

18 Summary of impacts and mitigations

The tables in this chapter summarise the impacts relating to the following:

- Chapter 5: Human beings
- Chapter 6: Flora and fauna
- Chapter 7: Water
- Chapter 8: Soils, geology and groundwater (chapter 8)
- Chapter 9: Air quality
- Chapter 10: Noise
- Chapter 11: Traffic and transport
- Chapter 12: Navigation risk assessment
- Chapter 13: Cultural heritage
- Chapter 14: Visual impact
- Chapter 15: Material assets
- Chapter 16: Coastal processes

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
5	Human Beings	Receiving environment	The proposed development contains no residential component, it will not have any significant direct impact on the composition of the population in the immediate area.	No mitigation required	<p>The proposed development contains no residential component, and will not have any significant direct impact on the composition of the population in the immediate area.</p> <p>However, through the provision of some local employment it will help sustain the existing population and help prevent decline in the population of the area.</p>
		Employment and socio-economic benefits	<p>The installation of the proposed marine cable will not have a significant impact on employment either at the construction stage or otherwise. Short-term employment will be available for up to six months.</p> <p>There is also potential for short-term employment of guard vessels and small boats during the cable-laying and landing operations.</p> <p>The impact during construction is predicted to be positive but of short duration.</p> <p>The decommissioning phase will offer short-term employment opportunities. However, any long-term employment specifically associated with the operation of the AMETS test site will be lost. Those who have worked on the test site, however, will have a skill base</p>	No mitigation required	

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			that should make it easier for them to find employment in what at that stage will be a well-established ocean energy sector.		
		Electromagnetic Fields (EMF)	The magnetic field and induced electric field from the proposed submarine electricity cables are well below the ICNIRP guidelines and there will be no significant impact on human beings.	No mitigation required	

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6	Flora and Fauna: Sub-tidal Habitats	Receiving environment	No rare species or species of conservation importance were recorded.		<p>The biotopes present within the site, at both the infralittoral and circalittoral reef areas, are all characteristic of exposed communities already subject to extreme wave action. They all showed evidence of being subjected to the effects of sand scouring and sediment movement during the survey and any sedimentation caused during the cable laying process is unlikely to have any more effect on these communities than a natural storm event would have.</p> <p>The greatest potential for impact on subtidal benthos is the creation of artificial reefs which may fragment communities and provide habitat for predatory species leading to impact on benthic species. However, the extent of this will be small in the context of the total available habitat. Conversely the</p>

			artificial reefs may serve to increase biodiversity in the area providing additional habitat which would result in a positive impact overall. No significant negative impacts will arise.
Construction	The burial of cables by water jetting or cable plough will temporarily increase sedimentation in the water column. Predicted impacts are considered insignificant as the species and biotopes within the existing reef habitats are all characteristic of exposed sites subject to sand scour and sediment deposition caused by the frequent high winds and swell associated with the event. The placement of rock armour has the potential to cause habitat loss and fragmentation, and damage to or loss of certain species. It may also cause an alteration to the existing environment by the creation of new habitats. However, the impact of placing rock armour over a small area (less than 1%) is likely to be negligible in the context of the overall area of the site.	<ul style="list-style-type: none"> • The development should have the smallest possible footprint • The development should be carried out as efficiently as possible within the shortest possible timeframe • All vessels used in cable laying should have an Oil Pollution Emergency Response Plan and carry emergency response equipment • Care should be taken that no oils or hydraulic fluids are allowed to leak from machinery on vessels or WECs • The submarine cable should be buried deep enough to minimise any possible warming of the surficial sediments 	
Operational Phase	The wave energy devices currently described for deployment at the site have a requirement for mooring on	<ul style="list-style-type: none"> • The potential effects on adjacent biota because of the use of antifoulants on WECs should be 	

sandy substrates and the mooring of the devices will therefore not impact on reef habitats.

The likely impact of rock armour scour protection around moorings is considered insignificant as it represents less than 1% of the total site area.

It is highly unlikely that any antifoulants used on wave energy devices would cause a negative impact on local reef communities.

The likely impact of increased biomass in the vicinity of WECs is considered to be low, as the exposed nature and depth of the site would prevent the accumulation of biomass beneath individual WECs.

The main concern relating to electromagnetic fields (EMF) in marine systems is their potential effect on organisms that are either magnetoreceptive (for example, marine mammals) or electroreceptive (for example, chondrichthyes such as sharks, rays and skates). While the possible effects of electromagnetic fields on benthic organism, being neither a magneto-receptive or electroreceptive organism is not well researched in regard to benthic marine invertebrate, such effects are likely to occur only in close vicinity to the cables. The potential for effect and impact is very small and local.

monitored as part of the environmental management plan for the facility and the use of antifoulants should be strictly controlled.

Good practice indicates that mitigation of EMF by burial of the cables should be undertaken and mitigation should also be taken into consideration at the cable design stage.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
6	Flora and Fauna: Inter-tidal Habitats	Receiving Environment	The extremely low diversity of species and biomass at Belderra Strand indicates the particularly harsh environment at this site, where even the most robust species were lacking. The lack of organic matter in the sand, a factor of the exposure regime and lack of any silt input into this area has contributed to the lack in species diversity and biomass.		The species diversity at Belderra is extremely low, reflecting the exposed harsh nature of the environment in the area. The impact of the development will be low and of short duration over a minor proportion of the beach area. Full recovery would be expected within one year of construction or decommissioning.
		Construction	<p>The impact arising is disturbance of the habitat, but its effects are unlikely to be detectable within a very short time since the intertidal area is already frequently disturbed by severe weather conditions.</p> <p>A potential impact could also occur from oil leakage from machinery used on the beach area.</p> <p>Overall, the potential impact will be of short duration and will not be significant.</p>	<ul style="list-style-type: none"> To avoid any undue disturbance to the beach an on-site ecologist should oversee the process of trenching and cable routing through the intertidal area and off the beach. Trenching of the beach and the laying of cables should be conducted in as short a time frame as possible. Care should be taken that no oils or hydraulic fluids are allowed to leak from any machinery entering the beach during construction. 	
		Operational	Once the cables are in place there will be no further impact on the intertidal areas.	No mitigation is required	
		Decommissioning	During decommissioning cables can easily be pulled from the cable ducts if	<ul style="list-style-type: none"> Mitigation required is as set out under the construction phase. 	

