on increased levels of intervening screening and / or the oblique nature of view. The proposed Project would have very limited cumulative influence upon the visual experience of local residents (the additional cumulative effect of the Project, assuming the prior presence of the Islay Offshore Wind Farm, would not be significant).

15.10.6 Cumulative Effects on Residents within dispersed properties

With reference to the cumulative ZTV (Figure 15.9) there would be theoretical cumulative views of the proposed Project in combination with the Islay Offshore Wind Farm from several of the dispersed residential dwellings within the Study Area (including, but not limited to Windyedge, Port-a-Reidhleinn, Poll a Chappuil, Claddach, Brookfield, An Sabial, the Old School House, Ballymeanach and the farmsteads at Cladville and Lossit). The exact nature of the view (including primary direction / orientation and the extent of intervening screening) would

vary in each case. For those residents with open views to the south west / west / north west, the two developments would extend the spread of infrastructure across the seascape, albeit they would be located in completely different sectors of the view with sufficient separation distance between the two schemes to prevent coalescence.

Overall, the cumulative magnitude of change would be Moderate to Substantial, resulting in a Major/Moderate to Major (and significant) level of effect for residents with direct, open views across the seascape to the west. However, this would be based on views of the Islay Offshore Wind Farm, which would form a new focal point on the distant horizon. Conversely, the proposed Project would represent a background feature of limited height and horizontal spread within a different sector of the view. The additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.7 Cumulative Effects on Motorists and Other Road Users: A847

Cumulative ZTV coverage across this A-road is limited to a relatively short section at the western terminus of the route (near Portnahaven / Port Wemyss) from which there would be cumulative views of the proposed Project and the proposed Islay Offshore Wind Farm at distances of approximately 5.5km to the south west and 14.8km to the north west respectively at the closest point. Views of the proposed developments would be tempered by intervening built form and roadside infrastructure (power / telecom lines) and the underlying topography (refer to Viewpoint 4 – Figure 15.5). The vast majority of the route would be outwith the ZTV and completely unaffected.

Overall, the cumulative magnitude of change would be Moderate from a highly localised section on the western end of the route (based primarily upon views of the proposed Islay Offshore Wind Farm, due to the horizontal spread of the turbine array and movement of the turbine rotors), reducing to Zero across the vast majority of the route (based on no ZTV coverage). The cumulative level of effect would be locally Moderate to Major/Moderate, and significant (based on views of the Islay Offshore Wind Farm), dropping to no change across the vast majority of the route. The proposed Project would represent a background feature with very limited cumulative influence upon the visual experience of road users. In summary, the additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.8 Cumulative Effects on Motorists and Other Road Users: Portnahaven to Port Charlotte via Kilchiaran

Cumulative ZTV coverage is relatively fragmented across this minor road which extends within approximately 5.7km and 14.8km of the proposed Project and proposed Islay Offshore Wind Farm respectively at the closest point. Considered together, the two proposed developments would extend the spread of development across the seascape to the south west / west, albeit there would be sufficient separation distance between the two schemes to prevent coalescence (refer to Viewpoint 5 – Figure 15.6). With reference to the cumulative ZTV, the proposed Islay Offshore Wind Farm would be visible across lengthy sections of the route (where the turbine array would account for a wide angle of view on the western horizon, subject to localised screening. Conversely, views of the

proposed Project would generally be limited to localised southern sections of the route.

Overall, the cumulative magnitude of change would be Moderate, resulting in a Moderate to Major/Moderate level of effect that would be significant. However, this would be based primarily upon views of the proposed Islay Offshore Wind Farm. The proposed Project would have limited cumulative influence upon the visual experience of road users, representing a minor component within the view from localised sections of the route. The additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.9 Cumulative Effects on Motorists and Other Road Users: Minor Road to Claddach
Cumulative ZTV coverage is relatively extensive across this minor road, which extends within approximately 5.9km and 13.8km of the proposed Project and proposed Islay Offshore Wind Farm respectively at the closest point. The proposed Islay Offshore Wind Farm would extend across a wide angle of view on the north western horizon (refer to Figure 15.11), however the proposed Project would have relatively limited impact upon the views to the south west.

Overall, the cumulative magnitude of change would be Moderate to Substantial leading to a Moderate to Major level of effect that would be significant. However, this would be based upon views of the proposed Islay Offshore Wind Farm. Conversely, the proposed Project would represent a background feature with limited cumulative influence upon the visual experience of road users. In summary, the additional cumulative effect of theProject (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.10 Cumulative Effects on Recreational Receptors: Core Path (Portnahaven to Port-a-Reidhleinn)
Cumulative ZTV coverage is fragmented across this Core Path, which extends within approx. 5.5km and 14.3km of the proposed Project and proposed Islay Offshore Wind Farm respectively at the closest point. The proposed Islay Offshore Wind Farm would extend across a wide angle of view on the north western horizon, however the proposed Project would be partly screened by the intervening island of Eilean Mhic Coinnich and would represent a relatively minor component within the view to the south west.

Overall, the cumulative magnitude of change would be Moderate to Substantial, based primarily upon views of the proposed Islay Offshore Wind Farm; leading to a Moderate/Major to Major level of cumulative effect that would be significant. However, the proposed Project would represent a minor component within the view, with limited cumulative influence upon the visual experience of walkers using the path. The additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.11 Cumulative Effects on Recreational Receptors: Core Path (Claddach)
This route follows the same route as the Claddach Minor Road (assessed above). Cumulative effects experienced by walkers on this Core Path would be the same as those already described above in relation to road users (although would be experienced at lower speeds). Overall, the cumulative magnitude of change

would be Moderate to Substantial, leading to a Moderate/Major to Major level of cumulative effect (significant) based primarily upon views of the proposed Islay Offshore Wind Farm. The additional cumulative effect of the Project, assuming the prior presence of the Islay Offshore Wind Farm, would not be significant.

15.10.12 Cumulative Effects on Recreational Receptors: Core Path (Portnahaven to Octofad)

The path shares the same route as the Portnahaven to Port Charlotte via Kilchiaran Minor Road (assessed above) between Portnahaven and Lossit Burn, before diverging east towards Octofad. Cumulative ZTV coverage is relatively fragmented across this Core Path, and is absent altogether from eastern parts of the route (near Octofad). Whilst views of the proposed Project would be limited to localised southern sections of the route (i.e. between Portnahaven and Ben Cladville); the proposed Islay Offshore Wind Farm would be visible across more lengthy sections of the route (including additional sections located further north / north east), where it would represent a relatively prominent feature due to the horizontal spread of the turbine array and movement of the rotors.

Overall, the cumulative magnitude of change would be Moderate based primarily upon views of the proposed Islay Offshore Wind Farm, although would decrease to None on eastern sections of the route (which is outwith the ZTV for both schemes). The cumulative level of effect would be locally Moderate/Major (and significant) based on views of the Islay Offshore Wind Farm, decreasing to no change. The proposed Project would represent a relatively minor component within the view with limited cumulative influence upon the views experienced by recreational users. In summary, the additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.13 Cumulative Effects on Recreational Receptors: Beach at Lossit Bay

Lossit Bay is located approximately 8.6km to the north east of the proposed Project and approximately 14.6km to the east / south east of the proposed Islay Offshore Wind Farm. This is an enclosed bay, and views of the proposed Project would be partly screened by the headlands and rocky outcrops to the south west, whilst views of the proposed Islay Offshore Wind Farm would be similarly restricted in part by the headland on the north western side of the bay (Lossit Point) which would screen the proposed wind turbines within the northern part of the site. Considered together, the two proposed developments would extend the spread of development across the seascape to the west, albeit there would be sufficient separation distance between the two schemes to prevent coalescence.

Overall, the cumulative magnitude of change would be Moderate to Substantial, leading to a Major/Moderate to Major level of cumulative effect (significant) based primarily on views of the proposed Islay Offshore Wind Farm, which would represent a relatively prominent feature due to the horizontal spread of the turbine array in combination with the movement of the turbine rotors against the skyline. By contrast, the proposed Project would represent a distant, background feature with very limited cumulative influence upon the visual experience of visitors to the bay. On this basis, the additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.10.14 Cumulative Effects on Recreational Receptors: Boat trips / Fishing - Loch Indaal
There would be simultaneous cumulative views of the proposed Project and the proposed Islay Offshore Wind Farm to the north west from recreational boat trips sailing from Port Ellen (outwith the Study Area on Islay's Southern coast) to the distilleries situated on Loch Indaal (including Bowmore / Bogh Mor and Bruichladdich). However, views of these two schemes would be at distance, partly screened by the intervening headland at Rinns Point, and viewed within an expansive seascape context that would be open across the surrounding 360° field of view. The cumulative magnitude of change would typically be Slight, leading to a Moderate level of cumulative effect that would not be significant.

In terms of other recreational fishing and sailing vessels (including those setting out from Portnahaven and Port and / or those sailing around the north western side of the Rinns Peninsula); passengers would experience clearer, closer proximity views of the Project and the proposed Islay Offshore Wind Farm (in comparison to vessels sailing from Port Ellen towards Loch Indaal). Both developments would be clearly visible from areas of open water around the south western tip of the Rinns Peninsula. Considered together, the two proposed developments would extend the spread of development across the seascape, albeit they would typically be located in different sectors of the view with sufficient separation distance between the two schemes to prevent coalescence. The Islay Offshore Wind Farm would represent a new focal point in north westerly views based on the horizontal spread of the turbine array, in combination with the movement of the turbine rotors. Conversely, the proposed Project would typically represent a more discreet feature, lower to the horizon, and static in form. Overall, the combined cumulative magnitude of change would be Substantial, leading to a Major level of cumulative effect that would be significant. However, these effects would be primarily associated with views of the proposed Islay Offshore Wind Farm alone, which would represent a new focal point. Conversely, the proposed Project would represent a more discrete feature with limited cumulative influence upon the experience of those partaking in recreational fishing / sailing activities in the surrounding area. With the exception of recreational vessels sailing within 1-2km of the proposed TECs (which is considered unlikely due to the turbulent nature of the tide within the locality); the additional cumulative effect of the Project, assuming the prior presence of the Islay Offshore Wind Farm, would not be significant.

15.11 Conclusion

15.11.1 Seascape / Landscape Character

The proposed Project would result in indirect effects upon seascape character across the Study Area – primarily associated with views of the proposed development at distances of 4.8km offshore from the Isle of Orsay, 5.4km offshore from the Rinns Peninsula at its closest point. The most prominent effects on local seascape character would be associated with views from the Rubha na Faing to Rinns Point SCU sub-type and the Lossit Bay SCU sub-type, where the magnitude of change would be Slight in both cases, resulting in a Minor/Moderate to Moderate level of effect that would not be significant. The proposed TECs would also be visible from other local-level SCU sub-types and the Rocky Moorland LCT, albeit would predominantly represent a distant, background feature resulting in a Negligible magnitude of change. Overall, there would be no significant effects on seascape / landscape character.

15.11.2 Landscape Planning Designations

The Islay APQ represents the only landscape designation within the 15km Study Area, located within approximately 4.8km of the proposed development at its closest point (measured from Orsay). Views of the proposed development would be intermittent across the APQ and would be oblique to the primary direction of view. The magnitude of change would be Slight in localised southern parts of the AONB, decreasing to Negligible or less further north. The level of effect would be Moderate/Minor in localised areas, dropping to no change. Overall, there would be no significant effects on landscape planning designations.

15.11.3 Visual Receptors: Residents within Settlements and dispersed properties

Portnahaven and Port Wemyss represent the only settlements within the 15km Study Area. Visual effects experienced by residents would vary, based on localised screening and the orientation of the properties. Residents with open, unobstructed views of the proposed development (including a limited number of residents within Queen Street, Portnahaven) would experience a Slight magnitude of change and a Moderate level of effect (not significant). The majority of residents within these settlements would experience lesser or no effects based on increased screening by neighbouring built form and / or the underlying landform (including the intervening islands of Orsay and Eilean Mhic Coinnich) which would screen views of the proposed development from some locations. Effects on the majority of residents would therefore be Moderate/Minor or less, and not significant.

Similarly, effects experienced by residents within dispersed dwellings (outwith the settlements of Portnahaven and Port Wemyss) would also vary dependent upon orientation of view and intervening screening. Residents with open, unobstructed views of the proposed development would experience a Slight magnitude of change at most, and a Moderate level of effect (not significant).

Overall, there would be no significant effects on residents within settlements or residents within dispersed properties throughout the surrounding areas.

15.11.4 Visual Receptors: Motorists and Other Road Users

Visual effects as a result of the proposed TECs would be experienced intermittently from a range of roads in the Study Area. The principle roads include the A847, as well as sections of minor road extending from Portnahaven to Port Charlotte (via Kilchiaran), as well as a small loop extending to Claddach on the western part of the Rinns Peninsula. In each case, the magnitude of change would be Slight at most, leading to a Moderate level of effect on localised sections that would not be significant. With particular reference to the A847 and the Portnahaven to Port Charlotte (via Kilchiaran) minor road; there would be lengthy sections from which there would be no view of the proposed development, and therefore no effect. Overall, there would be no significant effects on motorists and other road users.

15.11.5 Visual Receptors: Recreational Receptors

Recreational receptors considered in the assessment include those using recreational footpaths, those visiting key destinations / attractions, and those undertaking recreational sailing / fishing activities in the coastal waters. Recreational footpaths within the Study Area include the Core Path extending to Claddach, as well as the Portnahaven to Port-a-Reidhleinn Core Path, Portnahaven to Octofad Core Path, and the Kilchiaran to Machir Bay Core Path. In each case, the magnitude of change would be Slight or less, leading to a Moderate level of effect (not significant) on localised sections, decreasing to Moderate/Minor or no change from lengthy sections from which there would be very limited / no view of the proposed development.

In terms of recreational destinations; visitors to the beach at Lossit Bay would experience a Slight to Negligible magnitude of change, leading to a Moderate to Moderate/Minor level of effect that would not be significant). Effects experienced by visitors to other recreational destinations (including the Picnic site at Port Wemyss, the summits of Ben Cladville and Beinn Tart a' Mhill, the Cultoon Stone Circle, the Gearach hunting estate, and the American Monument on the Mull of Oa) would be less; i.e. Moderate/Minor or less (and not significant).

Effects experienced by recreational passengers on boat trips extending up Loch Indaal would typically be Moderate or less (based on a Slight magnitude of change or less), which would not be significant. Effects experienced by passengers on other recreational fishing / sailing vessels (including those sailing around the south western end of the Rinns Peninsula) would also typically be Moderate and not significant (based on a Slight magnitude of change). Recreational passengers aboard vessels sailing within 1-2km of the proposed development would experience close proximity views of the TECs which could be perceived as significant; however, the turbulent nature of the tide within the locality of the site dictates that the area is not typically used for recreational sailing or fishing activities (thus limiting the likelihood of recreational vessels sailing into such close proximity to the TECs).

15.11.6 Cumulative Effects

There are no operational, consented or proposed (with submitted planning application) developments within the 15km Study Area. The proposed Islay Offshore Wind Farm (currently at scoping-stage, with a planning application scheduled for submission at the end of 2013) represents the only cumulative development within the Study Area.

Considering the combined effect of the Project with the Islay Offshore Wind Farm; there would be significant cumulative effects on a number of seascape, landscape and visual receptors within the Study Area. However, in all cases these effects would be primarily associated with views of the proposed Islay Offshore Wind Farm alone, which would represent a new characteristic in north westerly views based on the horizontal spread of the turbine array, in combination with the movement of the turbine rotors. Conversely, the proposed Project would represent a relatively discreet background feature with limited cumulative influence. In the majority of cases, the two developments would be located in completely different sectors of the view, with sufficient separation distance between them to prevent coalescence. Overall, the additional cumulative effect of the Project (assuming the prior presence of the Islay Offshore Wind Farm) would not be significant.

15.11.7 Chapter Summary

A summary of the predicted seascape, landscape and visual effects of the proposed West Islay Tidal Energy Project, including an evaluation of their significance, is listed in Table 15.20. This includes a summary of the cumulative seascape, landscape and visual effects of the proposed West Islay Tidal Energy Project in association with the proposed Islay Offshore Wind Farm. Where significant cumulative effects are predominantly associated with development other than the proposed West Islay Tidal Energy Project, this is clearly listed.

There would be no significant effects associated with the construction or decommissioning phase of the proposed West Islay Tidal Energy Project, and as such these are excluded from the table. Following completion of the decommissioning phase (including removal of the surface piercing section of the TECs and the departure of the decommissioning vessels from the site), there would be no permanent residual effects on seascape / landscape or visual amenity.

Receptor	SLVIA: West Islay Tidal Energy Project			Cumulative SLVIA: West Islay Tidal Energy Project in association with proposed Islay Offshore Wind Farm
	Sensitivity	Level of Effect	Significance	
Effects on Seascape Character Unit sub-types				
Rubha na Faing to Rinns Point	Medium to High	Minor/Moderate to Moderate	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Rubha na Faing to Machir Bay	Low to Medium	Minor/Negligible to Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible incremental effect.
Lossit Bay	Medium to High	Minor to Moderate	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Kilchiaran Bay	There would be no effect		Not Significant	The proposed West Islay Tidal Energy Project would have no incremental effect.
Rinns Point to Port Charlotte	Low to Medium	Minor to None	Not Significant	The proposed West Islay Tidal Energy Project would have negligible incremental effect.
Indirect Effects on Landscape Character Types				
Rocky Moorland LCT	Low to Medium	Minor/Negligible to Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible incremental effect.
Indirect Effects on Landscape Designations				
Area of Panoramic Quality	Medium	Moderate/Minor	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Visual Effects Experienced by Residents within Settlements				
Portnahaven	High	Moderate or less	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Port Wemyss	High	Moderate to Moderate/Minor or less	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Visual Effects Experienced by Residents within Dispersed Properties				
Residents within 10km including: Windyedge,	High	Moderate to Moderate/Minor	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy

Port-a-Reidhleinn, Poll a Chappuil, Claddach, Brookfield, An Sabial, the Old School House, Ballymeanach, and farmsteads at Cladville and Lossit				Project would have very limited cumulative influence / incremental effect.
Residents >10km	High	Negligible to no change	Not Significant	The proposed West Islay Tidal Energy Project would have negligible / no cumulative effect.
Visual Effects Experienced by Motorists and Other Road Users				
A847	Medium to High	Minor to Moderate	Not Significant	Significant cumulative effects from localised sections of the route would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Portnahaven to Port Charlotte via Kilchiaran	Medium to High	Minor to Moderate	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Minor road to Claddach	Medium to High	Minor to Moderate	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Visual Effects Experienced by Recreational Receptors				
Picnic site at Port Wemyss	There would be no effect		Not Significant	The proposed West Islay Tidal Energy Project would have no incremental effect.
Core Path (Portnahaven to Port-a-Reidhleinn)	High	Moderate or less	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Core Path (Claddach)	High	Moderate to Moderate/Minor	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Core Path (Portnahaven to Octofad)	High	Moderate/Minor to Moderate	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would have very limited cumulative influence / incremental effect.
Summit of Ben Cladville	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.
Beach at Lossit Bay	High	Moderate to Moderate/Minor	Not Significant	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy

				Project would have very limited cumulative influence / incremental effect.
Summit of Beinn Tart a' Mhill	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.
Cultoon Stone Circle	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.
The Gearach hunting estate	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.
Core Path (Kilchiaran to Machir Bay)	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.
Boat trips from Port Ellen to Loch Indaal	High	Moderate or less	Not Significant	Not Significant
Sailing and fishing vessels from Portnahaven and Port Wemyss	High	Moderate	Not Significant (Rising to significant from vessels sailing within 1-2km of the proposed development.	Significant cumulative effects would be primarily associated with views of the proposed Islay Offshore Wind Farm. The proposed West Islay Tidal Energy Project would typically have very limited cumulative influence / incremental effect on the view experienced by passengers at distances of approximately 2km or more from the proposed TECs.
American Monument, Mull of Oa	High	Moderate/Minor	Not Significant	The proposed West Islay Tidal Energy Project would have negligible cumulative effect.

Table 15.20: Summary of Effects: Operational Phase

15.12 References

Ref. 15.1 – Guidance for Landscape and Visual Assessment: Third Edition (Landscape Institute and Institute of Environmental Management and Assessment, 2013)

Ref. 15.2 – Landscape Character Assessment: Guidance for England and Scotland (Countryside Agency and Scottish Natural Heritage, 2002)

Ref. 15.3 – Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape, Guidance for Scoping an Environmental Statement (SNH, March 2012)

Ref. 15.4 – The siting and design of aquaculture in the landscape: visual and landscape considerations (Prepared by Alison Grant, Landscape Architects for SNH, November 2011)

Ref. 15.5 – Assessing the Cumulative Impact of Onshore Wind Energy Developments (Scottish Natural Heritage, March 2012)

Ref. 15.6 – Offshore Renewables – guidance on assessing the impact on coastal landscape and seascape (Scottish Natural Heritage, March 2012)

Ref. 15.7 – Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report (Enviros for the DTI, 2005)

Ref. 15.8 – Guide to Best Practice in Seascape Assessment (Countryside Council for Wales, Brady Shipman Martin and University College of Dublin, 2001)

Ref. 15.9 – Photography and Photomontage in Landscape and Visual Assessment, Landscape Institute Advice Note 01/2011 (2011)

Ref. 15.10 – Visual Assessment of Windfarms: Best Practice, prepared by University of Newcastle. Commissioned Report F01AA303A (2002)

Ref. 15.11 – Visual Representation of Windfarms: Good Practice Guidance Scottish Natural Heritage (2007)

Ref. 15.12 – Landscape Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity (SNH & Countryside Agency, 2004)

Ref. 15.13 – Argyll and Bute Landscape Wind Energy Capacity Study (Carol Anderson and Alison Grant Landscape Architects for Argyll and Bute Council and Scottish Natural Heritage, 2012)

Ref. 15.14 – An Assessment of the Sensitivity and Capacity of the Scottish Seascape in relation to Windfarms, SNH Report No.103 (Scott, Anderson, Dunsford, Benson and MacFarlane, 2005)

Ref. 15.15 – Landscape Assessment of Argyll and the Firth of Clyde, SNH Review No 78 (Environmental Resources Management, 1996)

WESTISLAY TIDAL

ENERGY PARK

volume 2 // chapter 16 // traffic & transport

16.0 Traffic & Transport

16.1 Introduction

This chapter describes the likely traffic and transportation which will be required during the life of the Project covering installation, operation and maintenance and decommissioning of the marine elements of the project only. Traffic and transportation associated with onshore infrastructure will be defined as part of the onshore consents process.

When reviewing this chapter it is recommended to reference the following:

- Navigational Safety Risk Assessment – Technical Appendix 14.1;
- Project Description – Chapter 5;
- Shipping and Navigation – Chapter 14; and.
- Noise – Chapter 19

As there isn't expected to be an impact on Islay's road network system and as there is no evidence of guidance on assessing traffic and transportation for marine projects, an environmental impact assessment has not been considered. However, the following information has been provided to enable a clearer picture of the likely traffic and transportation requirements to be gained.

As part of the consenting process, a detailed construction method statement (CMS) will be issued to Marine Scotland for approval following completion of the detailed site design, order acknowledgement for the equipment to be used and finalisation of the methodology by which construction will be undertaken.

16.2 Baseline Description

16.2.1 Marine Traffic & Transportation

16.2.1.1 Commercial Vessels

The AIS data and onshore radar surveys carried out between the 21st March and 4th April 2012 (15 day winter period) and the 19th July to 2nd August 2012 (15 day summer period) collected as part of the NSRA (Technical Appendix 14.1) illustrate the low levels of shipping activity in and around the project. Detailed fisheries information is provided within Chapter 12: Commercial Fisheries.

16.2.1.2 Ferries

As shown in Figure 16.1, Islay has several important ferry routes all of which are operated by Caledonian MacBrayne

The normal sailing frequency from Kennacraig to Islay is three to four times on weekdays and Saturday and two on a Sunday. On most days there are two early (07.00 and 09.45) and one late (18.00) sailing to Port Ellen and there is an early afternoon sailing (13.00) to Port Askaig. In the summer season, on Wednesdays

there is an early sailing (07.45) from Kennacraig to Oban, which calls at Port Askaig (09.50) and Colonsay (11.25). That same ferry returns from Oban in the afternoon (15.30) to arrive at Kennacraig in the evening (21.50), again stopping at Colonsay (17.45) and Port Askaig (19.15).

The Isle of Jura can be reached by car from Port Askaig. A small ferry runs at approx. 30min intervals daily from 7.30am till 6.30pm. Other means of transportation are a small boat from Colonsay to Loch Tarbert and there is a water taxi from Crinan to Ardlussa, but this is mainly for visits to the Corryvreckan Whirlpool.

Information on the three ferries used is provided in the following table 16.1.

Specification	**MV Hebridean Isles - Eileanan Innse Gall**	**MV Isle of Arran - Eilean Arrain**	**MV Finlaggan - Fionn Lagan**
Built	1985, Cochrane Shipbuilders Ltd,	1984, Ferguson Ailsa, Port Glasgow	2011, Remontowa SA, Gdansk, Poland
Gross tonnage	3046	3296	5209
Size	85.2m x 15.8m	84.9m x 15.8m	89.8 x 16.4m
Service speed	15 knots	15 knots	16.3knots
Capacity	62 cars and 494 passengers	62 cars; 659 passengers	85 cars, 550 passengers

Table 16.1 Ferries on the Kennacraig to Islay Service Operated by Caledonian Macbrayne.

It is noted that no ferries operate within the vicinity of either the tidal energy site or the subsea cable route.

16.3 Marine Traffic & Transportation – Tidal Project

16.3.1 Introduction

The following information is presented as an indication of the likely construction traffic and transportation based on information currently available. Sourcing major equipment will only be confirmed when suppliers have been identified and orders acknowledged as manufacturing locations will change depending on which supplier is used. The information is also developed on the assumption that if a mix of MCT and TGL equipment is used then the foundations will be sourced by the installation contractor who will be required to have significant experience in installing major marine projects. The tidal turbines would effectively be "free issued" to the civils and installation contractor at a suitable dock facility.

This information is also assembled on the presumption that installation will be completed in two distinct phases The reasoning behind this approach is due to the fact that it is unlikely that the 30MW tidal development would be built during one summer and it is unlikely that the selected turbine supplier could provide a batch of 15 to 30 machines in one summer:

- Year 1 – Locate template, drill pin pile holes, locate piles and grout.
- Year 2 – Install foundation over pin piles (including turbine If MCT) or separately install TGL turbines, install inter-array cables and export cable.

As this is not an EIA chapter the information provided is not the likely "worst case" but the likely approach to delivering equipment to site. Details of installation methodologies and timescales are provided in Chapter 5: Project Description.

16.3.2 Installation Delivery

16.3.2.1 Template, Rock Drill and Piles

On the basis that a large jack-up, DP vessel or barge is mobilised, they are all likely to come from the continent unless they can be redeployed from duty in for example the North Sea. Due to the expense of hiring such a vessel, it will not be mobilised until equipment is ready to be loaded. Installation materials will consist of the template, rock drill and pin piles on a vessel with a lifting capability of 320 tonnes (heaviest item being the rock drill). It is probable that the vessel will mobilise direct to site via the Irish Sea.

Once on station each TEC location can be prepared (four piles 11m deep) in one to five days depending on conditions. Assuming 5 days and 20 TEC locations, the work would be completed in 100 days or around three months (during the summer).

When weather windows are not available for installing pin piles, the vessel would be likely to shelter in the more protected area of Loch Indaal, though this would depend on prevailing conditions.

16.3.2.2 Foundations, Turbines, Inter-array Cables and Export Cable

Due to the heavy lift requirements of 460 tonnes for the MCT turbine, a heavier vessel will be required for phase 2. In addition, it is likely that a support vessel will be required to transit between site and the construction facility to deliver equipment in parallel with the installation vessel installing turbines.

The vessel is likely to mobilise to site via the Irish Sea and potentially load equipment at one of the facilities as shown in Figure 15.1. It will then mobilise directly to site.

A separate specialist cabling vessel will be mobilised to site, again via the Irish Sea. This vessel will independently install the export cable from the site to landfall at Kintra. These activities are also expected to take up to 100 days and again sheltering would take place in Loch Indaal.

16.3.3 Operation and Maintenance

Under normal operation there will be no requirement for vessel presence. However, as described in Chapter 5: Project Description, there are two fundamentally different approaches to maintenance depending on which TEC is installed.

16.3.3.1 In-situ Maintenance (MCT and BlueTEC)

One of the main advantages of installing surface piercing equipment is that they are maintained in situ. This means that regular scheduled and unscheduled maintenance will be carried out by a small service vessel likely to be moored at Port Ellen (or possibly Portnahaven if a RIB can be used). The main advantage of this approach is that in order to provide rapid response to a requirement to mobilise to site, there will be a requirement for an onshore maintenance facility on Islay which could provide income and employment. It is also likely that the environmental programme would be managed from this facility. It is predicted that there will be daily visits to site for the first year reducing as better experience of the devices grows.

16.3.3.2 Modular Maintenance (TGL, Hammerfest, Voith etc.)

In this scenario a larger vessel in excess of 30m would be required to be deployed from a dedicated maintenance facility on the Clyde or Belfast where heavy craneage exists to remove the recovered turbine from the recovery vessel. In this instance there would be no opportunity to utilise Islay's facilities and the vessel is likely to be on site for only a day, enough time to recover the inoperable unit and replace it with a spare.

16.3.4 Decommissioning

It is assumed that the vessel requirements during decommissioning would be similar to that of the phase 1 requirement of installation except that there would be no cable laying vessel.

16.4 Conclusion

There will be no major onshore vehicle movement associated with the project. The only likely vehicles required relate to the pulling of the 33kV cable to shore and the provision of a local excavator for digging and back-filling the trench and these movements are considered to be insignificant.

A navigational risk assessment has been carried out for the project which concluded that with the application of the recommended controls, the risk from the proposed installation is "tolerable with monitoring" and As Low As Reasonably Practicable (ALARP).

Further information on vessel types and movements are provided in the Chapters referenced in section 15.1 above.

If local maintenance is adopted then a further impact assessment with respect to onshore facilities will accompany an additional application for consent for onshore infrastructure.

WESTISLAY TIDAL

ENERGY PARK

volume 2 // chapter 17 // recreation & amenity

17.0 Recreation and Amenity

17.1 Introduction

This chapter provides an assessment of the potential impacts on tourism and recreation that could occur as a result of the proposed West Islay Tidal Energy Project (the Project), and includes both the potential adverse and beneficial effects upon the local tourism economy and tourism and recreational interests. The assessment has been undertaken by PBA Roger Tym.

The assessment addresses the potential worst case where the Development could potentially impact upon visitors, businesses and the local population alike and best case in terms of impact on the local (Islay, Jura and Colonsay) and wider areas (Argyll & Bute Council area).

Although the Project application terminates at high water mark in the vicinity of Kintra Farm, and features only the tidal energy site, inter-array cabling and export cables to landfall, this assessment has been undertaken for the entire development recognising that infrastructure will be required both on Islay and the Kintyre peninsular. Any references to onshore works or the sub-sea cable connection from Islay to Kintyre are for information only and are not currently associated with this application and will be the subject of further applications for consent in the near future.

The following technical studies have been used to support this chapter as set out in table 17.1.

Technical Studies
The Economic Impacts of Wind Farms on Scottish Tourism: Scottish Government (2008) – section 13.4 - http://www.scotland.gov.uk/Resource/Doc/214910/0057316.pdf
Scottish Natural Heritage's publication 'A Handbook on Environmental Impact Assessment' (February 2006) Appendix 5
Scotland Visitor Survey 2011 – Argyll & the Isles: VisitScotland (2011)
Tourism in Western Scotland VisitScotland: VisitScotland: (2006 2011 and 2012)
TNS Research International for VisitScotland – Scottish Hotel Occupancy Survey (2011)
TNS Research International for VisitScotland – Scottish Guest House and B&B Occupancy Survey (2011)
TNS Research International for VisitScotland – Scottish Self Catering Occupancy Survey (2011)
TNS Research International for VisitScotland – Scottish Hostel, Bunkhouse and Bothy Occupancy Survey (2011)

Table 17.1: Technical Studies.

This chapter should be read in conjunction with the following chapters:

- Chapter 2 Legislative & Policy Context;

- Chapter 12 Commercial Fisheries;
- Chapter 15 Landscape & Seascape Visual; and
- Chapter 18 Socio-Economic.

17.1.1 Guidance

There are no specific guidelines or requirements for such an assessment either set out by the Environmental Impact Assessment (Scotland) Regulations 1999 (as amended in 2009), or in any other statutory guidance on the preparation of Environmental Impact Assessments. However, the methodology used for this assessment follows good practice for establishing the potential impact on tourism and recreation within an area. In terms of defining and assessing 'tourism impacts or effects' the 2008 Scottish Wind Farm Research study, recommended the preparation of a Tourism Impact Assessment, which comprises an assessment of the:

- Number of tourists travelling past on routes to elsewhere;
- Impacts on views from tourist accommodation in the area;
- Relative scale of tourism impact – local to national;
- Potential positive impacts; and
- Impacts on outdoor activities in the area.

Whilst it is accepted that this methodology is designed to answer the requirements of applications for onshore wind farms, the preparation of such an impact assessment incorporating these elements has become the industry standard of good practice including for the assessment of marine energy projects.

In terms of assessing 'recreation impacts and effects' guidance on 'Outdoor Access Impact Assessment' is provided by Scottish Natural Heritage (SNH). This guidance provides the approach to the assessment of recreation impacts and effects broadly adopted here, examples of which include:

- Loss / closure / extinguishment / diversion of links, routes, or walks etc.;
- Reduction in amenity;
- Enhancement in amenity;
- Intrusion;
- Obstructing access routes;
- Enhancing access; and
- Changing to setting and context.

The guidance with reference to 'windfarms', which can be considered to be relevant to some elements of the proposed scheme in terms of energy generation and transmission infrastructure highlights that these: *"can change perception and amenity of both area and linear facilities through visual and noise*

impacts, access tracks can interfere with / or facilitate public access, general deterrent / attractor effects." This impact assessment highlights such impacts and effects.

The assessment includes an extensive review of information sources to establish existing tourism & recreation conditions within the study area. The datasets used in this document are standard sources of data from available datasets, including VisitScotland, and other individual research, reports, and surveys referenced throughout the chapter.

17.2 Methodology and Scope of Works

The assessment methodology employs a combination of web and desk-based surveys, consultations, information assessment and analysis. It has been undertaken on the following basis and through the following stages:

- Scoping and consultation process;
- Baseline assessment; and
- Impact Assessment.

17.2.1 Scoping and Consultation Process

A series of consultation meetings arranged by the Islay Energy Trust (IET) were carried out on Islay on the 11th and 12th of December 2012 to gauge local opinion on the proposed development and to discuss whether Islay could benefit from the Project. Meetings were held with the Islay Community Councils Renewable Energy Sub-Committee, South Islay Development Group, Port Ellen Harbour Association and local businesses.

In summary, the consensus from the meetings was that individuals and businesses were generally positive about the Project. Many of the consultees considered that local businesses on the island could and would benefit and will encourage the developer to implement their philosophy of employing local people on projects wherever possible and commercially viable. Moreover, many were enthusiastic about potential job creation on the island and the opportunity for Islay to have the potential of becoming a renewables hub. The potential benefits are quantified and qualified through the assessment below.

There were concerns raised about potential negative visual impacts off the Rinns of Islay and there was also concern that the fishing industry in the location of the Project could potentially be affected. These concerns are discussed below in this assessment and also through Chapter 12 Commercial Fisheries and Chapter 15 Landscape & Seascape Visual.

A full record of the issues raised in the consultation meetings is set out in Technical appendix 17.2.

17.2.2 Baseline Assessment

The baseline assessment comprised an assessment of tourism and an audit of recreational facilities and activities. The method of assessment requires a definition of the study area, description of the means of data collection, and an approach and methodology.