they are to be removed. If there is a requirement to remove the cable ducts, then the impacts will be similar to those of the construction phase. There will be disturbance of the beach along the cable duct corridor and also compaction of sands in the working corridor

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
6	Flora and Fauna: Marine Mammals	Receiving Environment	<p>The marine mammal community at the AMETS is described from a combination of visual and acoustic surveys as well as published, unpublished and historic data. There was great consistency between datasets with common and bottlenose dolphins the most frequently reported species, harbour porpoise recorded during the current survey and a range of species recorded regularly but infrequently. Densities of common dolphin are similar to those reported elsewhere on the west coast of Ireland.</p> <p>These studies and reports show that there is a rich marine mammal community in and adjacent to the AMETS.</p>		<p>Prediction of impacts is difficult in the absence of specific studies on full-scale WECs deployed in the marine environment. Although potential for impact on marine mammals will be highest during the construction phase, the impacts are likely to be low given the overall small scale of the development in the open ocean environment.</p> <p>Once the WECs are deployed, a comprehensive monitoring programme should be in place to guide the site management and inform future deployments. This programme should include continued onsite observations of marine mammals when devices are operational and noise monitoring using up-to-date equipment and validated techniques.</p>
		Construction	Underwater noise generated during construction from intensive boat traffic could potentially lead to avoidance of	<ul style="list-style-type: none"> To minimise disturbance to marine mammals, the development should be carried out as efficiently as 	

	<p>the area by marine mammals or damage to individuals. However this period of time is very limited and animals are likely to return to the area post construction. Also Construction work associated with rock armouring or deploying of anchoring systems is not believed to create noise levels that would be of great concern for marine animals. These activities would also be of short duration.</p> <p>The collision risk with the cable laying vessel and other work boats will be low as they will be relatively slow moving in the area.</p> <p>Although the risk of an oil spill is low vessels will be required to have a shipboard oil pollution emergency plan, emergency oil spill equipment and crews trained in its use. This will minimise the potential for any impact in the unlikely event that an oil spill occurs.</p> <p>The potential impact of encounters with rock armour as it is being laid can be avoided by using a system to drop the rock near to the seabed rather than through the water column.</p>	<p>possible within the minimum timeframe possible.</p> <ul style="list-style-type: none"> • All vessels used in cable laying should have an oil pollution emergency response plan and carry emergency response equipment • Marine Mammal Observers (MMO) should be used during the placing of rock armour to ensure there is a minimum distance between marine mammals and the vessel when working.
<p>Operational</p>	<ul style="list-style-type: none"> • The WECs and associated moorings could create a physical barrier to the movement of marine mammals. The risk of this is low given the relatively small scale of development in the open ocean environment. 	<ul style="list-style-type: none"> • Ongoing monitoring of marine mammal activity and noise monitoring in the vicinity of the AMETS during its operational phase should be a component of the environmental management plan.

	<ul style="list-style-type: none"> • There could be disturbance of feeding and perhaps migratory behaviour through interference by the effects of EMF along the power cables. Given the water depths at which the submarine cables will be deployed and the fact that they will be almost entirely buried to a minimum of one metre beneath the seabed, migratory and feeding impacts are unlikely to occur. Thus the impact will be of low significance. • Potential underwater noises from the WECs could lead to disturbance of marine mammals or their avoidance of the area. The extent to which this could occur would be very device specific but given the open ocean location of the test areas it is unlikely to cause significant impact. 	
<p>Decommissioning</p>	<p>Noise and vessel movement during decommissioning of WECs could give rise to some short term disturbance of marine mammals leading to their temporary avoidance of the area. The impact of this will be very low and of short duration.</p>	<ul style="list-style-type: none"> • Marine Mammal Observers (MMO) should be used during the decommissioning phase and the development should be carried out as efficiently as possible within the minimum timeframe possible. • All vessels used in cable laying should have an oil pollution emergency response plan and carry emergency response equipment.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
6	Flora and Fauna: Terrestrial Habitats	Receiving Environment	<p>Belderra Strand and the surrounding area is an exposed, low-lying mosaic of improved agricultural grassland and dry calcareous grassland with smaller areas of marram dune, dune slack and machair. Within all of these habitats the vegetation recorded was typical of the habitat and no rare or threatened species were recorded.</p> <p>With the exception of the intertidal area at Belderra Strand, all remaining areas of the site that will encompass the cable landfall, temporary construction area, cable bay and substation location are outside any designated area (SAC, NHA or SPA).</p>		<p>The principal impact will be the loss of semi-improved agricultural grassland. Although this will be of long-term duration it is not of conservation interest. The extent of habitat loss (2 Acres) is very limited and the impact is not significant.</p>
		Construction	<p>The impacts of the development will include disturbance and temporary loss of dry calcareous grassland habitat in a small area where machinery will be stored and parked during the cable landing operation and in which an underground cable joint bay will be located. The cable joint bay will be buried underground and the site will be reinstated to its original condition. Loss of an area of semi-improved agricultural grassland habitat will arise in the construction of the substation and access road.</p> <p>Habitats such as these are widespread and there is no conservation concern. The extent of habitat loss, (2 hectares) is</p>	<ul style="list-style-type: none"> • Movement of vehicles should be restricted to existing roads with unfenced areas of calcareous grassland, dune slack or any other habitat being avoided in parking or turning of vehicles. • Vehicles, machinery and construction materials should only be parked or housed in the designated area. • Any embankments used in screening the substation should be constructed of soil excavated in construction of the substation. Soil from other areas should not be imported to the site to minimise the likelihood of introducing non-native 	