A baseline of the study area is provided covering key issues, trends and the performance of the local Islay, Jura and Colonsay and the wider Argyll & Bute tourism economy, relative to Scotland and the UK. The assessment focuses upon the local area both onshore and offshore. The baseline assessment of tourism covers the following:

- Visitor and tourist trends;
- Tourism volume and value;
- Visitor patterns;
- Visitor accommodation occupancy rates;
- Expenditure patterns;
- Tourism employment; and
- The drivers currently having an impact upon the industry both nationally and locally.

This sets the context for the remainder of the appraisal, and against which any impact can be set. The baseline review draws upon standard available VisitScotland and other tourism related and economic datasets. The tourism audit covers the aspects, which make up the tourism product in the local and wider area, act as a focus for attraction for visitors and lead to expenditure by tourists and visitors. It is this expenditure which is measured in terms of economic impact upon the tourist sector in the local and wider area.

An assessment of recreation facilities and resources has been undertaken within the local area, which focuses on Islay and a small area of Kintyre (where the potential route corridor passes through). The areas covered include:

- Tourist accommodation – including Bed & Breakfasts (B&Bs) and guest houses, caravan parks , hotels, and camping: their business prospects, visitor profile, and potential business effects;
- Visitor attractions, facilities, and destinations including - archaeological sites, cultural facilities, sports, recreation, and leisure facilities: their market, performance and business effects;
- Visitor activities – including walking, fishing, country pursuits, wildlife interests, and sports: their potential profile, prospects, and business effects; and
- Visitor and tourist routes – including driving, cycling, walking, bridleways, and rights of way: their visitor numbers, patterns of activity and potential focal points of spend.

The recreational impact is assessed through a combination of the Landscape Seascape and Visual Impact Assessment (LSVIA) to establish potential visual impacts and an assessment of whether or not physical disturbance of tourism resources will occur temporarily or permanently as a result of the Project.

17.2.3 Impact Assessment

17.2.3.1 Definition and Assessment of Tourism Impact

Tourism and recreational behaviour is only considered to be detrimentally affected if the impact of the Development either changes the visitor/user pattern – in terms of numbers, and/or where patterns of expenditure may change. In this, opportunities for tourist and visitor expenditure and any potential variation in expenditure or visitor numbers and its consequent effect upon turnover or employment, are of key importance.

This impact assessment highlights such impacts and effects and their likelihood of occurrence. An understanding has been derived of the profile of visitors and tourists and other clientele in the local area, business trends and prospects, occupancy rates, levels of turnover. The potential impact of the project upon businesses has been derived through contact via the Business Survey with a 36% response rate from 48 predominantly key visitor accommodation providers, other representative and relevant organisations. Details of the businesses in the survey are listed in Appendix 1 of Technical Appendix 17.1.

17.2.3.2 Definition and Assessment of Recreational Impact

The overall catchment area for the assessment has been defined as 30km in radius from the boundary of the Project. This is to ensure that all those facilities or notable points of focus of visitor attraction within the local Islay area have been identified. The catchment is taken to include all settlements within this radius and the intermediate and adjacent areas between the settlements which might be considered to have linked visitor patterns.

Regarding these visitor facilities and locations, comment is provided on how likely the Project will be to influence visitor and tourist attitudes and behaviour based upon the visibility of the Project.

Recreational behaviour will be affected where one or more events occur as a result of a development which might result in recreational users possibly changing their habits or activities. Factors which might lead to such a change in behaviour include: loss, closure, or diversion of routes, obstruction of access routes, enhancing access, reduction in amenity or intrusion, enhancement in amenity and changes in setting and context of the recreational resource.

The assessment of an impact upon recreational users as being major or moderate relates to the proximity and visibility of a development and infrastructure from the resource at all points, physical diversion due to a development's infrastructural presence, significance of the resource in terms of usage and the type of resource e.g. a town centre indoor recreational facility compared to a hill top view point.

In each instance the recreational impact assessment highlights the possible worst case adverse and/or best case beneficial effect that the development will have on the recreational resources within the study area. Major and moderate effects are considered as significant.

The evaluation criteria to determine the level of significance of the effects are set out in Table 17.2.

Sensitivity	**Definition**
High	Where the receptor or resource is defined as being of International or National status or high visitor numbers
Medium	Where the receptor or resource is defined as being of regional status or medium visitor numbers
Low	Where the receptor or resource is defined as being of local status or low visitor numbers
Magnitude	**Factors in the assessment of the magnitude of effect**
Major	Where the extent of effects on receptors (activities, resources, or businesses) is large scale and a large number of people or activities will be affected; or where there is an obvious view of the Project with potential to cause significant impact
Moderate	Where the extent of effects on receptors is small in scale, but a large number of people or activities will be affected; or alternatively this will be where the extent of impacts on activities, resources and/or businesses is large in scale but only a small number of people or activities will be affected
Minor	Where the extent of effects on receptors is small in scale and will only affect a small number of people or activities; or where the Project will be unlikely to be visible (as it will be obscured by hills or woodland, etc.) or will be at a distance, therefore the magnitude of effect will be minor.
Negligible	Where impacts on receptors will be negligible

Table 17.2: Evaluation of Impacts Criteria

In line with standard EIA practice, the sensitivity of receptors (as defined in Table 17.2 Receptor Sensitivity) is considered against the Magnitude of Effect to determine the significance of impact (Table 17.3).

Sensitivity of receptor		**High**	**Medium**	**Low**
Magnitude of the effect	Major	Major significance	Major or moderate significance	Moderate significance
	Moderate	Major or moderate significance	Moderate significance	Minor significance
	Minor	Moderate significance	Minor significance	Minor significance
	Negligible	Not significant	Not significant	Not significant

Table 17.3: Matrix of Sensitivity and Magnitude

17.3 Baseline Summary

17.3.1 Tourism

The baseline review of the tourism market (Technical Appendix 17.1) details the profile of the wider and local study areas for the Project. The Argyll Tourism area is defined in Figure 17.1.

The most popular reason for choosing to visit Argyll & the Isles is the scenery and landscape. Popular activities include sightseeing, walking and experiencing the local whisky and food.

The overall Western Scotland tourism industry is heavily reliant on the domestic market, with the majority of all trips (85%) and expenditure (82%) being from visitors from the UK. Both domestic and overseas visitor numbers and expenditure have however fallen since 2006.

The vast majority of domestic and overseas tourists, visit Western Scotland for a holiday stay (79% and 67% respectively). The majority of visitors to Argyll & the Isles stay in either B&Bs, guesthouses, or self-catering accommodation.

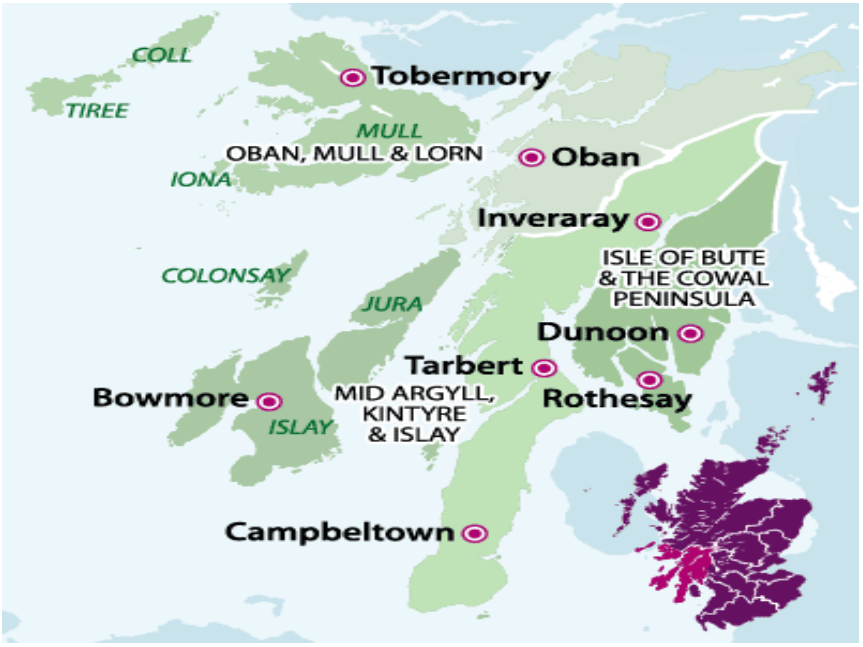

Figure 17.1: Map of Argyll and Bute

Map Source: Visit Scotland: http://www.visitscotland.com/destinations-maps/argyll-isles/

The principal reasons for visiting Islay are visiting whisky distilleries, watching wildlife and outdoor pursuits such as walking, playing golf and going to the beach.

Occupancy rates on the island for hoteliers and proprietors of B&B's, guest houses and self-catering accommodation are above average during the high season and slightly below average in the off-season.

Reflected through the good occupancy rates, the tourism economy on Islay is regarded as buoyant with the overwhelming majority of businesses considering

the market to be healthy over the past three years, currently, and forecast over the next three years.

17.3.2 Principal Recreation Facilities

The local area of Islay includes a wide variety of tourism and recreation activities and facilities, including settlements, tourist routes, walking routes, rights of way, core paths, climbing routes, cycle routes, golf and fishing (i.e. lochs and rivers), forest parks/nature reserves, country estates, events. Visitor attractions include the eight distilleries on the island, activity centres, offshore boating, fishing and diving.

A full audit of the local area is provided in Technical Appendix 17.1 (Baseline assessment), together with maps detailing the various tourist and recreational attractions.

17.4 Tourism Impact Assessment

This section deals with the impact that the Project will have on tourism and recreational resources within the local area. This encompasses all aspects including businesses, country estates, activity centres, accommodation providers, tourist routes, walking routes, rights of way, cycle routes, climbing routes, golf and fishing (i.e. lochs and rivers) present within the study area. Further details are contained in the Technical Appendix 17.1 Baseline assessment.

17.4.1 Tourism Business Survey

17.4.1.1 Introduction

This analysis provides a summary of the key findings of the survey of local accommodation businesses undertaken by PBA Roger Tym during December 2012. The survey population consists of all accommodation businesses that could be considered to derive part of or all of their trade from Islay tourism.

Each accommodation business was contacted by telephone in order to gain their opinion on the potential impact of the Project. If it was not inconvenient, another time was arranged or contact made by post or e-mail. The survey was advertised in the Ileach, the local paper and this allowed some businesses to respond online. A number of respondents considered they did not have the time to give a full response, so responded to some key questions on potential impact only.

17.4.1.2 Definition of Scale of Impact on Business

The survey sought the respondents' opinion on the likely impacts of the Project on their business performance and on tourism in wider Argyll and Bute area.

The scale of adverse impact of the Project on both the individual business and Argyll and Bute tourism generally was defined as follows:

- Low Impact = <10%;
- Medium Impact = 10-15%; and

- High Impact =>15%

The definitions of Major Negative taken as >15% on business turnover, Moderate Negative taken as 10-14%, and Minor Negative taken as <10%, are based upon wide market experience. In tourism related business surveys across Scotland and elsewhere, respondents have generally stated that 15% or >15% reductions in turnover is critical to business sustainability/survival, but 10-14% represents a moderate impact which can be recouped through marketing, cost saving and similar market responses, and <10% is subsumed within general changes in trading conditions.

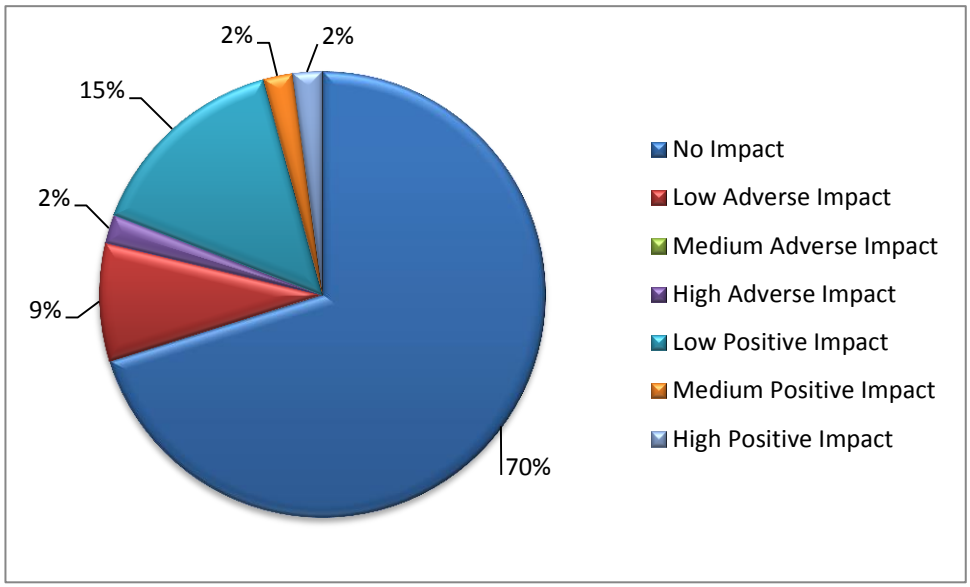

Chart 17.1: Impact on Local Business Prospects

Chart 17.1 shows nearly all respondents provided an answer to what impact they considered the Project will have on their business. The majority of respondents stated that the Project will have no impact on their business and another 9% indicated that they expect it to have a low or minimal impact on their business.

Nearly 20% expected that to varying degrees the Project will have beneficial impacts on business trading. The main reason for this was that they viewed the Project as potentially having a beneficial impact on the local economy with workers coming to the area during the construction period. Several people also hoped that it will reduce their energy bills.

One business in Portnahaven (2% of respondents) considered that the Project will have a high adverse impact on their business due to potential visual impact.

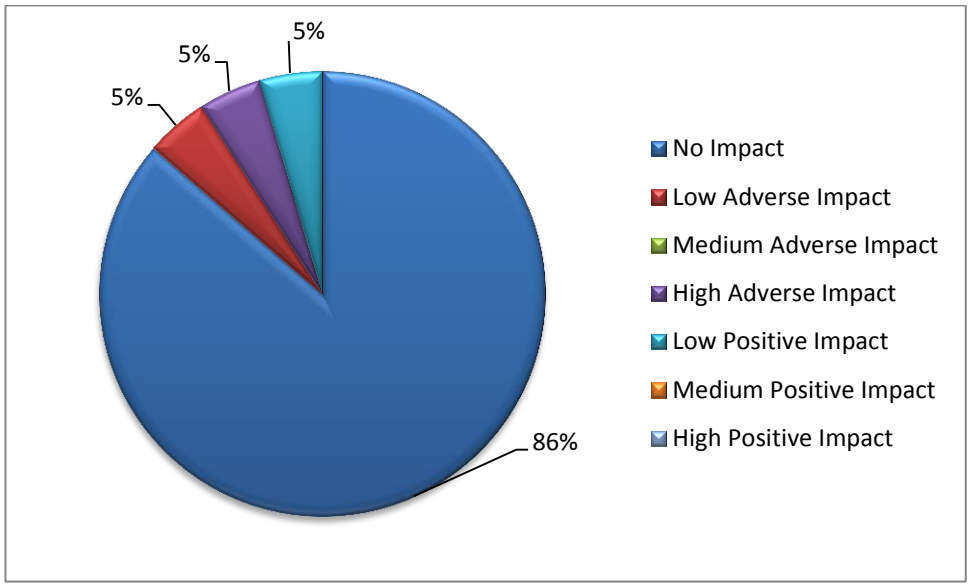

Chart 17.2: Impact on Argyll and Bute Tourism Prospects

Businesses were also asked to indicate what they expected the impact might be on Argyll and Bute tourism in general. As shown in Chart 17.2 the majority (86%) considered that the Project will have no impact on tourism, with a further 5% indicating that the impact will be low or minimal. A low positive impact was also expected by 5% of respondents.

5% of respondents considered that the Project will have a high adverse impact on Argyll and Bute tourism. The concern being that the scenery is the main reason why tourists come to Islay and they may be deterred from coming back as a result of the Project.

17.4.2 Conclusions on Tourism Impact

Of the 137 businesses surveyed, 49 responded to the tourism business survey questionnaire, giving a 36% response rate.

The majority of respondents were from Bowmore, the administrative capital of the island. Many of the businesses were small/medium in size.

Many of the respondents were B&Bs or self-catering accommodation providers. The survey identified that over 80% of the respondents' trade came from tourists/visitors to the area. The origins of these tourists were mainly from the UK outside of Scotland.

Website and telephone bookings were the most popular, but overall trade was received via a variety of media and methods.

The main activities that customers undertook when visiting the area were visiting distilleries going on short walks and watching wildlife.

The majority of businesses considered that their business performance had increased or remained stable over the last three years. Current levels of satisfaction were high, with over 95% of respondents reporting trade as being fair or good. Respondents were also optimistic that their future business performance will improve and level of business increase.

Business and economic cycles, product and reputation were deemed to be the most influential factors impacting upon business trends. The likely potential impacts on local tourism businesses were as follows:

- 70% said their business will experience no adverse impact;
- 9% said their business will experience a low adverse impact;
- 2% said their business will experience a high adverse impact; and
- 19% said their business will experience a beneficial impact

The likely potential impacts on Argyll & Bute tourism were as follows:

- 86% said the area will experience no adverse impact;
- 5% said the area will experience a low adverse impact;
- 5% said the area will experience a high adverse impact; and
- 5% said the area will experience a beneficial impact.

17.5 Recreational Impact Assessment

The following section sets out the likely visual impact of the Project upon recreational amenities on Islay. Recreational activities on the mainland identified in the main tourism and recreation audit have not been included as part of this assessment, due to their distance away from the Project.

Scale of impact is based upon factors such as proximity and visibility of the Project in relation to the recreational receptor/activity. The popularity and sensitivity of the recreational receptor/activity is also taken into account.

Table 17.4 sets out the nature of potential impacts on tourist and recreational resources derived from the Project and by type of resource.