		very limited and the impact is not significant.	and / or invasive species. <ul style="list-style-type: none"> Any landscaping of the screening embankments surrounding the substation should use species native to the calcareous grassland of the area. Waste materials arising during the construction phase should be removed from site and disposed of according to legal practice.
	Operation	There are no impacts on the ecology of the site associated with the operational phase of the development. All access to the substation will be via existing roads in the area and the level of human activity associated with the substation location will be very low.	No mitigation is required
	Decommissioning	Should demolition of the substation be part of decommissioning, then demolition material will be removed from the site and disposed of in accordance with legal practice. The site will be restored to semi-improved agricultural grassland.	<ul style="list-style-type: none"> Any site restoration should use local native species to restore vegetation cover.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
6	Flora and Fauna: Birds	Receiving Environment	Counts of birds at Belderra Strand were consistently low. This may be due in part to disturbance by beach users, which was regularly recorded at this site. Also exposed sandy shores tend to support a lower abundance of macrofauna as prey compared to		The potential impacts from the wave energy installations will vary depending on the species involved, their status and/or behaviour. Considering that wave energy is still an emerging technology with only a limited number of devices deployed there is a lack of

	<p>sheltered shores.</p> <p>Winter and summer surveys of terrestrial habitats found that they were used by a range of species typical of coastal dune and grassland habitats, none of which appear on the Red List of Birds Of Conservation Concern. The presence of breeding waders, ringed plover and common sandpiper was of note.</p>	<p>documented information on wave energy impacts. The impacts upon birds will vary depending on the location of the installations. The impact will also depend on the timing of construction activities. Careful planning and timing of activities will minimise any potential impact as will efficient construction and operation using the minimum footprint. It will be important to monitor bird populations in the study area, focusing on those species of note in terms of their conservation status and/or abundance and on any species that may be at particular risk due to their behaviour.</p>
<p>Construction</p>	<ul style="list-style-type: none"> • Construction noise from vessel activity may lead to birds avoiding the area for a brief period. However, this would be a temporary disturbance and birds would return to the area following construction. The impact would be very low • During cable laying there would be a temporary increase in suspended solids in the water column but this would be confined to an area adjacent to the cable. In shallow depths used by diving birds this could give rise to some temporary loss of feeding area. This would be of short duration and given the extensive area available the impact 	<ul style="list-style-type: none"> • Cable laying should be carried out as efficiently as possible within the minimum timeframe possible. • Cable laying should take place in the summer months. • Disturbance impacts should be minimised by limiting intertidal construction activities to the summer months, when wintering waders are not present. • An ecologist should be present during construction • The trenching method with the least disturbance to the seabed should be used

	<p>would be negligible.</p> <p>Disturbance of birds using the intertidal area at Belderra beach will also occur from construction activities, (cable duct trenching and cable landing). This area is not used extensively by birds due to recreational activities on the beach giving occasional disturbance. Any disturbance caused by construction would be of very short duration (one to two weeks) and will not give rise to any significant impact.</p>	
<p>Operational</p>	<p>Given the small number of devices which will be deployed and which will be well marked the risk of collision will be low and the potential impact will be low also. There is a risk of underwater collision while diving for prey. If avoidance of WECs occurs this risk of will be reduced.</p> <p>Disturbance / displacement may arise due to noise during construction and operation of the WECs. In relatively calm conditions the WECs will generate little or no surface noise. As wind and wave increases the WECs become more active but there is less noise propagation. Hence the potential impact is likely to be very low.</p> <p>Displacement may also arise due to birds avoiding areas with manmade structures and night lighting.</p> <p>Birds may need to navigate around multiple WECs but the impact is</p>	<ul style="list-style-type: none"> • Ensure design of WECs minimises the potential for entrapment in the WEC. • Monitoring of interaction of WECs with birds to determine if unforeseen impacts are occurring.

	considered negligible for most devices unless they are located between breeding, foraging and/or roosting grounds.
Decommissioning	<ul style="list-style-type: none"> • Temporary disturbance to birds from vessel movement associated with the decommissioning of the site. • Ensure efficient and timely operations to minimise for potential for impact.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
7	Water	Receiving Environment	<p>The AMETS site is located within the Western River Basin District (Western RBD) as defined in the European Communities (Water Policy) Regulations, 2003.</p> <p>The land-side components of the project are not located within any statutory water body, as defined by the Environmental Protection Agency (EPA). There are no identified rivers of significance at the substation location or the land-side cable route to Belderra Strand. The substation site does, however, drain through the local land drainage network, joining other drainage from the area before flowing across Belderra Strand and entering the sea.</p> <p>Test Area B (50m water depth) is located within the coastal water body of the Western Atlantic Seaboard (IE_WE_250_0000 in Hydrometric Areas</p>		<p>No significant risks to water quality are anticipated during construction, operation or decommissioning. In the marine environment, the main threat to water quality is oil pollution arising from accidental leakage from the vessels used in construction and deployment and from WECs in operation. Vessels engaged in construction and operational activities will be required to have appropriately trained staff to implement an oil pollution emergency response plan and to have appropriate emergency response equipment. This will minimise the impact of any oil spill that might occur. WECs should be designed so that on-board oil leaks are contained within the hull, and only oils with low environmental impact should be used.</p>

	<p>32, 33 and 34). This coastal water body, as defined by the EPA, is 4,686km² in size. The test area comprises a very small fraction of this total area.</p> <p>Test Area A (100m water depth) is located outside the river basin district boundary, and is not directly under the management of the river basin authorities.</p>	
<p>Construction</p>	<p>The main potential impacts on terrestrial surface water that could arise are:</p> <ul style="list-style-type: none"> • Sedimentation, Cement, grout and concrete, Oil and fuels arising from leakages or spillages, Improper waste disposal and Sanitary waste disposal from temporary facilities on site. <p>Best practise construction site management will ensure these impacts are contained and as such not significant</p> <ul style="list-style-type: none"> • The main potential for impact on the marine environment arises from the cable-laying and WEC deployment operations. The effects of these operations will be temporary and of short duration. Possible impacts include: • Sedimentation: mobilising sediment on the seabed will increase the concentration of suspended matter in the water column. Any such disturbance will be of short 	<p>To minimise potential impact in the terrestrial environment:</p> <ul style="list-style-type: none"> • The development should involve the minimum footprint possible. • The development should be carried out within a minimum timeframe. • The construction site will have an oil spill response plan, and there will be appropriately trained staff and containment equipment on the site to allow immediate control of any spills. • A drainage system, incorporating sediment ponds and silt traps, will be provided at the substation sites to control silt during construction works and manage any accidental spillages. • Waste water effluents arising primarily from welfare facilities (toilets and washbasins) will be required to be treated by a proprietary treatment system and percolation area or alternatively collected in storage tanks that will

	<p>duration, and the suspended matter will quickly settle onto the seabed.</p> <ul style="list-style-type: none"> • Accidental spillage of oil and fuels on vessels: any such spillages would have a direct impact on fish, fish food and fish habitats, and other aquatic species. • Leakage of hydraulic fluids from WECs during deployment: any such leakages would involve small volumes and the fluids would be rapidly dispersed in the open ocean environment. 	<p>be emptied by a licensed waste liquid tanker and disposed of at an appropriately licensed treatment facility.</p> <p>To minimise potential impact in the marine environment:</p> <ul style="list-style-type: none"> • All vessels used in cable-laying should have an oil pollution emergency response plan and carry emergency response equipment to allow immediate control of any spills. Staff should be appropriately trained in oil pollution response procedures. • All hydrocarbons on board vessels should be managed appropriately to prevent their potential release to surface or ground water.
<p>Operational</p>	<ul style="list-style-type: none"> • During the operational phase, the surface water runoff from the substation buildings will be drained to the adjacent drain through an oil interceptor. The HV transformer will be banded to prevent any oil leak to groundwater. The substation will occasionally be manned, and sanitary facilities will be provided which will give rise to small volumes of sanitary waste. <p>When the test facility is operational WECs will be brought to and anchored in the test areas, and routine maintenance operations will be carried out. These activities will involve vessel</p>	<ul style="list-style-type: none"> • It is not anticipated that significant impacts on terrestrial water quality will arise during the operational phase and no mitigation measures are required other than monitoring and inspection. • As regards marine water quality all vessels will be required to have an oil pollution emergency response plan and carry emergency response equipment and appropriately trained staff. • WECs should be designed so that

	<p>movement in the area. The impacts that potentially arise include:</p> <ul style="list-style-type: none"> • Contamination of marine waters resulting from oil spillage from work vessels or WECs • Contamination from anti-foulants used on the WECs • Short-term disturbance of the sea bed from WEC anchoring activities when WECs are taken off station and reinstated, resulting in increased concentration of suspended solids. Any such suspended solids will rapidly disperse, and impact will be minimal. 	<p>on-board oil leaks are contained within the hull; only oils with low environmental impact should be used.</p> <ul style="list-style-type: none"> • The use of antifoulant on WECs should be minimised to prevent the excessive accumulation of antifoulants in the sediments of the area.
<p>Decommissioning</p>	<p>Decommissioning, involving demolition of the substation and site restoration, will result in temporary disturbance to the site. There is some potential for an increased concentration of suspended solids in the nearby drainage system from runoff and sedimentation. This will be a temporary impact of short duration and of low significance. Accidental oil spillage could also occur leading to contamination of the drainage system leading to Belderra Strand but with proper mitigation the risk of this will be very low.</p> <p>It is unlikely that the submarine electricity cables will be recovered from the sea bed. However, if this is required as part of decommissioning, the lifting of the cables will result in increased</p>	<ul style="list-style-type: none"> • As regards terrestrial water quality decommissioning works will involve activities similar to those during the construction period and the mitigation measures will be the same. • As regards marine water quality mitigation measures will be the same as for construction.

concentrations of suspended matter in the water column along the cable routes as they are recovered. The impact would be temporary, of short duration and of low significance.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
8	Soils, Geology and Ground water	Receiving Environment	The receiving environment comprises the onshore area, including Belderra Strand and the substation location in Ballymacsherron townland, the offshore seabed, the overall geology of the area, and any groundwater in the form of aquifers.		<p>The electricity transmission cables in the sea bed offshore and in the beach of Belderra Strand are not anticipated to present any significant risks with respect to soil, sediment or geology during construction, operation or decommissioning. The construction of landside project components – cable jointing bay, land cable and substation – present limited risks to receiving waters during construction and further reduced risk during operation. These limited risks will be mitigated by the implementation of good construction practice and the provision of robust protection measures in the design of the substation.</p> <p>The proposed development does not present any significant risks to soil or sediment, geology or groundwater during construction or subsequent operation.</p>

Construction

The marine environment off the Mullet Peninsula is highly dynamic, and this suggests that any disruption of marine sediment by cable laying and burial would be rapidly ameliorated by natural sediment processes.

In areas of rock outcrop, it is expected that the cable will be placed on the surface and protected, for example by the placement of 'mattresses' or 'rock armour'. This is not anticipated to have any impact on the nature and distribution of marine sediments.

Mooring operations and rock armour scour protection for same is not anticipated to have any impact on the nature and distribution of marine sediments.

Belderra Strand is a high-energy and dynamic environment where the temporary disruption caused by the cable installation is not anticipated to have a short- or long-term effect on the geomorphology of the beach.