	Number of Each Facility	No Impact Likely	Possible Minor Adverse Impact	Possible Moderate Adverse Impact	Possible Major Adverse Impact
Principal Settlements	9	8	1	-	-
Principal Tourist Routes	7	5	2	-	-
Principal Walking Routes	44	35	9	-	-
Rights of Way	38	33	5	-	-
Core Paths	40	36	4	-	-
Cycle Routes	18	16	2	-	-

Horse Riding Centres	2	2	-	-	-
Golf Courses	1	1	-	-	-
Fishing	22	21	1	-	-
Sailing/Marine Activities	10	10	0	-	-
Events	12	12	-	-	-
Nature Reserves	2	1	1	-	-
Visitor Attractions	12	11	1	-	-
Total	227	202	25	-	-
Total %		89%	11%	0%	0%

Table 17.4: Summary Impact on Tourism and Recreation Resources
(Source:RTP 2012)

17.6 Onshore Infrastructure Recreational Impact – For Information Only

There is currently little definition as to exact routes and locations of additional infrastructure. However, based on information gathered to date, the infrastructure on Islay from high water mark near Kintra is likely to include:

- Underground or overhead (on wooden poles) 33kV cable to an area in the vicinity of Port Ellen;
- A 33/132kV sub-station to be located in the vicinity of Port Ellen;
- An underground 132kV cable landfall in Kilnaughton Bay probably to the west of the main beach; and
- A monitoring, operations and maintenance base consisting of offices, front line spares stock, workshop and welfare facilities which is likely to be located in Port Ellen.

Therefore, there is potential for impact on recreational receptors/activities. This could be through the cable causing severance or disturbance of a particular route or activity.

The following receptors/facilities may be affected by the proposed cable route:

- Kilnaughton Beach;
- Promoted Paths: Soldiers Rock and Kintra Circuit and CarraigFhada and the Singing Sands;
- Core Paths: CO71, CO72A and CO72B; and
- Rights of Way: 100, 107, 108 and 109

However, it is unlikely that the works during the installation construction phase of the Project will have anything other than minor and temporary inconvenience to users of surrounding facilities. In the permanent operational phase, the underground cable option will have no impacts on the surrounding area. The overhead line option will be unlikely to have a significant adverse visual impact. Suitable locations for the sub-station are currently being investigated with a view

to potential adverse visual impacts being mitigated by appropriate location and screening so as not to result in any significant adverse impacts.

The Project connects via a subsea cable to the mainland 132kV network on the Kintyre Peninsula near Carradale.

17.7 Mitigation Proposals

The following tourism and recreation mitigation measures are proposed for the Project.

17.7.1 Construction Period

The main construction elements of the Project, i.e. manufacturing, will not be carried out on Islay. However, there is a possibility for some degree of engineering support, with Port Ellen the most likely destination due to its port capability. Regardless of whether or not construction activity takes place on Islay, there will be little to no impact on onshore recreational activities on the island. Construction work taking place at Port Ellen will be regarded as normal port related activity and is therefore unlikely to adversely affect any nearby recreational activities.

There will be a range of construction and installation vessels in the location of the tidal site off the Rinns of Islay during the period of construction. This is likely to result in temporary visual impact from the shore and from passing leisure traffic. These potential visual impacts are addressed in chapter 15 Landscape & Seascape Visual, and potential impacts on marine movement addressed in chapter 14 Shipping & Navigation.

The visual impacts during the course of construction are unlikely to have any adverse impacts upon tourism and recreation onshore. In addition, during the construction period there may be increased traffic on the ferry routes with workers coming and going from the island. This may affect the ability of tourists to get to the island. Possible mitigation could be for people involved in the Project to avoid travelling at peak visitor or tourist periods or to use their own vessels.

Liaison will be required with any sea tour operators on the island during the construction phase and there may be a low minor positive impact for tour operators given that some tourists may be interested in viewing the construction of the Project from outside the 500m construction exclusion zone.

The construction of the substation and the installation of the associated cable may have impacts on some recreational receptors/activities due to disruption and severance. However, the significant of these impacts can be reduced using the following mitigation measures:

Any transport of abnormal loads where they do occur will be programmed wherever practicable to avoid peak visitor or tourist periods, and indeed at busy

periods to ensure visitors avoid slow moving traffic and congestion on delivery and movement of construction materials and this will act as mitigation of the effect of the proposals on particularly sensitive locations, tourist/visitor viewpoints, and road corridors.

Where possible, construction traffic will be programmed to avoid other traffic on key routes during the time of events of note. This will be achieved through discussion between the developer/contractors and the council and event organisers to ensure that proximity to such key events will be avoided or alternative routes chosen for construction access away from routes used by the events.

Construction of the substation and the installation of the associated cable will be programmed wherever practicable to avoid particularly sensitive locations, recreational user viewpoints and corridors at peak user periods. For example the location of the substation may be located in an industrial area thus reducing its visual impact

It is likely that the cable route will pass through the Kilnaughton Bay area, which is popular with walkers. The contractors will ensure on-going safe access to all key walking and cycling routes, etc., and provide an alternative should any recreational routes need to be closed temporarily due to construction activities, or where obstruction, or diversion was required.

17.7.2 Permanent Tourism & Recreation Mitigation

The impact section concluded that the Project will not have any moderate or major and hence significant adverse impacts upon any of Islay's recreational activities. The scenery or views of the countryside across Islay will not be affected by the Project and therefore no permanent mitigation will be required and it is possible that the project may attract visitors

Once constructed, the substation is unlikely to have any permanent impacts upon recreational activities in the area. If the cable were to be undergrounded, it will not be seen by recreational users. Even if parts of the cable route are built overhead, the use of wooden poles will minimise any potential visual impact compared with the use of steel pylons. Moreover, there is no research evidence to suggest that the use of such wooden pole lines has negative impacts on recreational activity.

If the substation is appropriately positioned, for example, in an industrial setting it is highly unlikely that its presence will detrimentally impact upon tourists and recreational users in the area.

17.8 Cumulative and Residual Effects

17.8.1 Cumulative Effects

In terms of tourism and recreation issues it is considered that there will be no significant cumulative positive or negative effects from the Project together with

the Sound of Islay Tidal project experienced by either tourists or other recreational users of facilities within the study area. There might however be some minor positive benefits in the attraction of visitors interested in the development of the marine energy sector in the area.

In terms of tourism and recreation there is no evidence to indicate that significant numbers of visitors will be dissuaded from visiting the local area as a result of the cumulative development of these projects. While the tidal energy projects are by their design likely to result in minimal visual impact during the operational phase, the visual impact of the Islay Offshore Wind Farm located at the nearest point 13km offshore is likely to be considerably greater. Until such time as the detailed assessment of that project is undertaken the level of potential impacts is uncertain and unable to be quantified.

17.8.2 Residual Effects

The post-mitigated residual effects experienced by users of the tourism and recreational resources as a result of the Project are expected to be minimal given the need for little to no permanent mitigation measures.

17.9 Conclusions and Impact Summary

In summary, the Project could have the potential to act as a catalyst to create a critical mass of marine energy activity on Islay, independently or in conjunction with the Sound of Islay Tidal Array. The key issue for the island is the provision of high quality and skilled jobs, which can provide permanent employment for the local population and the infrastructure required to service the development's needs and requirements.

There is also a wide variety of different activities and facilities that visitors and other recreational users can make use of and undertake on Islay. These include distillery visits, various different walking routes, sightseeing attractions, and fishing opportunities amongst others.

Of the 227 different facilities within the local area, none will experience a significant negative impact. It can therefore be concluded that the impact of the Project on the recreation facilities in the local area will be limited and only of minor and not significant scale.

Table 17.5 sets out the tourism & recreation impacts, which will result from the Project. As there are no assessed significant impacts no mitigation proposals are required, and as a result impacts and residual effects will remain at the same value and scale.

Impact Type	Sensitivity of Receptor	Magnitude of Impact	Impact Significance	Nature of Impact
Tourism & Recreation Visual Impacts	Low to Medium	Minor Negative	Minor	Temporary (construction and decommissioning) Permanent (operation

				phase)
Tourism Accommodation Impacts	Low	Minor Positive	Minor	Temporary (construction and decommissioning)
Mitigation	▪ Where appropriate works will be programmed to avoid peak tourist routes at peak visitor times to minimise potential congestion and/or disruption. ▪ Temporary interruption of recreation routes during cable route construction (where applicable) will be carefully managed and any diversions clearly sign-posted. ▪ During the temporary cable route works, screening measures may be implemented to reduce impacts on passing recreational users or from recreational focal points.			
Residual Effects	**Sensitivity of Receptor**	**Magnitude of Impact**	**Impact Significance**	**Nature of Impact**
Tourism & Recreation Impacts	Low	Minor	Minor	Temporary & permanent

Table 17.5 Summary of Tourism & Recreation Impacts and Residual Effects

WESTISLAY TIDAL

ENERGY PARK

volume 2 // chapter 18 // socio-economic

18.0 Socio-economic

18.1 Introduction

This chapter provides an assessment of the potential socio-economic effects that could occur as a result of the proposed West Islay Tidal Energy Project ("Project"), and this includes the potential beneficial and adverse effects upon the local economy in terms of income and job creation. The assessment has been undertaken by PBA Roger Tym.

The assessment addresses the potential worst and best case where the Project could potentially impact upon businesses and the local population alike on the local (Islay, Jura and Colonsay), wider area (Argyll & Bute Council area), and national Scottish economy.

Although the Project application terminates at high water mark in the vicinity of Kintra Farm, and features only the tidal energy site, inter-array cabling and export cables to landfall, this assessment has been undertaken for the entire development recognising that infrastructure will be required both on Islay and the Kintyre peninsula. However, any reference to onshore works or the sub-sea cable connection from Islay to Kintyre is for information only and these works are not currently associated with this application and will be subject of a further application for consent in the near future.

A report by the Sustainable Development Commission (2007) identified that local economies could benefit from the development of tidal energy schemes and projects. This was based on simple analysis of the local labour market in areas of high tidal resource which showed that there are potential strengths in terms of construction and service industries in these areas. The report also identified that the development of tidal energy projects could have wider implications in terms of the effects on sectors such as ports, commercial and recreational shipping, aggregates, commercial fishing, tourism and the development of new transport links. It was also considered that opportunities for wider regeneration may also arise, particularly where the tidal resource exploited is in a rural or deprived area.

The following technical studies have been used to support this chapter as set out in table 18.1

Technical Studies
'The Green Book Appraisal and Evaluation in Central Government', HM Treasury (2003) http://www.hm-treasury.gov.uk/d/green_book_complete.pdf
Scottish Marine Renewables Strategic Environmental Assessment (SEA), Faber Maunsell and Metoc plc (March 2007)
Further Scottish Leasing Round (Saltire Prize Projects) Scoping Study, (March 2010)
Further Scottish Leasing Round (Saltire Prize Projects) - Regional Locational Guidance, Marion Harrald, Catarina Aires and Ian Davies (September 2010)
Scottish Offshore Renewables Development Sites – West Coast Cluster – Scottish Enterprise and HIE (2010)
Highlands & Islands Enterprise Sectoral Strategy: Energy (2010)
Argyll and Bute Renewable Energy Action Plan – Powering Scotland's Future HIE, Argyll & Bute

Council, Argyll and Bute Community Planning Partnership (2010)
Economic Development Action Plan 2010 -2013 Argyll & Bute Council (2010)
Wave and tidal energy in the Pentland Firth and Orkney waters: How the projects could be built: BVG Associates for The Crown Estate (May 2011) http://www.thecrownestate.co.uk/pentland_firth_how_the_projects_could_be_built.pdf

Table 18.1: Technical Studies

This chapter should be read in conjunction with the following:

- Chapter 2 Legislative & Policy Context;
- Chapter 12 Commercial Fisheries;
- Chapter 15 Landscape & Seascape Visual;
- Chapter 17 Recreation and Amenity; and
- Technical Appendices 17.1 and 17.2 – Baseline Studies.

18.2 Guidance

The methodology used for the socio-economic impact assessment element follows guidance in Her Majesty's Treasury's 'Green Book for Economic Appraisal and Evaluation, and also good practice guidance for economic assessment used by both the Scottish Government and Scottish Enterprise. It is also similar to that which has been employed in a number of other development projects throughout Scotland, where the effects of infrastructure development on local economies have been assessed.

The assessment includes an extensive review of information sources to establish existing socio-economic conditions within the study area. The datasets used in this document are those standard sources of socio-economic and demographic data from standard available datasets, including the 2001 census, NOMIS the Office for National Statistics website, and other individual research, reports, and surveys referenced throughout the chapter.

In terms of establishing the potential impact on tourism and recreation within an area, there are no specific guidelines or requirements for such an assessment either set out by the Environmental Impact Assessment (Scotland) Regulations 1999 (as amended in 2009), or in any other statutory or advisory guidance on the preparation of Environmental Impact Assessments. However, the methodology used in this assessment has been employed in a number of other development projects throughout Scotland. This approach has been robustly tested and accepted as valid throughout the development process and at public inquiry.

18.2.1 Economic Development Policy Review

The following review provides a brief socio-economic strategy and policy context. A detailed review of planning and other policy is provided elsewhere in Chapter 2 Legislative and Policy Context

18.2.1.1 Scottish Marine Renewables Strategic Environment Assessment (SEA) – Wave and Tidal Power: Faber Maunsell and Metoc plc (2007)

This assessment was carried out to examine the environmental effects of developing wave and tidal power. The assessment highlighted that the seas around Islay were potentially a suitable resource for both wave and tidal schemes.

18.2.1.2 Further Scottish Leasing Round (Saltire Prize Projects) Scoping Study (2010)

The Scoping Study was carried out to identify potential additional areas for leasing. The study re-iterated the point that seas around Islay have the potential to accommodate both wave (to the west of Islay) and tidal (to the south-west of Islay) renewable development.

18.2.1.3 Further Scottish Leasing Round (Saltire Prize Projects) - Regional Locational Guidance Marion Harrald, Catarina Aires and Ian Davies (2010)

In part as a result of aforementioned SEA and Scoping Study the Scottish Government published guidance in September 2010, detailing the areas of Scotland's seas considered as most appropriate for development of wave and tidal energy. The guidance specifically highlights the south-west of Islay as a prime location for a tidal stream energy site. It stated that the site "contains a high level of tidal resource".

18.2.1.4 Scottish Offshore Renewables Development Sites – West Coast Cluster: Scottish Enterprise and HIE (2010)

As part of the National Renewables Investment Plan (N-RIP) the west coast cluster[1] identifies a number of sites suitable for the offshore wind industry. These include four priority sites for manufacturing: Arnish, Kishorn, Hunterston, and Campbeltown/Machrihanish; and ten priority sites *"offering potential for Operations & Maintenance, logistical support services and supply chain manufacturing",* one of which is Port Ellen on Islay.

Port Ellen as a location is also *"supported by the facilities at Port Askaig on Islay, owned by Argyll & Bute Council, which offers the opportunity for a further O&M base to the north of the island"* and also the "*facilities at Islay's Glenagedale Airport could potentially accommodate a forward helicopter base."*

All of these facilities are also regarded as appropriate for development of marine tidal and wave energy supply chain and offshore wind projects in the wider area.

[1] http://www.scottish-enterprise.com/~/media/SE/Resources/Documents/STUV/SDI-west-coast-clusters.ashx

18.2.1.5 Highlands & Islands Enterprise Sectoral Strategy: Energy (2010)
Highlands and Islands Enterprise's (HIE) energy strategy outlines growth targets and key areas of focus for the Highland and Islands (HI) energy sector. Renewable energy is a central component of HIE energy strategy. HIE state *"there is a time-limited opportunity to shape and grow the sector to secure maximum economic, community and social benefit for the Highlands and Islands."*

HIE is recognised as taking a lead role in the renewable energy sector having implemented a number of projects which can be considered world firsts including the:

- European Marine Energy Centre (EMEC) in Orkney[2];
- The Crown Estate's Pentland Firth and Orkney Waters Wave and Tidal leasing round[3]; and
- Talisman Beatrice Offshore wind farm[4].

The Strategy states the level of development activity will have to be both maintained and accelerated significantly to capture the full benefit. HIE aim to increase the Renewable Energy GVA contribution to the HI economy from £15m in 2010 to £220m by 2017 (c.25% growth rate per annum). HIE aim to achieve this growth target and secure local economic benefit by facilitating supply chain growth and the development of skills, infrastructure, business growth and inward investment.

18.2.1.6 Argyll and Bute Renewable Energy Action Plan – Powering Scotland's Future: HIE, Argyll & Bute Council, Argyll and Bute Community Planning Partnership (2010)
The main thrust of the Action Plan is to provide guidance on how to develop Argyll and Bute's renewable energy sector. Part of its vision is to find ways of *"maximising the opportunities for sustainable economic growth for the benefit of its communities and Scotland".*

As with the 2005 community benefit policy, a key strand of the plan is to encourage a partnership approach to ensure that local communities receive appropriate levels of socio-economic and community benefit from renewable developments.

18.2.1.7 Economic Development Action Plan 2010 -2013: Argyll & Bute Council (2010)
The main vision of the plan is that:
"Argyll and Bute will unlock the potential of its significant, sustainable economic assets for the benefit of its communities and the competitiveness and security of the Scottish and EU economies."

[2] the world's first grid-connected, independent, UKAS accredited testing facility for wave and tidal technologies
[3] the world's first marine area designated for commercial scale wave and tidal deployment
[4] the first deep-water offshore demonstrator wind farm adjacent to the Beatrice Oil platform in the Moray Firth

A key target is to ensure that Argyll and Bute unlocks the potential of its renewable energy assets. Indeed these assets are highlighted as one of Council's key areas of competitive advantage. Potential economic advantages accruing from renewable energy development include:

- "creation of higher value jobs and incomes;
- private and public inward investment;
- sustainable economic benefits in more peripheral, remote and fragile communities;
- community benefit funds that promote local development; and
- economic benefits to businesses and households through the generation and consumption of renewable energy."

The use of renewable energy is supported provided it can provide sustainable economic growth.