Landside cable burial, cable jointing bay construction and development of the substation and the access road will require excavation of soil and possibly of rock to allow the construction of foundations, drainage, earthing grid, etc.

Risks are:

- Hydrocarbons may be lost to the ground and subsequently the

No significant impacts are anticipated with regard to sediment and geology offshore. Therefore no specific mitigation measures are anticipated to be required beyond normal practice.

In relation to the onshore works:

- All hydrocarbons will be managed appropriately to prevent their potential release to surface water or groundwater.
 - Waste water effluents arising primarily from welfare facilities will be collected in storage tanks that will be emptied as required by a licensed waste liquid tanker and disposed of at an appropriately licensed treatment facility.
 - Excavated materials from construction works will be deposited in pre-arranged locations where there is no danger of run-off into local watercourses.
 - All run-off water from soil storage locations shall be captured and discharged to appropriate receiving water after being clarified by an appropriate particulate removal apparatus.
 - Wash-down water from exposed aggregate surfaces, cast-in-place concrete and concrete trucks will be trapped on site to allow sediment to settle out and reach neutral pH
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	<p>groundwater during fuelling of plant and vehicles, or from leakages from transformers prior to and during installation.</p> <ul style="list-style-type: none"> • Wastewater effluents may be generated by site facilities, such as toilets. • Surface water run-off from the site may contain high levels of particulate matter associated with soil excavation. <p>The storage and placement of excavated soils may generate surface water run-off with high particulate loads due to erosion by rain – this water may subsequently enter surface water or groundwater bodies, leading to a temporary reduction in water quality. During concrete-based construction high alkalinity waters may be generated that could reduce the quality of the receiving water.</p>	<p>before the clarified water is released to a drain system.</p>
<p>Operational</p>	<p>There will be no operational activities on the cable other than monitoring of its natural and artificial protection. However, in the worst case, where a section of cable needed to be replaced, the impact would be comparable to construction, which, with regard to sediment and geology, would be negligible to low.</p> <p>Rock armour around moorings or on exposed cables is likely to have localised effects on the movement of</p>	<ul style="list-style-type: none"> • No maintenance works, other than monitoring and inspection, are expected to be required for the offshore and beach portions of the proposed development. In the worst case, where the cable is damaged, the potential impacts and mitigation measures would be as detailed for the construction phase.

	<p>sediment, with deposition on the up-current side and scouring on the down-current side. Given that the structure will not be of significant height, although it may be several kilometres long, it is not expected that it will have any significant impact on sediment movement within the high-energy environment of the bay – the impact on sediment movement will be much less than that arising naturally from rock outcrops and reefs.</p> <p>Potential onshore impacts arise from the possible accidental release of hydrocarbons at the substation site and from effluent from permanent welfare facilities. The latter will consist primarily of toilet and washing effluents, which will be discharged to a holding tank for removal and disposal in accordance with good practice.</p>	
<p>Decommissioning</p>	<p>In general terms the potential impacts arising from decommissioning, with respect to soil, sediment and geology, closely resemble those arising from construction. However, if marine cabling were to be abandoned in situ, the impact of decommissioning would be less than that of construction. Similarly, if the substation were reconfigured for local electricity distribution, it would not require demolition, and the landside impact of decommissioning would be considerably less than that of construction.</p>	<ul style="list-style-type: none"> • The mitigation measures for decommissioning will be similar to those for construction, as detailed above. Given that some land-side infrastructure may be reused and marine-side infrastructure left in situ, the mitigation measures would be amended to reflect the reduced scope of work.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
9	Air Quality	Receiving Environment	The receiving environment will be the marine area where the AMETS test areas are located, the place where the cable ship will land the cable, and the location of the substation. The nearest potential receptors are likely to be the existing residential premises close to Belderra Strand and the substation location in the Cross area, and the recreational users of the area.	No mitigation measures are required	<p>Emissions from offshore vessels constitute a small fraction of one percent of national air emissions. Emissions associated with this project will be of short duration, and during the operational phase will be offset to a small extent by renewable energy generation from the site. Considering the low levels of air pollutants in the receiving environment and the rapid dispersion in the area, the impact on air quality from emissions associated with construction, operation and decommissioning of the test site is predicted to be negligible.</p> <p>Emissions from onshore activities will principally arise during construction and decommissioning, and will arise from vehicles and equipment used in the process. Implementation of a management plan for these phases of the project, incorporating agreed mitigation measures, will ensure minimal emissions with negligible impact on receptors in the project area.</p> <p>Overall, the impacts on air quality will be negligible, both in the national context and in the immediate receptor area.</p>
		Construction	During the construction phase, there is potential impact at the cable landing location, the cable joint bay location and the substation construction site.		

Plant exhaust emissions and dust emissions could arise from construction works associated with the cable landfall activities. Emissions to air from construction and staff vehicles travelling to and from the site will also occur, with a small number of additional vehicle movements per day predicted for the local L5233 road and the R313 from Binghamstown to Belmullet during the construction phase.

Potential impacts from fugitive dust and resultant nuisance impacts are likely to be insignificant.

Works are predicted to be carried out over a 6 month period and any emissions will be temporary in nature. Construction plant will satisfy relevant national legislative requirements with respect to emission standards.

Offshore activities by their nature are weather-dependent, and the estimates for the duration of construction and vessel operation on-site are based on acceptable weather conditions. Should inclement weather conditions result in more prolonged vessel activity, the predicted emissions will increase accordingly, but will still be insignificant in terms of potential impact on receptors in the area.