18.2.2 Summary of Socio-Economic Policy

The area's principal economic strategies offer broad support for the renewable energy industry and recognise the opportunity to capitalise on the economic benefits of renewable energy development and green status, ensuring that local communities receive appropriate levels of socio-economic and community benefit from such renewable developments.

18.3 Methodology and Scope of Works

The assessment methodology employs a combination of web and desk-based surveys, and information assessment and analysis. It has been undertaken on the following basis and through the following stages:

- Scoping and consultation process;
- Baseline assessment; and
- Impact Assessment.

18.3.1 Consultation Process

A series of consultation meetings arranged by Islay Energy Trust (IET) were carried out on Islay on the 11th and 12th of December 2012 to gauge local opinion on the proposed development and to discuss whether Islay could benefit from the Project. Meetings were held with the Community Councils Renewable Energy Sub-Committee, South Islay Development Group, Port Ellen Harbour Association, and local businesses.

In summary, the overall consensus from the meetings was that individuals and businesses were generally positive about the project. Many of the consultees considered that local businesses on the island could and would benefit and would encourage the developer through the Development to implement their philosophy of employing local people on projects wherever possible and

commercially viable. Moreover, many were enthusiastic about potential job creation on the island and the opportunity of Islay having the potential to become a renewables hub. The potential benefits are quantified and qualified through the assessment below.

There were concerns raised about potential negative visual impacts off the Rinns of Islay, and also concern expressed that the fishing industry in the location of the Project could potentially be affected. These are discussed below in this assessment and also through Chapter 12 Commercial Fisheries, Chapter 15 Landscape & Seascape Visual and Chapter 17 Recreation and Amenity.

A full record of the issues raised in the consultation meetings is set out in Appendix 18.1.

18.3.2 Baseline Assessment

The socio-economic baseline assessment method of assessment comprises definition of the study area, description of means of data collection, and approach and methodology.

A socio-economic baseline assessment of the study area is provided in Technical Appendix 17.1, covering key issues, trends and the performance of the local Islay, Jura and Colonsay and the wider Argyll & Bute economy, relative to Scotland and the UK. The assessment focuses upon the local area both onshore and offshore.

An estimate of the likely potential economic benefits from the Project to the local and wider area's economy in terms of construction, operation & maintenance, and decommissioning employment has been undertaken. This is based upon data on the employment and economic output likely to be generated from both the developer DP Marine Energy Ltd (DPME) and also from industry benchmark research. Further, an economic model was established to assess the scale and nature of the resulting economic impacts.

18.3.3 Impact Assessment

18.3.3.1 Definition and Assessment of Socio-Economic Impact

An assessment has been undertaken of the potential socio-economic benefits from the Project to the local and wider areas' economy in terms of construction, operation, and decommissioning employment.

Direct and indirect employment is expressed in Full Time Equivalents (FTE) and indirect employment is defined as those jobs, which would be generated through expenditure on the project elsewhere within the local and wider areas' economy, including spend on the procurement of materials, transport, services, and supplies.

'Leakage' is defined as those jobs which would be taken up by people resident outside the local and wider area, and 'displacement' is defined as those jobs, which would be taken up by people already in similar employment within the

local and wider area. The wider area is defined as the labour market encompassed by the Argyll and Bute Council area.

The impact assessment highlights the possible worst case adverse and / or best case beneficial effect that the Project could have on the economy within the study area.

The evaluation criteria to determine the level of significance of the effects are set out in Table 18.2. Major and moderate effects are considered as significant.

Sensitivity	**Definition**
High	Where there is a low/limited availability of labour and skills
Medium	Where there is a constrained supply of labour and skills
Low	Where there is a readily available labour force and skills
Magnitude	**Factors in the assessment of the magnitude of effect**
Major	Impacts of the project of greater than local scale or which exceed recognised standards
Moderate	Noticeable impacts of the project that may be judged to be important at a local scale
Minor	Slight impacts of the project that may be judged to be of minor importance
Negligible	Where impact is not discernible

Table 18.2: Evaluation of Impacts Criteria

In line with standard EIA practice, the sensitivity of receptors (as defined in Table 18.2 Receptor Sensitivity) is considered against the Magnitude of Effect to determine the significance of impact (Table 18.3).

Sensitivity of receptor				
		High	**Medium**	**Low**
Magnitude of the effect	Major	Major significance	Major or moderate significance	Moderate significance
	Moderate	Major or moderate significance	Moderate significance	Minor significance
	Minor	Moderate significance	Minor significance	Minor significance
	Negligible	Not significant	Not significant	Not significant

Table 18.3: Matrix of Sensitivity and Magnitude

18.3.4 Socio-Economic Baseline Summary

The local area is characterised by:

- Predicted population decline but with significant increases in its elderly population;
- Higher than average levels of unemployment;
- More jobs available per person than at national level;
- Slightly lower level of those with higher qualifications than at national level;
- Slightly higher than average earnings than national level;
- Low firm formation rate;
- Low levels of deprivation;
- Assumed higher cost of living than the mainland;
- Healthy and expanding whisky and beverage industry;
- Healthy and buoyant tourism industry, with strong cross-over with the whisky industry; and
- Potential limited diversity in employment with over-reliance on whisky and tourism

18.4 Socio-Economic Impact Assessment

18.4.1 Principle Economic Impacts

The principal economic impacts, which would result from the Project can be categorised as follows:

- Direct economic impacts: Employment and economic output / Gross Value Added (GVA)[5] that are wholly or largely related to construction, operation and maintenance and eventual decommissioning of the project;
- Indirect economic impacts: Employment and GVA generated in the economy of the study area in the chain of suppliers of goods and services to the direct activities;
- Induced economic impacts: Employment and GVA created by direct and indirect employees' spending in the study area or in the wider economy; and
- Wider economic (catalytic) impacts: employment and income generated in the economy related to the wider role of the project in influencing economic activities (including wider socio-economic effects). This will include the effects on the tourism sector, on inward investment, elsewhere within the construction sector (e.g. as a result of worker supply) and on other sectors of the economy.

[5] Gross value added (GVA) is a measure in economics of the value of goods and services produced in an area, industry or sector of an economy.

In addition, the wider socio-economic impacts on local communities due to changes in social conditions and the surrounding environment.

The convention for economic appraisals is that construction/decommissioning employment is quoted as 1 Full Time Equivalent (FTE) job is equal to 10 years of temporary employment. This assessment estimates the FTE job basis but also sets out the temporary 'one off' impact or effect of the construction/decommissioning activity in terms of total temporary employment. The latter definition is used in the assessment as a comparison between the output/demand for labour of the Project and the 'absorption capacity' of the local and wider areas to meet this demand.

18.4.2 Construction Development Scenarios

In determining potential job numbers generated by marine development available data are currently limited due to the small number of comparative examples. Drawing upon both developer information and industry research the most likely and realistic scenario has been specified in the assessment for the construction phase, and three scenarios specified for the operation & maintenance phase of the Project as defined below.

18.4.2.1 Construction - Most Likely and realistic Scenario

The most likely and realistic scenario is based upon the assumption that the tidal turbines and foundations were constructed at a facility outside Argyll and Bute. In addition, it is assumed that installation of the turbines, and offshore cabling would be undertaken by relatively large specialised heavy lift vessels with specialist crews, which are not likely to originate from the local area, nor indeed in the UK, but most likely from another European country. Employment under this scenario has been provided by the developer partners based upon comparative industry experience in the offshore wind industry.

18.4.2.2 Construction Impact

For the most likely and realistic scenario employment figures have been provided by the developer partners based upon comparative industry experience. This indicates that for the offshore element of the construction phase the majority would originate from outside the area as specialist staff. Hence, it is estimated that only a handful of jobs would be sourced from the local labour force over the construction period. These would be limited to supply vessel charter to deliver parts and consumables from local shops on Islay.

For construction of the onshore sub-station it is estimated that this could require approximately 10 temporary staff over the twelve month construction period on civils, ground works, plant operation, commissioning, and administration. This would represent one full time equivalent job. The installation of the onshore cable would be likely to require around 5 temporary jobs from the local labour force over a summer period, with specialist cable staff sourced from outside the local or wider areas. A similar number of jobs would be required to construct or refurbish the operations and maintenance offices over a similar timeframe. This would result in the total requirement of around 20 - 25 part time jobs for the local labour force or around 2 – 3 FTE jobs.

From the consultation meetings with members of the local business community there appears to be both capacity and capability within the local construction and plant hire sector to adequately provide both labour and services for the sub-station project.

Table 18.4 sets out the economic impacts derived from each of the construction scenarios. While the wider area is defined as Argyll and Bute, were these jobs to be drawn where possible from the local labour force specifically, which the 'most likely scenario relates to the 2-3FTE jobs over the construction period would be equivalent to 2.1-3.2 % of JSA on Islay, Colonsay and Jura. The impacts are assessed as being of moderate scale for the 'most likely' scenario.

Scenario	Local and Wider Area	Scotland Overall	Level of Local Impact
Most Likely			
FTE Jobs	2-3	3.2-4.8	Minor to Moderate
GVA	£0.176-£0.264m	£0.28m-£0.41m	

Table 18.4: Economic Benefits of Construction Scenario

18.4.3 Impacts during Operation & Maintenance

18.4.3.1 High Impact Scenario – Islay Service Base

It is assumed that under this scenario that the operation & maintenance base would be located on Islay with devices either towed to/from the base to site for servicing and maintenance or serviced in situ depending upon the technology selected for operation. This scenario would require investment in infrastructural improvement and upgrading to provide appropriate facilities for operation.

Under the 'high impact' scenario it is assumed that there would be an offshore and onshore requirement for 10-15FTE direct jobs split 50:50 between tasks based on Islay where the main service base would be located. These direct jobs would represent through[6] 'dead-weight' (0%), 'leakage' (-10%), displacement (-10%), and the multiplier (x1.714) approximately 16 FTE net additional local jobs. This scenario would generate local GVA per annum of £0.9m.

These direct job number estimates have been sourced from the joint developer partners.

18.4.3.2 Medium Impact Scenario – Mainland Service Base with Islay Local Support

In this scenario it is assumed that the principal operation & maintenance base would be located on the mainland (potentially somewhere on the Clyde) where specialist plant, infrastructure and staff would be based, in combination with a local Islay based service hub with a limited complement of staff.

[6] Deadweight is defined as the likelihood of the site being developed for a similar or other beneficial outcome; leakage is defined as the proportion of jobs which would be taken up by people outside the local study area; displacement is defined as substituting jobs elsewhere within the local study area; and the multiplier is defined as those jobs which would be created by 'downstream' expenditure within the local study area economy.

Under the 'medium impact' scenario it is assumed that there would be an offshore and onshore requirement for 5FTE direct jobs split 55:45 between onshore and offshore tasks based on Islay where the local service hub would be located. These direct jobs would represent through 'dead-weight' (0%), 'leakage' (-25%), displacement (-10%), and the multiplier (x1.5) a similar number of 5FTE net additional local jobs. This scenario would generate local GVA per annum of £0.268m.

These direct job number estimates have been sourced from comparative tidal stream projects and pro-rated by MW output size.

18.4.3.3 Low Impact Scenario – All Services from Mainland

In this scenario it is assumed that virtually all operation & maintenance activities would be based on the mainland and operational activity largely taken from specialist large vessels. There might however be a need for a small number of staff to have local proximity to the Tidal Site in case of bad weather and for logistical purposes.

Under this 'low impact' scenario it is assumed that there would be an offshore and onshore requirement for only 2FTE direct jobs based on Islay. These direct jobs would represent through 'dead-weight' (0%), 'leakage' (-25%), displacement (-10%), and the multiplier (x1.29) approximately 2FTE net additional local jobs. This scenario would generate local GVA per annum of £0.1m.

These direct job number estimates have been sourced from comparative industry experience and provide for a nominal local presence.

Table 18.5 sets out the economic impacts derived from each of the operation & maintenance scenarios. While the wider area is defined as Argyll and Bute, were these jobs to be drawn where possible from the Islay labour force specifically, the 'low impact' scenario's 2 FTE net added jobs would be assessed as minor impact, the 'medium impact scenario's 5FTE net added jobs assessed as moderate local impact, and the 'high impact' scenario's 16FTE jobs assessed as of major scale impact, were each of these scenarios to arise.

Factor	Low Impact Scenario	Medium Impact Scenario	High Impact Scenario
Onshore Jobs	1	3	7
Offshore Jobs	1	2	7
Total Jobs (FTE)	2	5	14
Dead-weight (0%)	2	5	14
Leakage (-25%)	1.5	4	3.5
Displacement (-10%)	1.3	3.5	3
Multiplier (1.29, 1.5, 1.714)	1.8	5.1	16
Net Added Jobs	1.8	5	16

GVA	£0.1m	£0.268m	£0.9m
Level of Local Impact	Minor	Moderate	Major

Table 18.5: Operation & Maintenance Economic Benefits by Scenario

18.4.4 Impacts During Decommissioning

The most recent research as to values relating to the decommissioning of marine devices[7] estimates the cost per MW to be in the range of £25,000-100,000, and assuming that costs will reduce from the higher points in the range as commercialisation of marine arrays is achieved. Hence the assessment has taken the median point of this cost range at £62,500 per MW to estimate decommissioning employment impacts.

At 30MW the estimated offshore decommissioning cost of the Project would be approximately £1.875 million. Specialist construction expenditure to support one FTE job for Argyll & Bute is estimated to be £127,813 resulting in 15 FTE direct decommissioning jobs and a local direct and indirect FTE decommissioning employment of 13 staff in Argyll & Bute and 21 at an all Scotland level. This would generate between £0.854m and £1.380m in temporary annual GVA, which would accrue to the economy. However, it is not possible at this point to estimate the proportion of this labour requirement or GVA benefit, which would be based on Islay.

Thus Table 18.6 sets out the economic benefits, which would accrue from the Project.

	Local and Wider Area	**Scotland Overall**	**Level of local Impact**
Decommissioning FTE Jobs	13	21	Minor
Decommissioning GVA	£0.854m	£1.380m	Minor

Table 18.6: Decommissioning Economic Benefits

18.4.5 Overall Economic Impacts

Table 18.7 summarises the overall economic benefits by scenario that potentially could result from the Project.

Development Phase	**Scenario**	**Study Area Benefit**	**Sensitivity of Receptor**		**Level of Impact**	
Construction			Argyll &Bute	Islay	Argyll &Bute	Islay
Most Likely	FTE Jobs	2-3	Low	Medium	Minor	Minor

[7] It is assumed that 1 temporary job is equivalent to approximately £164,427. This value is derived from the average sales per employee in the economy construction sub-sector inflated to 2010 prices. Source:UK PLC, A Financial Analysis of Corporate Britain (2005)

Impact						
	GVA	£0.176m-£0.264m	Low	Medium	Minor	Minor
O&M						
Low Impact	FTE Jobs	2	Low	Medium	Minor	Minor
	GVA	£0.14m	Low	Medium	Minor	Minor
Medium Impact	FTE Jobs	5	Low	Medium	Minor	Minor
	GVA	£0.268m	Low	Medium	Minor	Minor
High Impact	FTE Jobs	16	Low	Medium	Moderate	Major
	GVA	£0.9m	Low	Medium	Moderate	Major
Decommissioning						
	FTE Jobs	13	Low	Medium	Minor	Moderate
	GVA	£0.854m	Low	Medium	Minor	Moderate

Table 18.7: Summary of Economic Benefits by Phase and Development Scenario

For the construction phase the impacts at a wider Argyll and Bute level are assessed as minor beneficial and not significant, and at the sub-local Islay level, these impacts are assessed as moderate beneficial and significant.

For operation & maintenance throughout the lifetime of the Project, at an Argyll and Bute level the impacts are assessed as moderate beneficial (and significant) in only the 'high impact' scenario. At an Islay level the 'high impact' scenario is assessed as major beneficial, and being assessed as significant.

For the temporary decommissioning phase the local benefits are assessed as minor and not significant at an Argyll and Bute level, but as moderate (and significant) beneficial at an Islay level.

These impacts derived from the different scenarios would be highly dependent on the turbine technology adopted, and the procurement and supply chain route chosen for the West Islay Tidal Energy Project.

However, the scenarios for both construction and operation & maintenance would be dependent upon government development agencies (along with landowners and other partners) working together to put in place the necessary infrastructure and skills capabilities and capacity to maximise the prospects of locally based activities and economic benefits. While technical, skills, regulatory, financial and commercial risks will need to be addressed or mitigated, without a strong commitment and economic support in providing this infrastructure these potential benefits will likely be located elsewhere off-island, and possibly also outside the wider Argyll and Bute area.

18.5 Mitigation Proposals

While the potential impacts of the Project would be positive depending upon the scenario and phase (as set out in section 18.4 and table 18.7 above), and hence mitigation to reduce any adverse impacts would not be necessary, these impacts

and benefits will not be realised in Argyll and Bute and more specifically locally on Islay without the necessary infrastructural capability and capacity to accommodate the Project's construction phase and on-going operation & maintenance requirements. Further, the necessary skills and skilled labour force must be present for the island's community to benefit from the potential economic prosperity, which could flow from operations and activities on Islay.

Hence, the various partners including government development agencies, land owners and others propose to work jointly to provide support for the upgrading in the 'hard and soft' infrastructure necessary to enhance the likelihood of such benefits being realised on Islay and in the local community.

18.6 Cumulative and Residual Effects

18.6.1 Cumulative Effects

In terms of socio-economic issues it is concluded that there would be no significant negative cumulative economic effects from the Project together with the Sound of Islay Tidal Project. It is likely however that depending upon the development scenario, the phase of development (as set out in section 18.4 and table 18.7 above), and the technology chosen for the Project and the procurement route were that to be located on Islay that this together with the Sound of Islay Tidal project would potentially result in a moderate and significant positive effect at an Argyll and Bute study area level, and a moderate to major and significant positive effect at an Islay level, during both the construction and operation & maintenance phases of the Project, potentially leading to a critical mass in offshore marine device activities. This is heavily dependent however upon the necessary infrastructure capacity and capability being available to serve the needs of the Project and other similar projects in the area.

Potential cumulative employment impacts from the Project, together with the Sound of Islay Tidal Project and the Islay Offshore Wind Farm, are set out in table 18.8. These job estimates are based upon estimated net additional FTE jobs in the local and wider Argyll and Bute area, assuming that a proportion of the construction and operation & maintenance employment is located within these areas.

Development Phase	West Islay Tidal Energy Project	Sound of Islay Tidal Project	Islay Offshore Wind Farm	Total Jobs (FTE)
Construction	2-3	4-5	300-800	307-808
Operation & Maintenance	2-5-16	4-5	70-100	76-121

Table 18.8: Cumulative Employment Impacts in Local and Wider Area

The source of the job estimates are as follows:

- West Islay Tidal Farm – this socio-economic assessment – range of scenarios;
- Sound of Islay Tidal Project – discussion with IET as to potential job numbers; and
- Islay Offshore Wind Farm – based on job estimate averages per MW from other Round 2 and Round 3 offshore wind farms pro-rated for the 690MW Islay offshore project.

The cumulative impacts from these three projects would have a major impact upon both the local and wider Argyll and Bute areas' economies assuming any major percentage of the employment totals were based in either area. It would clearly only be possible to have this level of employment or part thereof based locally if the appropriate and adequate infrastructure was established in the area. Were cumulative jobs to be created even at the bottom of the scenario ranges for either or both the phases of development this would result in major positive economic impacts. However, this would only be the case if the infrastructure and labour force were available to sustain this level of development without adverse impacts on the population and the economy.

18.6.2 Residual Effects

There would be moderate positive and significant residual effects, depending upon the Project scenario adopted and the level of jobs and economic activities located on Islay for both the construction and operation & maintenance phases.

18.7 Additional Opportunities

18.7.1 Environmental Monitoring Programme

The tidal energy industry is in its infancy requiring early deployed devices and their immediate surroundings to be monitored to gain a better understanding of the potential impacts of the devices on receptors. The project will be undertaking such an exercise which is likely to be active for 3- 5 years. During this time there will be additional scientific and engineering support required from the mainland to design, implement and monitor these programmes.

18.7.2 Technology and Political Visits

As the project is likely to be one of the first tidal turbine arrays installed it is certain to attract political and academic interest from around the world. Again the spin offs, although positive are not possible to estimate.

18.7.3 Alternative Fuel for Distilleries

DPME and its project partners DBE have for some time been in consultation with a number of the major distilleries on Islay (and Jura) with a view to reducing the islands dependency on heavy fuel required to provide steam for the distilling process. Although a feasibility project is currently underway, there is a considerable interest in the opportunity to utilise the renewable power generated from the tidal array to fuel the distillery process by electric boilers for example.

Again, it is too early in the project to enable an accurate prediction of potential benefits to be made.

18.7.3 Tidal Development off Fair Head in Northern Ireland

In addition to securing an AfL (lease) for the 30MW project off Islay, the joint venture partnership between DPME and DBE have secured a 100MW AfL for a tidal energy site off the Antrim coast of Northern Ireland. As part of the project, the JV partners are working with a collaboration of universities and associated bodies under the "EnTERNI" programme looking at developing innovative skills and techniques for site surveys.

SRSL with their substantial experience gained in the marine environment are also working on the programme. However, it is too early in the process to be able to accurately predict the likely benefit which may result to Islay.

18.7.4 Future Aspirations for the Site

DPME have always aspired to the potential development of a tidal site off Islay delivering many hundreds of MW of renewable tidal power and see this application as the first phase of such a project. If such an aspiration were to come to fruition there exists to potential for a substantial benefit to Islay in terms of service capabilities. Again it is not possible to accurately predict the tangible benefits but purely based on a pro-rata MW basis, the high end scenario of 7 jobs for 30MW would result in over 70 jobs for 300MW, running from 2018 – 19.

18.7.5 Grid Connection

DPME have a 30MW connection agreement with SSE at the Carradale sub-station on Kintyre. Once connected there exists the opportunity to provide a more stable electrical infrastructure to the island and hence reduce the outages currently experienced. In addition, the installation of the cable is likely to provide additional capacity onto the island which could be utilised for other renewable energy generation projects, be they onshore wind, hydro or community tidal projects

18.8 Conclusions and Impact Summary

In summary, the Project could have the potential to act as a catalyst to create a critical mass of marine energy activity on Islay. The key issue for the island is the provision of high quality and skilled jobs, which can provide permanent employment for the local population and the infrastructure required to service the Project's needs and requirements.

Depending upon the turbine technology and development scenario adopted for the Project this could result in a moderate and significant positive impact at the wider Argyll and Bute level and a moderate to major positive impact at a local Islay level during the operation & maintenance phase.

Table 18.9 sets out all those potential significant impacts, which would result from the Project.

Socio-economic mitigation would only apply as a result of there being a number of national, regional and local initiatives involving the Scottish Government, regional and local development agencies with the aim of providing enhanced skills training, supply chain provision, and support for business improvement working in the offshore marine devices industry, in the West of Scotland. These will not act to reduce negative impacts, as no such impacts have been identified in the assessment. However, they would assist in realising and maximising the opportunities in the study area and where appropriate the applicants will support these initiatives. These initiatives would contribute to enhancing the likelihood of construction employment and output being based within the local and wider area.

As a result impacts and residual effects would remain at the same value and scale.

Development Phase	Scenario	Study Area Benefit	Level of Impact and Residual Effect	
Construction			Argyll &Bute	Islay
Most Likely Scenario	FTE Jobs	2-3	Minor	Minor
	GVA	£0.176m-£0.264m	Minor	Minor
O&M				
Low Impact	FTE Jobs	2	Minor	Minor
	GVA	£0.14m	Minor	Minor
Medium Impact	FTE Jobs	5	Minor	Minor
	GVA	£0.268m	Minor	Minor
High Impact	FTE Jobs	16	Moderate	Major
	GVA	£0.9m	Moderate	Major
Decommissioning				
	FTE Jobs	13	Minor	Moderate
	GVA	£0.854m	Minor	Moderate

Table 18.9: Summary of Potential Economic Impacts and Residual Effects

18.9 References

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WESTISLAY TIDAL

ENERGY PARK

volume 2 // chapter 19 // noise

19.0 Noise

19.1 Introduction

This chapter describes both the measured baseline noise characteristics of the site and a prediction of the installation and operational noise of the Project.

This chapter presents a quantitative prediction of noise and vibration levels generated at each stage of the project and references this to the measured baseline noise characteristics of the site.

In describing the noise emissions from the site, reference has been made to the following supporting studies contained in Volume 4: Technical Appendices.

Details of Study	Location
Acoustic Modelling Report 1 MCT	Technical Appendix 7.4
Acoustic Modelling Report 2 TGL	Technical Appendix 7.5
Underwater sound in the waters to the West of Islay: Ambient sound measurement and acoustic analyses	Technical Appendix 7.8

The installation and operational noise considered in this chapter include: noise generated during construction by installation vessels and installation techniques (e.g. rock drilling and pin piling), during operation by the turbines themselves, by visiting maintenance vessels and during decommissioning both by vessels and the disassembly and removal of the turbines. It also includes noise generated during inter-array and export cable installation by cable laying vessels and when implementing measures to secure the cables to the seabed.

Noise and vibration effects on ecological receptors are addressed in other relevant chapters within the ES.

19.2 Assessment Parameters

This chapter has been written using the same design envelope principle as those undertaken for the EIA. Therefore the "worst case" project parameters with accompanying justification are identified in Table 19.1 below.

Relevant Parameter	Maximum Parameter Considered	Justification of Parameter Selection
Installation - Vessel	Full Speed	This is the highest level of noise emissions from a vessel
Installation – Vessel	DP Vessel Holding Station	Highest noise of the three

		vessel choices.
Installation – Vessels	Assume two major vessels at one time	DP Vessel installing and support barge with major components. Cable laying will be single vessel at a different time.
Installation – Rock Drill	30 Turbines with four pins + marshalling hub with four pins gives 124 drillings	Longest duration when drilling will take place
Installation – Rock Drill	Depth 11m x 1.5m	Based on deeper MCT foundation requirement and therefore time to drill
Operation - Turbines	15 off SeaGen S	This is calculated to be the nosiest configuration

Table 19.1: Noise Assessment Parameters

19.3 Methodology

19.3.1 Introduction

In order to ascertain the impact of the noise generated during the lifecycle of the project, the following had to be carried out:

- Measure baseline ambient noise for the site;
- Measure the noise emissions for the Project (turbines, vessels, drilling etc.);
- Refine the noise signatures for the project;
- Undertake predictive modelling for the noise propagation; and
- Evaluate the effects of the additional noise with reference to the baseline measurements.

The assessment process is defined in Figure 19.1 below

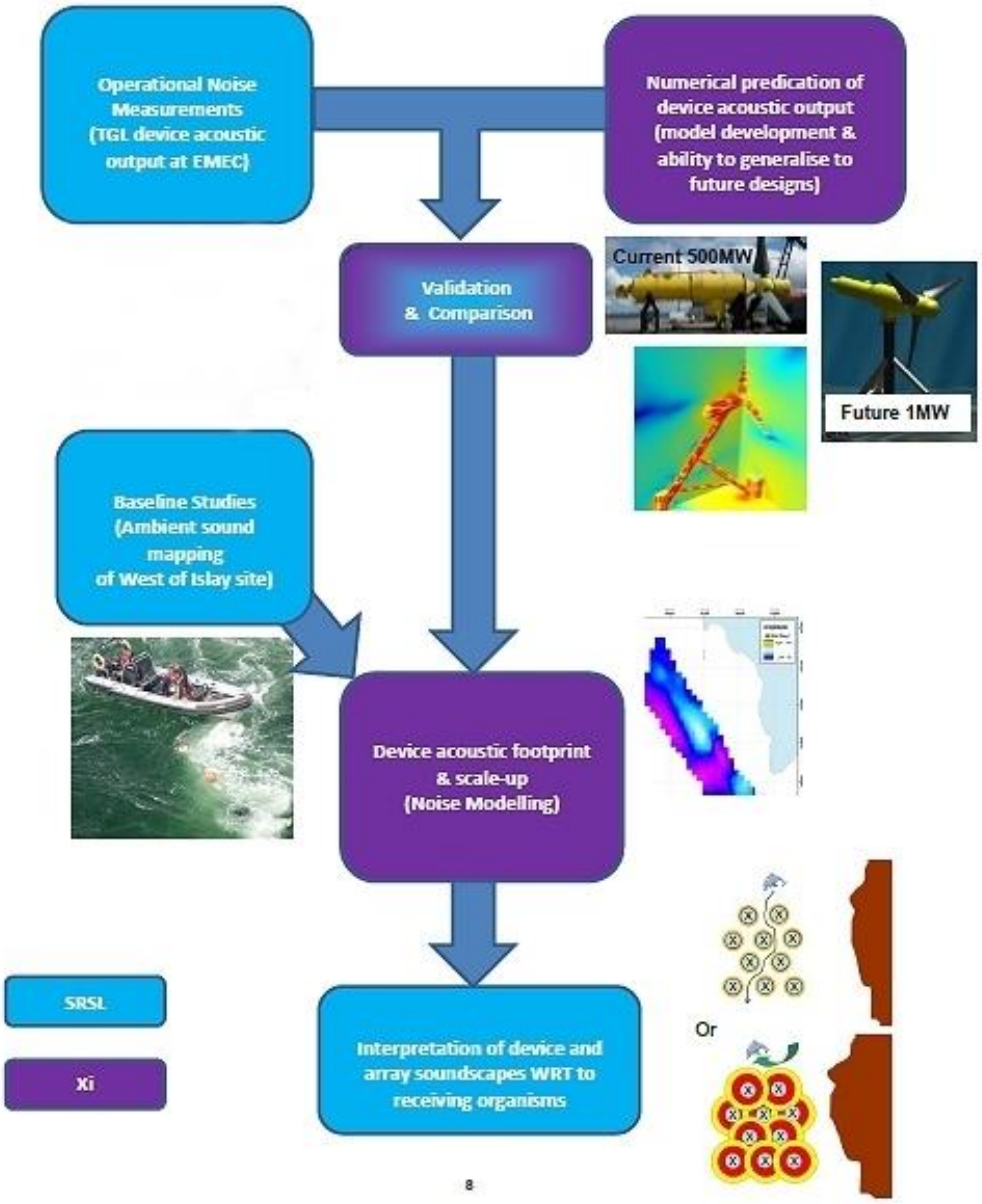

Figure 19.1: Schematic Showing Measurement and Modelling Interaction.

19.3.2 Baseline Ambient Noise

In order to predict the noise emissions directly attributable to the Project, it was first necessary to conduct acoustic measurements in the region of the proposed tidal array, so as to determine the ambient (or background) noise at the site.

To measure ambient underwater noise at the Project site, recordings were carried out using the "Drifting Ears" approach specifically developed by SRSL for high energy tidal sites. The customised "Drifting Ears" method was applied because traditional measurement techniques are not well suited to flowing

water and typically expose the receiving hydrophone element to contaminating water-flow noise from surface friction / turbulence, cable strum or noise from the mounting platform itself. In most studies of marine acoustics, this problem is negligible but as tidal energy sites are specifically chosen because of their high flow rates, this factor is of prime consideration when monitoring ambient sound or ship acoustic output.

The "Drifting Ears" equipment and methodology has been demonstrated successfully in challenging tidal environments, such as projects in the Kyle Rhea, Falls of Warness [(1)], Falls of Lora and Sound of Islay. These studies have shown that ambient noise varies significantly in tidal-stream sites both temporally and over small spatial scales.

A scheme of the "Drifting Ears" assembly is shown in Figure 19.2 with an accompanying image of its deployment.

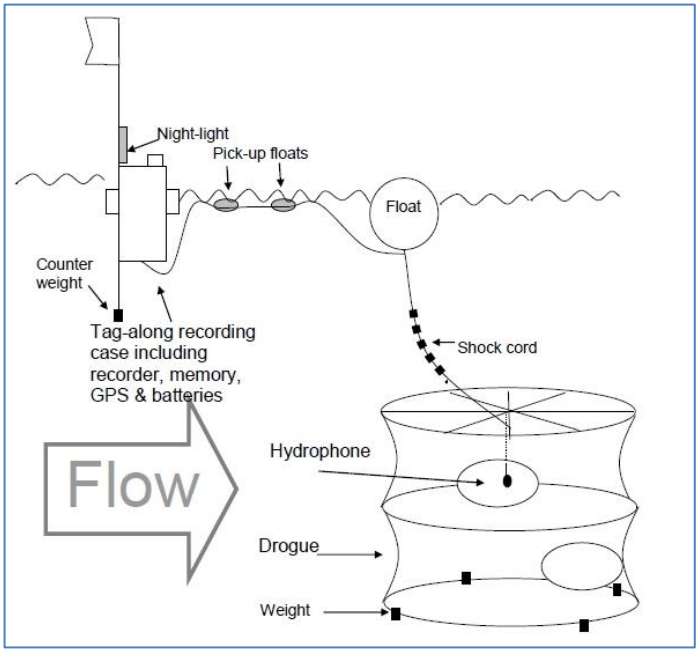

Figure 19.2: Drifting Ears Hydrophone Schematic and Photo of Deployment

The tracks for the device are shown in Figure 19.3 below:

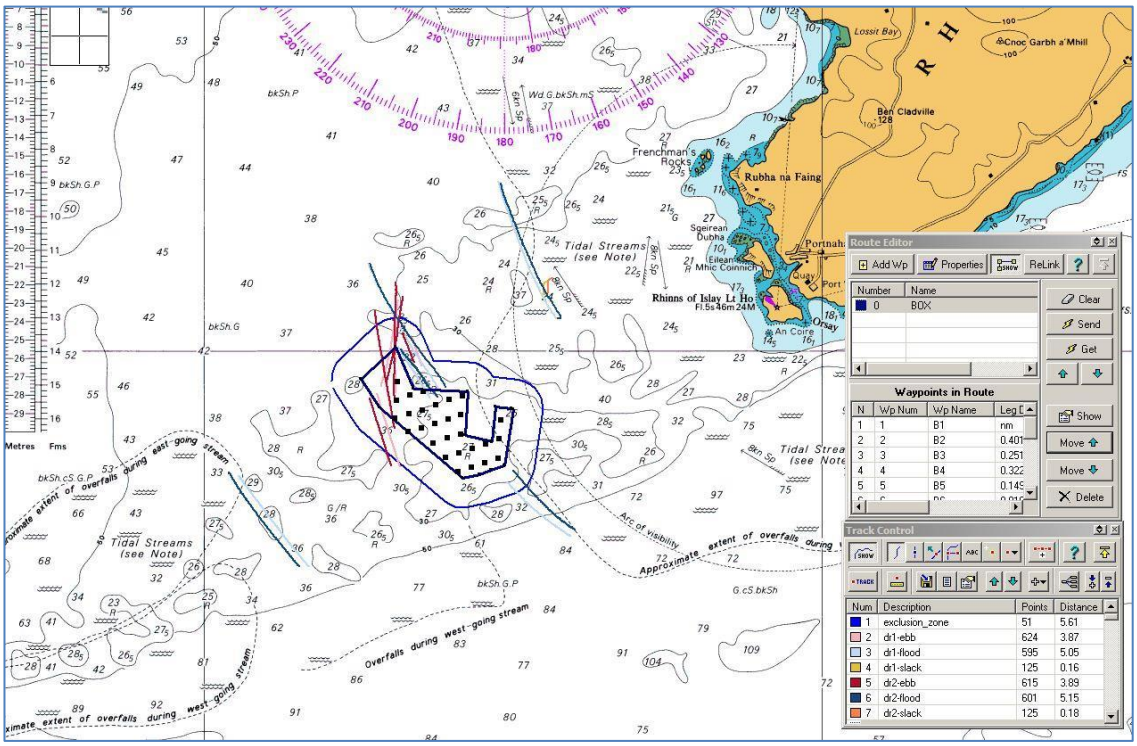

Figure 19.3: Tracks of Drifting Ears Hydrophones

A detailed account of the survey and findings is included in Technical Appendix 7.8 with summary detail provided in this chapter for ease of reference.