The vessel emissions associated with cable laying close to Belderra strand will be rapidly dispersed by the prevailing

	westerly winds and will not impact on receptors in and around the Belderra landfall area.	
Operational	<p>Onshore there will be some small vehicle movements associated with the operation of the substation and emissions from these operational activities will comprise a small fraction of that from local traffic. There will be no significant impacts on receptors in the area.</p> <p>Offshore, the operational phase of the test site will involve deployment and testing of WECs and their subsequent recovery over a 15-year period, using a variety of work vessels. It is also likely that the integrity of the submarine electricity cables will be checked annually by suitable vessels. Likely fuel consumption has been calculated and no significant impacts on receptors in the area are anticipated.</p>	No mitigation required
Decommissioning	<p>Onshore, decommissioning may entail substation and compound demolition and site reinstatement.</p> <p>The main potential impact on the receptors in the area will be from dust. Decommissioning will be for a fixed, short duration and is likely to take about two months. Impacts are likely to be insignificant.</p> <p>Offshore, estimated emissions during the decommissioning stage are less than those for the construction and</p>	No mitigation required

			operational phases, and no significant impact is anticipated.		
10	Noise	Receiving Environment	<p>The background noise levels in the Belderra area are typical of a rural area but can be elevated by natural sources such as surf noise. The lowest background level recorded during the day at any of the four locations monitored was an LA90 level of 25 dB at the holiday village (location N2) and the quietest night-time level was 23 dB at the church car-park (location N3). Noise levels in the Belderra area (location N1) were consistently above levels at the other locations (locations N2 and N3) due to surf noise.</p> <p>The noise levels measured at the junction near Belderra Strand (location N1) were consistently higher than those measured on the proposed substation site due to location N1's proximity to the beach and local road network, and some natural screening at the proposed site.</p> <p>Average background noise levels in the vicinity of the proposed site can be taken to be in excess of 30 dB for the majority of the time.</p>	No mitigation required.	<p>Construction noise will be within the limits set out in the NRA guidelines and will not have significant impact at the nearest dwellings.</p> <p>During operation, noise from within the substation due to switch gear and alarms are not foreseen to be a problem, as any such noise would be infrequent and of short duration. It is expected that noise generated by the transformer will be sufficiently attenuated outside the substation so as not to cause annoyance at neighbouring properties. In addition, the noise level should be further reduced by landscaping and the planting of the earthen berms around the substation perimeter.</p> <p>Corona and Aeolian noise are predicted to be low at the site; should corona noise occur, the developer will carry out the appropriate mitigation measures, which could include the fitting of air-flow spoilers and the replacement of insulators.</p> <p>Traffic noise will not increase significantly above background levels during all phases of the project.</p> <p>Overall the predicted noise impact from the development will be low and is not expected to give rise to complaints from local residents.</p>

Construction	As regards the substation construction and cable burial the results of the noise model indicate that noise levels in excess of 60 dB(A) will occur in the immediate vicinity of the site, but will drop significantly with distance. At the nearest houses, the noise levels as a result of the construction works will be in the order of 45 dB(A), which is within the National Road Authority’s guideline figure for construction activity and similar to the background noise measured for the area.	No mitigation required
Operation	Noise modelling of the operational phase noise sources predicts that noise levels will be below 30 dB(A) at the nearest noise sensitive receptors and will not give rise to any impacts. Noise levels will therefore not be significant.	No mitigation required
Decommissioning	Noise modelling of the operational phase noise sources predicts that noise levels will be below 30 dB(A) at the nearest noise sensitive receptors and will not give rise to any impacts (Figure 10 6). Noise levels will therefore not be significant.	No mitigation required

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
11	Traffic and Transport	Receiving environment	Traffic surveys were undertaken at three locations as agreed with Mayo County Council as part of the scoping exercise for the TTA. These show that the roads serving the site have		Subject to the implementation of the proposed mitigation measures identified, the construction, operational or decommissioning phases of the AMETS project will result in no

	<p>significant amounts of spare capacity when compared to their typical carrying capacities and thus link capacity should not be an issue of concern.</p> <p>The surrounding road network has a good safety record and there are no particular locations where road safety is an issue that could be exacerbated by the traffic associated with the proposed AMETS facility.</p>	<p>significant impacts in the construction, operational or decommissioning phases of the project.</p>
Construction	<p>As regards impact on traffic construction of the substation and cable burial etc will increase existing traffic flows on the L5233 by a maximum of 8.2%, below the 10% threshold agreed with Mayo County Council. In summary, this traffic will have minimal impact upon the capacity of the surrounding road network and is not an issue of concern. This concurs with discussions with Mayo County Council prior to preparing the TTA.</p> <p>With regard to road safety given the good existing safety record on the surrounding roads and the minimal increase in traffic volumes attributable to the proposed AMETS facility, it is considered that the development will not have an adverse effect upon road safety.</p> <p>The issue of traffic safety at the proposed access to the development has been considered in the preparation of the entrance design, including</p>	No mitigation required

		entrance geometry and sightlines. The design proposed will ensure sufficient and safe access to the site from the local road and no significant impact on safety is predicted.	
Operational		<p>Traffic movements to and from the site during the operation phase will be very low and the impact on traffic levels and safety is predicted to be negligible.</p> <p>Traffic to Frenchport Pier and Ballyglass Pier will also be very low in volume with an estimated 2 to 4 vehicles per day using these facilities when WECs are deployed and maintained at the test site.</p>	<ul style="list-style-type: none"> • Consultation with local pier users at Ballyglass and Frenchport will take place on an ongoing basis to ensure congestion is avoided.
Decommissioning		<p>The decommissioning phase would involve an intense period of material removal from the site and possibly the importation of soil. Traffic movements would be similar to the construction phase with similar predicted levels of impact.</p> <p>Potential safety impacts during the decommissioning phase will be similar to those in the construction phase and will be low.</p>	<ul style="list-style-type: none"> • During the decommissioning phase vehicle movements will be restricted to avoid conflict with school opening and closing times – 08.00–09.30 and 14.30–15.30.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
12	Navigation Risk Assessment	Receiving Environment	Two surveys of vessel traffic in the vicinity of the test site area were undertaken using radar, AIS and human observers. There was a survey over a 14		The AMETS risk assessment carried out in line with the UK DTI guidance indicates that the majority of the risks identified are 'broadly acceptable'

	<p>day period in winter followed by a summer survey over a 23 day period. The total number of vessels recorded in the winter period was 105 and in summer 109. The bulk of these were fishing vessels with rest consisting of cargo vessels, work boats and leisure craft.</p> <p>Inshore fishing is the principal type of fishing in the region of the AMETS and is carried out along the entire coast. There is also whitefish or pelagic fishing with larger vessels to the west of the AMETS in deeper waters.</p> <p>Consultation with the Coastguard indicates that there is sufficient ship passing room in the region either inside or outside the location of Test Area A. There is a large gap (approximately 4.2 nautical miles) between Test Area A and Test Area B, and this is considered more than enough for a ship to pass through.</p>	<p>provided the risk control measures outlined within the risk assessment hazard log are put in place. A technical review by industry experts carried out as part of this report confirmed that the risk assessment is reasonable. Therefore, once all the outlined control measures are in place, these risks require no further action.</p> <p>WEC developers will include the hazards relevant to their device in a device-specific navigation risk assessment, which will be approved by the AMETS management before the WEC is installed.</p> <p>The construction and operational work will be planned and managed to ensure the safety of those involved and the safety of other maritime users in this area. This will include the selection of contractors and working vessels that are competent or capable of undertaking the works required, and that comply with offshore industry guidance and best practices.</p>
<p>Construction, Operation and Decommissioning</p>	<p>Rerouting of vessels around the AMETS will be required once the test areas are established. A number of fishing vessel tracks passed through the AMETS Test Area A during the winter survey period. Almost all tracks appeared to indicate vessels transiting rather than actually fishing in the area of the AMETS. Based on the data collected, the impact of rerouting vessels to avoid the Test Area</p>	<ul style="list-style-type: none"> • A separate device-specific risk assessment outlining the hazards associated with the WEC will be prepared by the WEC developer before WECs are installed in the AMETS. S • The site will need to be adequately marked (appropriately sized navigation buoys with AIS,

A is likely to be small as there is substantial sea-room to the east and west of Test Area A.
 Hazards identified by the risk assessment were: Collision or contact with other vessels or moored structures, grounding and foundering, foundering and capsizing, machinery related accidents, accidents to personnel, electrocution, search and rescue and emergency response. In the assessment these risks were classified either as 2broadly acceptable or “tolerable with monitoring”

equipped with radar reflection panels and so on), noted on navigation charts and included in radio navigation warnings and notices to mariners as necessary.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
13	Cultural Heritage, Terrestrial	Receiving environment	The archaeological and historical background of the area, coupled with the researched baseline data, indicates that the subject site is one of very high archaeological potential and that, although the project will not impact any sites identified in the RMP or the RPS, the possibility of ground works – and in particular cable trenching – impacting previously unknown subterranean cultural heritage deposits is relatively high.		The combined results of the desktop assessment and the field survey indicate that, although the subject site is one of considerable archaeological and historical significance, there is no evidence of archaeological material in the proposed development. Notwithstanding this, there is potential that invasive ground works at the subject site may impact previously unrecorded archaeological material. Consequently, it is recommended that a suitably qualified archaeologist be present during the construction and decommissioning phases of the project, and that the works should be licensed appropriately. Any excavations during

			the operational phase will also require the presence of an archaeologist.
Construction	<p>There will be no impact on known protected structures or national monuments, and the development will not impact directly or indirectly upon sites or monuments listed in the Record of Monuments and Places or structures listed in the Record of Protected Structures for County Mayo.</p> <p>The construction of the landfall cable route has the potential to uncover archaeological and historical features and materials. Consequently, there is potential for works in the construction phase to have a negative, direct and long-term impact on any such cultural heritage deposits they encounter.</p>	<ul style="list-style-type: none"> Any invasive groundwork should be monitored by a suitably qualified archaeologist, and should be appropriately licensed. 	
Operational	<p>The development will not impact directly or indirectly on known and protected structures or national monuments during the operational phase.</p> <p>Should any additional site works or modifications to the site be required during the operational phase, the potential exists for such works to have a negative, direct and long-term impact on any cultural heritage deposits they encounter.</p>	<ul style="list-style-type: none"> Any invasive groundwork arising from the operational phase should be monitored by a suitable qualified archaeologist and should be appropriately licensed. 	
Decommissioning	<p>There will be no impact on known and protected sites, structures or national monuments, either directly or indirectly, during the decommissioning</p>	<ul style="list-style-type: none"> Any invasive groundwork should be monitored by a suitably qualified archaeologist, and should be appropriately licensed. 	

phase.
 If invasive groundworks are to be carried out as part of the decommissioning works, there is potential for the decommissioning phase of the development to expose deposits of cultural heritage significance. If this were to happen, their exposure could have a negative, direct and long-term impact.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
13	Cultural Heritage, Marine	Receiving environment	<p>The admiralty chart of this area (Admiralty Chart No 2703) states that the seabed is comprised of rock and sand in the nearshore area, with rock, sand and broken shell in the outer section. The chart does not record the presence of any shipwrecks or other features of cultural heritage significance.</p> <p>The National Shipwreck Inventory records two vessels as having possibly foundered in or around the area of Annagh Peninsula</p> <p>There is a possibility that there are non-ferrous artefacts buried under the sand. If submarine peat deposits were found at the subject site, the excavation of a cable trench through the area would have a direct impact on these deposits and it would have the potential to uncover prehistoric archaeological</p>		<p>The combined results of the desktop assessment and the field survey indicate that, although the subject site is one of considerable archaeological and historical significance, there is no evidence of archaeological material in the proposed development.</p> <p>Notwithstanding this, there is potential that invasive ground works at the subject site may impact previously unrecorded archaeological material. Consequently, it is recommended that a suitably qualified archaeologist be present during the construction and decommissioning phases of the project, and that the works should be licensed appropriately. Any excavations during the operational phase will also require the presence of an archaeologist.</p>