19.3.3 Noise Emissions from Project

Noise emissions from the Project will be generated by the following:

- During Installation: Vessels, drilling and component installation;
- During Operation: Operation of the turbine and visiting maintenance vessels; and
- During decommissioning: Vessels, decommissioning and removal of installations.

For the purposes of this evaluation, noise generated by decommissioning activities is assumed to be similar to that generated during installation.

There is limited information with respect to measured noise emissions from tidal energy installations. However, enough pertinent data has been gathered from a literature review to formulate the "worst case" conditions used herein.

19.3.4 Noise Propagation Model

For the Seagen S:

At the time of modelling the SeaGen S Mk 2 turbine proposed to be installed is not in production and thus there is no measured data for its acoustic output. To estimate acoustic impact of an array of fifteen Mark 2 turbines on the marine environment west of Islay, the following steps were undertaken:

1. A finite element model was made of the MCT SeaGen Mark 1 with duel bladed rotors with 18m diameter. The forces related to gear-meshing that are used to excite the model were calibrated using site noise data collected by Kongsberg. The model is referred to as the "18m MCT".

2. The SeaGen finite element model was scaled up to have triple-bladed rotors with 20m diameter. The forces that represent gear-meshing were also scaled up to represent the increase in torque related to the increase in power generation from 0.6 to 1.0 MW. This model is referred to as the "20m MCT".

3. The modelled sound field from the 20m MCT was used to determine the near-field (within 50m of the turbine) noise surrounding the SeaGen S Mk 2 turbine.

4. The results from the near-field model were then used in a far-field (100m to 10km) acoustic model to calculate the sound field surrounding the proposed arrays of 15 turbines. The far-field noise model included the geometry of the array and the local bathymetry.

5. The predicted sound fields were then compared to the ambient background noise to determine where the array is audible above the ambient noise at specific frequencies and therefore detectable by marine species.

For the TGL Turbine:

1. A near-field structural acoustic model was produced of a TGL tidal turbine with 22m rotor diameter and calibrated using gearbox vibration data recorded while the turbine was run in air and in water;
2. The sound field was compared to ambient noise levels measured by SAMS to determine where tones produced by the tidal array could be detected above the ambient noise and therefore detectable by marine species.

19.4 Description of Noise Emitters

19.4.1 Installation

Underwater noise generated during installation activities arises from the installation vessels and activities. These activities produce underwater noise of varying intensity, duration and spectrum (Richardson et al. 1995) [(2)]. The noise generated by installation techniques is typically high intensity impulsive (e.g. pile driving), while vessel noise is less intensive but more continuous, i.e. in the lower frequency range.

19.4.1.1 Vessel Noise

Three types of installation vessels are considered in this ES: jack-up vessels/barges (self-propelled or not), heavy-lift shearleg vessels (HLVs) and Dynamic Positioning (DP) vessels.

Jack-up vessels/barges sail or are tugged to a specific location, where they lower their spuds/legs and jack up to hold their position. After carrying out the works, they jack down and sail or are tugged to the next location. Figure 19.4 shows two jack-up barges during the installation of a turbine at the Thornton Banks windfarm off the Belgian coast.

Figure 19.4: Jack-up barges at Thornton Banks, Belgium

Heavy-lift shearleg vessels are typically tugged to the location for installation and then hold their position by means of anchors. An example of an HLV is the Rambiz, which was used to install the MCT SeaGen S Mk 1 tidal turbine at Strangford Lough, Northern Ireland (Figure 19.5).

Figure 19.5: Rambiz HLV installing MCT SeaGen at Strangford Lough

DP vessels sail to the installation point and hold their position using a number of thrusters. Figure 19.6 shows the North Sea Giant DP vessel installing the foundation of the Voith tidal turbine at EMEC, Scotland. It should be noted that the newest types of jack-up barges and HLVs also have propulsion an d DP capability.

Figure 19.6: North Sea Giant DP vessel installing foundation Voith turbine

While stationary, noise generated by jack-up vessels/barges and HLVs predominantly originates from the generators and machinery on board.

Based on the specification of the three main installation vessels described above, the DP vessels which will be continuously "holding station" by means of propulsion represent the worst case for installation vessel underwater noise.

Apart from these three types of vessels, ancillary barges, tugs, safety vessels, multi-cat vessels and personnel transfer vessels will also be required on site. These vessels typically operate in close proximity to the main installation vessel and travel between the installation site and port on a regular basis.

Vessel noise mainly consists of engine & mechanical sound and propeller & thruster sound. Internally located engines produce relatively strong and

continuous noise, which is transferred through the ship's hull to the water. The sound will, in general, be continuous and relatively constant with respect to frequency and intensity depending on the type of engine. Furthermore, vessel propellers and thrusters also produce noise. Corresponding noise levels are very much dependent on the speed of the vessel and the working environment. Noise generated by vessels while travelling at speed will be higher though over a relatively short period of time compared to the noise of vessels continuously operating in the installation site.

19.4.1.2 Drilling Noise

The drilling operations will produce the most noise during the installation phase. This will come from the mechanical components within the drill and from the interaction of the drill teeth with the rock seabed. The type of drill that is most likely to be used for this operation is shown in Figure 19.7 below.

Figure 19.7: Bauer Renewables BSD 3000 Seabed Drill

19.4.2 Operation

The tidal turbines have two principle sources of noise: mechanical noise associated with rotating machinery in the drive train and noise associated with the hydrodynamic effects as the blades pass through the water and the water passes over the structure. Particular effort is made in the design stage to minimise hydrodynamic noise from blades caused by cavitation which can be destructive to the mechanical integrity of the blades and reduce efficiency. Therefore the majority of turbine induced noise in the marine environment is a product of mechanical vibration in the drive train.

Noise will also be produced when maintenance vessels are deployed to service or exchange turbine components. However, these operations will mostly be carried out at slack water when the turbines are not in operation and therefore the overall noise produced will be less than when the turbines are in operation.

19.4.3 Decommissioning

Decommissioning details will be further defined, however, the noise generated can be considered to be similar in magnitude to that generated during installation. It is likely that no rock drilling will be required and that the turbine components will be cut into sections for removal by smaller vessels than those used in the installation. Pin piles will likely be cut level with the seabed and left in situ as with the inter-array and export cabling in the most part.

19.5 Results

19.5.1 Baseline Ambient Noise

Using the "Drifting Ears" method of measurement and extrapolating the data to predict site variability due to tidal flow and sea state as referenced in Technical Appendix 7.8, Variation in broadband Power Spectral Density (PSD) averaged levels appeared relatively sea-state independent with variation in broadband PSD level ranging from 79 dB re 1 Pa2/Hz for sea-states 1 compared to around 83 dB re 1 Pa2/Hz at sea-state 4 across the survey area as shown in the following Figure 19.8. No obvious correlation was evident with the rate of drifter passage (i.e. water flow rates). In contrast there was a distinct relationship with the inclement sea states at the time of recording that presumably masked any relationships with tidal flow. Indeed analyses of ambient sound in tidal-straits on the west and north coasts of Scotland found variable but overall subtle increases in ambient noise with flow (+1.24 dB/m.s-1 16 C. Carter2 2013, *pers. comm.*). Consequently scaling up values from 1 to 3 or 4 ms^{-1} would result in a negligible increase in ambient sound levels, especially when considering other factors affecting variation at the site.

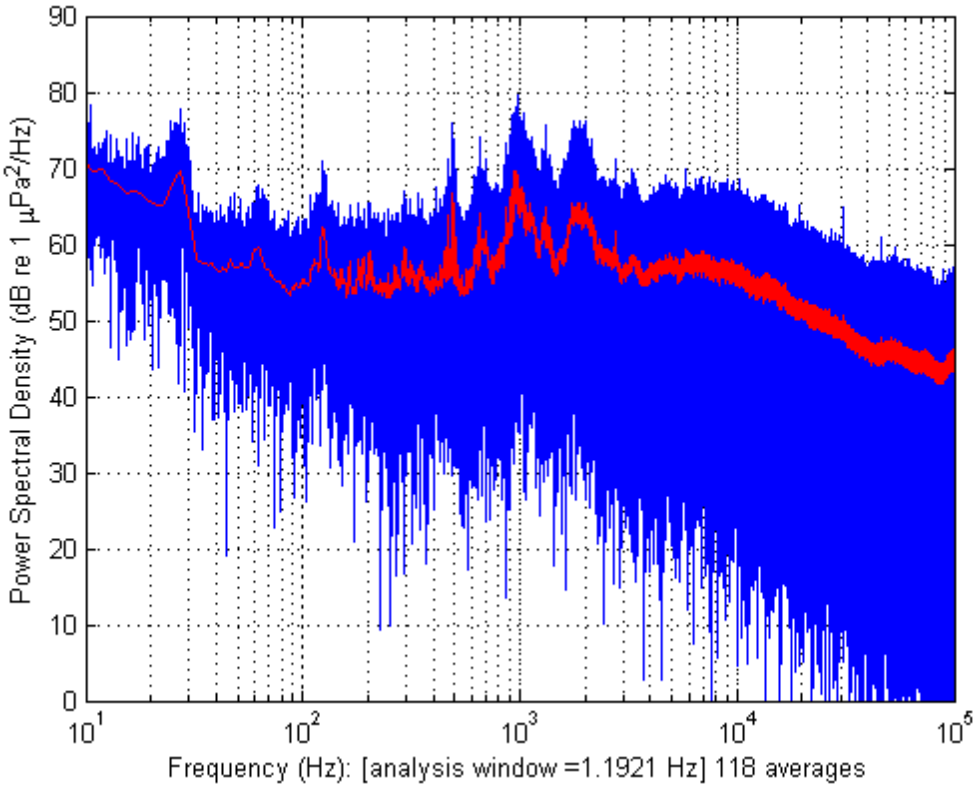

Figure 19.8: Power Spectral Density of a 50s Sample (blue) and Averaged Sample (red).

19.5.2 Installation Noise

19.5.2.1 Vessel Noise

Although installation noise can be generally described as in the previous sections, few data and few published characterisations of vessel-induced sound levels exist. Furthermore, it should be noted that the intensity and frequency of the noise of individual vessels depends very much on the propulsion system and whether there is propeller cavitation or singing. A literature review has been carried out in order to find more quantitative information on the underwater noise produced by installation vessels.

A study carried out by Richardson et al. (1995) [(2)] provides information on underwater noise from ships that are fully underway in open waters (see Figure 19.9 below). The data presented are based on extrapolation of vessel noise data measured at various far field distances.

It should be noted however that the vessels carrying out installation works at the Project site will be travelling at slower speeds or remain stationary.

Furthermore, with vessels operating in relatively shallow water depths up to around 35m, underwater noise levels are likely to be lower than the levels shown below.

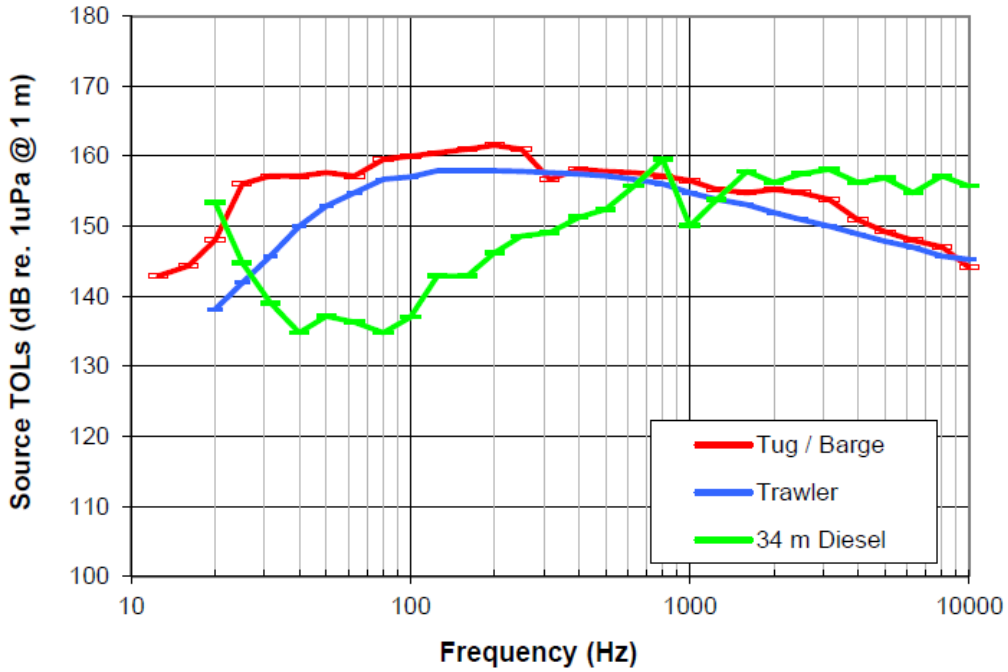

Figure 19.9: Estimated Third Octave Levels (TOLs) of underwater noise for range of vessels fully underway in open waters.

Nedwell and Barham (2012) [3] make reference to measurements taken by Subacoustech Environmental in close proximity to jack-up barges with tugs and other vessels operating in the surrounding area. Measurements were taken during breaks of impact piling, at ranges between 90m and 140m from a jack-up barge with tugs varying in distances between 100m and 500m from the measurement positions on board of the survey vessel. The following underwater noise levels as shown in Table 19.2 were measured:

	RMS Sound Level		
	Maximum	**Minimum**	**Mean**
Unweighted	135 dB re 1µPa	129 dB re 1µPa	133 dB re 1µPa

Table 19.2 – Measured noise levels between 90m and 140m away from a jack-up barge with operating tugs and survey vessels in the vicinity.

A typical time history of the measured underwater noise in these conditions is shown in Figure 19.10 below with the corresponding frequency content provided in Figure 19.11.

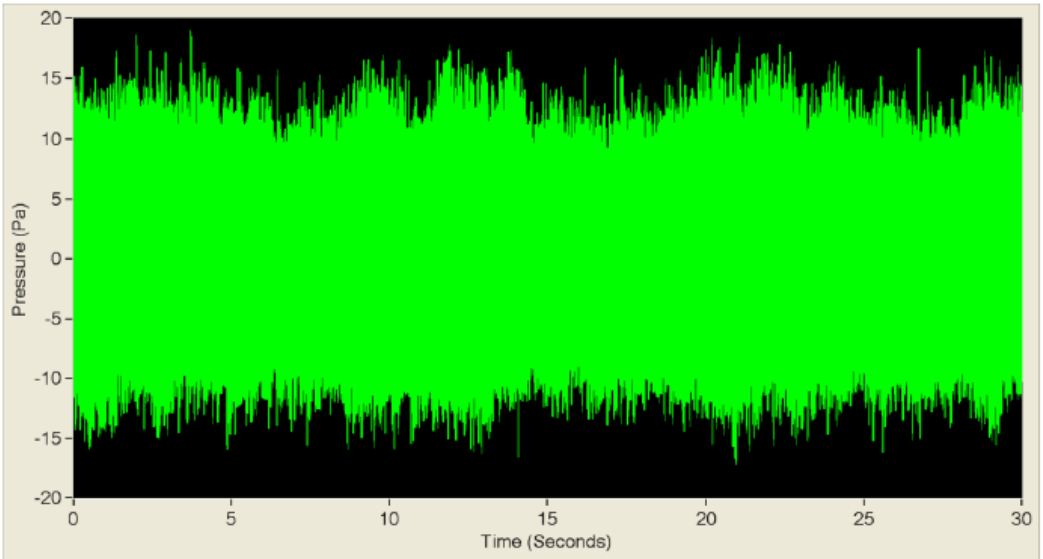

Figure 19.10 – Typical time history of measured noise levels between 90 m and 140 m away from a jack-up barge with operating tugs and survey vessels in the vicinity.

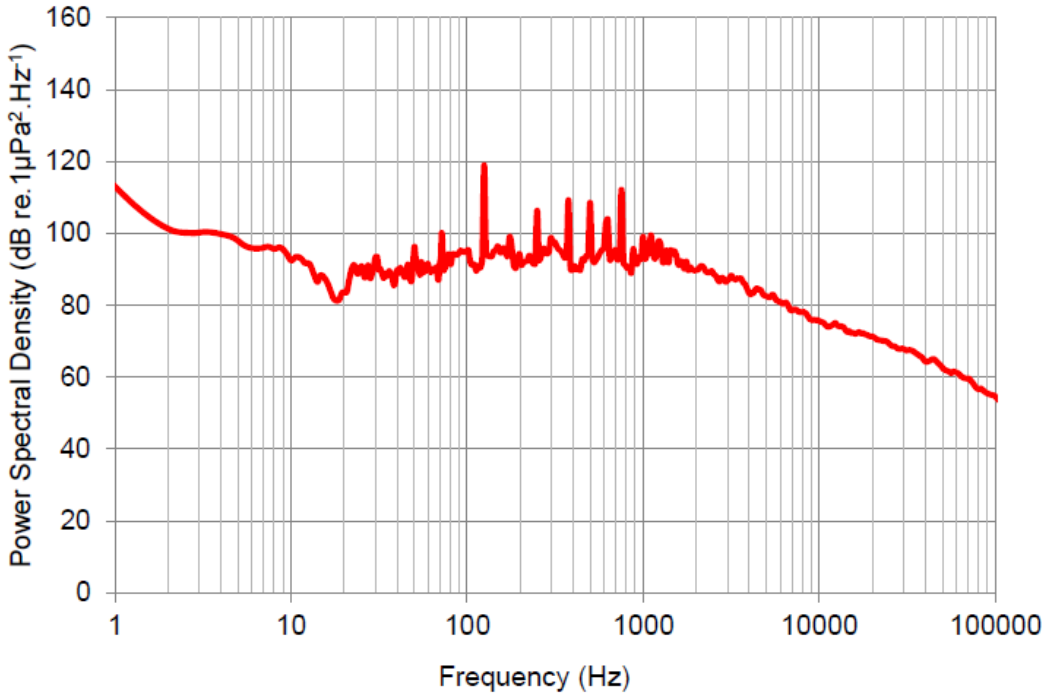

Figure 19.11 –Frequency content of time history shown in Figure 19.10.

Figure 19.11 shows that relatively high levels of underwater noise occur in the frequency range between about 100 Hz and 1 kHz. According to Nedwell and Barham (2012) these are typically linked to engine noise and rotating machinery and may also be linked to propeller noise. It should be noted that the noise levels measured at site include the background noise.

Beharie and Side (2011) [4] examined the underwater acoustic sound pressure levels produced before and during drilling operations on 25th of July 2011 for the installation of the foundation monopole of the Voith tidal turbine at EMEC, Fall of Warness, Orkney. The vessel used was the North Sea Giant (a DP-3 vessel owned by North Sea Shipping AS) as shown in Figure 19.6. Noise levels measured prior to drilling activity are found to be 126.4 dB re 1 µPa at 310 m from the drilling vessel and 123.9 dB re 1 µPa at 534 m. It should be noted that these levels are not measured at the source of the noise, i.e. the value typically expressed as re 1 µPa at 1 m. The measured values highly depend on the current speeds at which the DP vessel was working during measurements.

Finally, the Environmental Statement of the MeyGen project states noise data measured for tug boats; tug source levels are 172 dB re 1 µPa at 1 m.

19.5.2.2 Drilling Noise

Compared to installation vessel noise, more information is available in literature on noise by pile driving and drilling. Since the seabed is rock, pile driving is not an option and drilled pin piles will be the installation methodology.

The following references have been used to inform the installation noise generated.

1. Measurements by Heriot Watt University during foundation drilling operations for the Voith tidal turbine: both noise from drilling and the North Sea Giant DP vessel [4].
2. Sound attenuation properties for pile drilling operations within the Fall of Warness (Side 2010) and confirmation of these by measured data during anchor installations within the area (Beharie & Side, 2011) [4].
3. Nedwell et al (2003): Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial measurements of underwater noise during construction of offshore windfarms, and comparison with background noise. [5].
4. Nedwell & Brooker (2008). Measurement and assessment of background underwater noise and its comparison with noise from pin pile drilling operations during installation of the SeaGen tidal turbine device, Strangford Lough [6].

Available information on drilling noise has been assessed with the most relevant being a report commissioned by COWRIE [6], which published noise levels from the pin pile drilling operation which were measured during installation of SeaGen at Strangford Lough. The measured values were 139 dB re. 1 µPa at 28 m, and 105 dB re. 1 µPa at a distance of 2130m.

19.5.2.3 Summary of Predicted Installation Noise

In summarising the predicted noise emitted during installation the following assumptions have been made:

- Only two major vessels will be continuously on site at any one time, the installation vessel and a supply vessel, both of which are assumed to produce similar levels of noise;
- Tug noise was measured to be the highest but assumed to be an intermittent requirement;
- Smaller supply vessels have been included within the major vessel output;
- Installation will be undertaken continuously over two summer periods from May to August though this will vary depending on weather conditions;
- Vessel noise is assumed to be continuous;
- Drilling Noise is assumed to be intermittent;
- Cable laying will not occur in parallel with turbine installation and the vessel will be no noisier than the installation vessel; and
- During maintenance, service vessels will approach and depart at slack water when the turbines are not operating and will be emit lower levels of noise than the turbines in operation.

Estimations of the noise likely to be generated during the installation process are shown in Table 19.3 as follows:

Source	Noise	Duration	Reference
Installation vessel - DP	135 dB re 1µPa at 90m (including background noise and support vessels)	Continuous	DEME
Installation vessel - Barge	135 dB re 1µPa at 90m (including background noise and support vessels)	Continuous	DEME
Rock Drill	160dB@1m and 140dB@100m and falls below background@ 500m	Intermittent	EMEC/Strangford Lough Measurements
Support vessel	172 dB re 1 µPa at 1m	Intermittent	DEME

Table 19.3: Predicted Installation Noise

19.5.3 Operational Noise

19.5.3.1 Turbine

Based on modelled data which has been calibrated from measured data from the SeaGen S at Strangford Lough [7], the following conclusions were reached with regard to the predicted operational noise of fifteen MCT SeaGen Mark 2 2MW turbines:

- The 20m MCT model showed highest SPL associated with the gear meshing frequencies. The highest levels were associated with the 2nd Stage Gear meshing with SPL up to 170 dB (re 1 Pa2/Hz) within 5 m of the turbines nacelles;
- The sound field around the 20m MCT is directional with higher levels occurring directly up and downstream of the turbine;
- The far-field sound field was also found to be directional with higher levels found north-west and south-east of the proposed array. This elongation of the sound field is a function of the local bathymetry and the directionality of noise produced by the MCT device;
- The tones related to the 2nd in the 125 Hz one-third octave bands were found to be detectable above the ambient noise in sea state 5 for all of the 10km × 10km model space; and
- High levels were also found in the 40 Hz, 80 Hz, 250 Hz, 400 Hz, 500 Hz and 800 Hz one-third octave bands, though these were less persistent than the 125 Hz bands.

For thirty TGL turbines the predicted noise emissions based on gearbox meshing frequencies measured during dry gearbox testing, the following conclusions were reached with regard to the predicted operational noise of thirty TGL 1MW turbines:

- The highest SPL produced by the TGL turbine was localised around the hub in the 160 Hz one-third octave band where it reach 165 dB (re. 1 µPa). This high level of noise was associated with gear meshing in the 2nd gear stage;
- The sound field around the TGL turbine below 200 Hz is directional with higher SPL occurring in the rotor plane. Above 200 Hz the sound field is less directionally dependent;
- In both the near- and far- fields the MCT turbine tends to be 10 to 15 dB higher than the TGL turbine in frequency bands greater than 100 Hz. The TGL tends to be higher in the 25 Hz one-third octave band which is associated with the 1st gear stage meshing and in the 50 – 80 Hz bands.

This noise will be generated for the life of the tidal development of 25 years. As noise generation is directly related to the velocity of tidal flow, it is assumed that the peak noise will be generated during production and only silent at tidal speeds below 1m/s when the turbines stop turning.

An exception to this is the noise generated by the TGL thruster which operates for 2 minutes at each tidal cycle to yaw the turbine around to face upstream during slack water. This noise level will be verified during the summer of 2013 as part of the ongoing ReDAPT programme at EMEC but is predicted to be significantly lower than noise levels from the turbine rotation during operation.

19.5.3.2 Maintenance

Both the SeaGen S and TGL turbines will be maintained/replaced during slack water when the turbines are not in operation. It is assumed that vessel noise will be insignificant in comparison to turbine operational noise.

19.5.4 Decommissioning Noise

As decommissioning is likely to feature similar exercises and vessels as the installation period, it was assumed that noise levels would be equal to or less than the installation noise.

19.6 Conclusion

A reasonable prediction of the contributions to installation noise has been made and importantly the predicted worst case noise emission is based on actual measured data from Strangford Lough during installation of the pin piles on the currently operating unit and at EMEC during vessel location and pin pile drilling.

Operational noise has been assessed using modelling techniques which were calibrated against actual noise measurements from the SeaGen S at Strangford Lough and using measured gearbox frequencies from the TGL 1MW turbine gearbox.

19.7 References

1 Acoustic Monitoring of the European Marine Energy Centre (EMEC) Tidal Test Site: Methodology & Baseline Data Collection - 2008.

2 Richardson WJ, Greene CR, Malme CI and Thompson DH. Marine Mammals and noise. Academic Press Inc, San Diego, 1995.

3 Nedwell JR and Barham RJ, Assessment of underwater noise from construction and operation of the Kyle Rhea Tidal Array. Subacoustech Environmental Report No. E 366R0105.

4 Beharie, R. and Side, J. (2011) *Acoustic Environmental Monitoring* – Foundation drilling operations for the Voith tidal turbine. A report commissioned by Aquatera Limited. International Centre for Island Technology, Report No. 2011/08/AQ.

5 Nedwell et al (2003): Assessment of sub-sea acoustic noise and vibration from offshore wind turbines and its impact on marine wildlife; initial

measurements of underwater noise during construction of offshore windfarms, and comparison with background noise.

6 Nedwell, J. R. & A. G. Brooker (2008). Measurement and assessment of background underwater noise and its comparison with noise from pin pile drilling operations during installation of the SeaGen tidal turbine device, Strangford Lough. Subacoustech Report No. 724R0120 to COWRIE Ltd

7 Operational Underwater Noise, SeaGen Unit, Technical Report - Measurement: February 2010

WESTISLAY TIDAL

ENERGY PARK

volume 2 // chapter 20 // EMF

20.0 Electromagnetic Fields - EMF

20.1 Introduction

This chapter provides a brief review of the literature, an overview of the electromagnetic fields typically generated by power transmission cables, and an assessment of the potential for the subsea electric inter-array and export cables for the proposed Project to cause adverse effects in marine organisms. Potential impact assessments associated with individual receptors can be found in the relevant chapters.

This chapter should be read in conjunction with the following:

- Chapter 5: Project Description;
- Chapter 7: Mammals and Basking Sharks
- Chapter 8: Benthic Ecology
- Chapter 11: Natural Fish; and
- Chapter 12: Commercial Fisheries.

20.2 Electromagnetic Fields

Electrical and magnetic fields are both generated by the movement of electrical charge. Electrical fields (E fields) are proportional to the voltage (V) in a cable, and magnetic fields (B fields) are proportional to the current (A). The motion of an organism, or even seawater, through an existing B field causes the generation of an electrical field known as an induced electrical field (iE field) . E fields are produced around electrical cables that are not perfectly shielded. Industry-standard cables are constructed with shielding designed to retain E fields within the cabling. B fields, however, exist beyond even industry-standard cables and, as described above, are able to induce electrical fields in the surrounding environment. Therefore, although E fields generated directly by the movement of charge in the conductor will be contained within the cable, iE fields will still exist due to the effect of the B fields generated by the current in the conductor. It is important, therefore, to consider the effects of both magnetic and electrical fields on the environment surrounding the cable.

Power cables, such as those used to export electricity generated from tidal arrays, produce E- and B-fields when current passes through them. The B-field is detectable outside of the cable structure and this in turn creates a further induced E field (iE). Studies have shown that electromagnetic fields (EMF) radiate beyond the cable into both seawater and the seabed. However, the fields emitted by the cables are limited spatially and the field decays rapidly with horizontal and vertical distance from the cables (Normandeau et al., 2011) [(1)].

20.3 Studies Undertaken

20.3.1 The University of Liverpool Centre for Marine and Coastal Studies (CMACS) and Cranfield University.
The first report of the COWRIE EMF study [2] in 2003 was based on offshore wind developments and made the following findings:

- There is no direct generation of an E-field outside of the cable;
- B-fields generated by the cable created induced E-fields (iE) outside of the cable, irrespective of shielding;
- B-fields are present in close proximity to the cable and the sediment type in which a cable is buried has no effect on the magnitude of B-field generated;
- The magnitude of the B-field on the 'skin' of the cable (i.e. within millimetres) is approximately 1.6 micro Tesla (μT) which will be superimposed on any other B-fields (e.g. Earth's geomagnetic field); and
- The magnitude of the B-field associated with the cable fall to background levels within 20m.

Considering the results of the modelling undertaken as part of the research, in respect of significance to electro-sensitive fish, the report found the following:

- EMF emitted by an industry standard subsea cable will induce E-fields;
- Cables will emit approximately 91μV/m at the seabed adjacent to a cable buried to 1m. This level of E-field is on the boundary of E-field emissions that are expected to attract and those that repel elasmobranchs;
- The iE-fields calculated from the B-field were also within range of detection by elasmobranchs;
- Changing the permeability or conductivity of the cable may effectively reduce the magnitude of the iE-field;
- To reduce the iE-field that is below the level of detection of elasmobranchs will require a material of very high permeability, hence any reduction in E-field emission would minimise the potential for an avoidance reaction by a fish if it encountered the field but may still result in an attraction response; and
- The relationship between the amount of cabling present, producing iE-fields and the available habitat of electro-sensitive species is an important consideration.

20.3.2 COWRIE 2.0 Electromagnetic Fields (EMF) Phase 2
A further study in 2009 [3], funded by COWRIE, looked at the effects of EMF on electro-sensitive fish and concluded that:

- There is evidence that benthic elasmobranch species studied did respond to the presence of EMF emitted by a subsea cable. The responses were, however, variable within a species and also during times of cable switch on and off, day and night;
- The overall spatial distribution of fish was non-random, and dogfish were more likely to be found within the zone of EMF emission during times when the cable was switched on; and

- There did not appear to be any differences in the fish response by day or night or over time.

20.3.3 SNH Knowledge Review 2010

More recently a report was commissioned by SNH [4] to investigate EMF and noise emission from marine energy developments on three species, Atlantic Salmon, European Eel and Sea trout, the main findings with respect to EMF being that:

- Atlantic salmon and European eel can use the earth's magnetic field for orientation and direction during migrations. Juvenile sea trout respond to both the earth's magnetic field and artificial magnetic fields;
- Current knowledge suggests that EMF`s from subsea cables and cabling orientation may interact with migrating eels (and possibly salmonids) if their migration or movement routes take them over the cables, particularly in shallow waters (<20m). The effect, if any, could be a relatively trivial temporary change in swimming direction, or potentially a more serious avoidance response or delay to migration. Where this will represent a biologically significant effect cannot yet be determined;
- All three species are likely to encounter EMF from subsea cables either during adult movement phases of their life or their early life stages during migration within shallow, coastal waters adjacent to the natal rivers; and
- The review identified no clear evidence that either attraction or repulsion due to anthropogenic EMF will have an effect on any of three fish species identified in the report.

20.3.4 Effects of EMF`s from Undersea Power Cables on Elasmobranches and other Marine Species

A knowledge review was commissioned by The Department of the Interior in the US in 2011 [1] provided a comprehensive review of studies to date on potential effects of EMF on marine fauna. The report modelled the expected EMF's from a range of power cables and reviewed the available information on sensitive marine species. The report reached the following conclusions:

- The field is strongest directly over the cable and decreases rapidly with horizontal and vertical distance from the cable;
- The cable magnetic field is perpendicular to the direction of the cable. A water current or organism moving parallel to the cable magnetic field will not generate an induced electric field. Orientation of the cables relative to the flow of water and migration routes can reduce the potential impacts;
- Marine species are more likely to react to the magnetic fields of DC cables than AC cables. DC cables were found to have a greater impact as they can influence the intensity of the local geometric field;
- The risk of interference only exists in the areas surrounding the cables where sensory capabilities overlap with the cable EMF; and
- Magnetic fields can be minimised by placing the cables close together, allowing the field vectors to cancel each other out.

Despite the significant research, desk-based, laboratory and field studies which have been undertaken, it is still generally considered that the current state of knowledge regarding the EMF emitted from subsea power cables is too variable and inconclusive to make an informed assessment of any possible environmental impact of EMF.

Several other major wind farm developments have been planned, or indeed are under construction, in the UK. From a review of the environmental statements produced for these developments, it would appear that there is a general consensus that the electromagnetic fields likely to be present around a wind farm or tidal energy development will not have a significant environmental impact.

20.4 Magnitude of Electromagnetic Fields

Voltages in the inter-array and export cables are likely to range from 6.6 to 33kV at around 150V. However, because the level of B fields is proportional to the current, then the current will be at its highest in the export cable at around 300A. The standard cable is an industry-standard, three-phase 33kV, 300A, 50Hz alternating current (AC) XLPE (cross linked polyethylene) cable carrying 30MW.

In a typical industry-standard cable conducting 132kV and an AC current of 350A, the size of the B field produced would be 1.6μT CMACS, 2003 [(2)]. This B field would be present only directly adjacent to the cable, and although it would be additive with the earth's natural geomagnetic field (approximately 50μT), it was shown that the magnitude of B field associated with the cable would fall to background levels within 20m of the cable. Furthermore, the modelling conducted by CMACS showed that the magnitude of a B field is not affected by any non-magnetic sediment in which a cable may be buried.

In the same study CMACS showed that for a cable buried 1m below the seabed the magnitude of the iE field at the seabed would be approximately 91μV/m. Although the magnitude of the B field was not affected by the fact that the cable was buried, the iE field dissipated more quickly in sediment than in seawater. At a distance of approximately 8m from the cable the iE field in the sediment was only 1 or 2μV/m, whereas in seawater the iE field at this distance was still approximately 10μV/m.

20.5 Conclusion

It is likely that the B and iE fields produced by the subsea electrical cables for the Project will be large enough to be detected by receptive marine organisms. In locations where the cables may be buried, marine organisms on the surface of the seabed will be exposed to lower fields than they would be where the cables are exposed. It is not possible to make any accurate predictions as to

how these relatively weak B and iE fields will affect these species. Given the localised scale over which these electromagnetic fields are likely to propagate, however, it is likely that any effects which may occur would be highly localised. It is expected that the magnitude of the B field and iE field will be approaching zero at 10m and 20m, respectively, from the cables.

In order to minimise the potential impact of EMF the following actions are proposed:

- Cables will be specified with adequate shielding to minimise the emission of EMF;
- Three phase cables which have been shown to emit the lowest levels of EMF either individually shielded triaxial cable or with common outer shield will be used in preference to DC cable;
- Where required, cables will be buried either by rock dump, rock bags or some other form of cable protection as referenced in Chapter 5: Project Description: and
- Where feasible magnetic fields will be minimised by placing the cables close together, allowing the field vectors to cancel each other out

20.6 References

1 Effects of EMF`s from Undersea Power Cables on Elasmobranches and other Marine Species – Normandeau et al 2011.

2 COWRIE-EMF-01-2002 A Baseline Assessment of Electromagnetic Fields Generated by Offshore Windfarm Cables: July 2003.

3 COWRIE 2.0 Electromagnetic Fields (EMF) Phase 2: EMF-sensitive fish response to EM emissions from sub-sea electricity cables of the type used by the offshore renewable energy industry. Commissioned by COWRIE Ltd (project reference COWRIE-EMF-1-06).

4 Commissioned Report No. 401 - Literature review on the potential effects of electromagnetic fields and subsea noise from marine renewable energy developments on Atlantic salmon, sea trout and European eel: (2010)