	<p>material.</p> <p>A diver survey did not reveal any visible or detectable archaeological remains along the landfall route.</p> <p>The high-resolution marine archaeo-geophysical survey did not reveal the presence of any potential cultural heritage in the test areas or cable route.</p>	
<p>Construction</p>	<p>The construction phase of the development will not impact directly or indirectly upon any historic shipwrecks listed in the Shipwreck Inventory of County Mayo.</p> <p>Although no visible or detectable cultural heritage was recorded in the submarine zone, there is a possibility that remnants of prehistoric landscapes, such as those discovered at Blacksod and Broadhaven, could be encountered in the nearshore section. Non-ferrous materials, such as log boats or timber raft remains, could also be uncovered in offshore sands. The construction of the landfall cable route has the potential to uncover archaeological and historical features and materials. Consequently, there is potential for construction phase works to have a negative, direct and long-term impact on any cultural heritage deposits they encounter.</p>	<ul style="list-style-type: none"> • Submarine electricity cable trenching works should be monitored using appropriate equipment and by a suitably qualified archaeologist, and should be appropriately licensed.
<p>Operation</p>	<p>The operational phase of the development will not impact directly or indirectly upon any previously recorded</p>	<ul style="list-style-type: none"> • After the cable has been laid, surveys of the submarine cable route should be carried out at

			<p>Historic Shipwrecks listed in the Shipwreck Inventory of County Mayo. Unknown and unrecorded deposits could be impacted during the operational phase through physical impact or exposure. Exposure would mainly be achieved through secondary impact such as scour, erosion or mooring. If this were to happen, the exposure would have a negative, direct and long term impact on those deposits.</p>	<p>specified intervals, with the complete suite of results being sent to a suitably qualified archaeologist for interpretation and reporting.</p>	
	Decommissioning		<p>The decommissioning phase of the development will not impact directly or indirectly upon any historic shipwrecks listed in the Shipwreck Inventory of County Mayo.</p> <p>As in the construction phase, exposure of unknown cultural heritage deposits could have a negative, direct and long-term impact on those deposits.</p>	<ul style="list-style-type: none"> As in the construction phase, any invasive groundwork should be monitored using appropriate technology and by a suitably qualified archaeologist, and should be appropriately licensed. 	
Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
14	Visual Impact	Receiving Environment	<p>Smooth terrain is a characteristic of this unit, and within this type of landscape, distances can appear shorter and consequently, development can appear closer or larger than if it were viewed within a different type of landscape. As a result of this characteristic, development can have a disproportionate visual impact in such terrain due to an inherent inability to be absorbed physically or visually. Low vegetation also contributes to this</p>		<p>The assessment of visual impact has followed best practice in terms of landscape and seascape characterisation and assessment. The proposals will be new features in a landscape described in the Mayo Landscape Appraisal as 'vulnerable' and 'sensitive'. However, the location that emerged from a detailed site selection process as well as the design and mitigation measures proposed will result in landscape and visual impacts that range from negligible to slight to</p>

	<p>sensitivity.</p> <p>In a low-lying and open environment, even low ridgelines are significant and it is important that development does not interrupt the integrity of primary ridgelines.</p> <p>The seascape assessment for the test sites is mainly concerned with how the scheme will affect distinct character and views as experienced from land and coastal areas. Areas may be coastal in character even if they don't have a view of the sea – for example, behind sand dunes.</p> <p>For the purpose of the assessment 3 separate geographical sea scape units were defined encompassing the entire Western coastline of the Mullet Peninsula. It was concluded that all 3 units would generally be sensitive to change, as they are currently generally undeveloped and wild in character, although clusters of houses are visible in the landscape.</p> <p>The Mayo County Development Plan 2008–2014 indicates a number of designated ecological sites within the study area. While these designations are primarily concerned with ecological issues, their potential amenity value warrants assessment in terms of landscape value.</p>	<p>moderate and from negative to neutral. Landscape, seascape and visual effects will generally be localised to the area between Annagh Head and Corraun Point.</p> <p>In very clear atmospheric and good lighting conditions there will be slight visibility of AMETS Test Area B, and to a much lesser degree AMETS Test Area A from locations on the adjacent mainland. There would also be slight visibility of the roof of the proposed substation and visibility of the access road from a small number of localised views.</p>
<p>Construction</p>	<p>The greatest visual impacts during the</p>	<p>No mitigation required</p>

	<p>construction stage would occur in the vicinity of the substation site and the location of the underground cable. These impacts would be temporary, moderate and negative.</p> <p>The construction impacts associated with the proposed offshore test areas would largely occur at sea and, while these impacts would also be temporary, there would be slight and negative visual impacts during the construction period.</p>	
<p>Operational</p>	<p>Sub-station and landfall: The main landscape change arises from the change in texture of the site grassland, along with the new road which curves to take account of the contours. While these two features would be visible to someone immediately adjacent to the site, they would not be visible from other potential points in the landscape such as Belderra Strand.</p> <p>The substation is located in an area which is described in the Mayo Landscape Appraisal as vulnerable and sensitive. While there are some residential houses in the near vicinity, the coastal location and lack of significant vegetation would result in a development being potentially highly visible and therefore impacting on the landscape character.</p> <p>The proposed substation is designed to replicate the scale of a residential house, which is appropriate in terms of</p>	<p>No mitigation required</p>

scale and design. The location takes advantage of an existing rock outcrop for screening and the proposed naturally contoured berm would extend this screening.

Considering the underlying characteristics of the landscape, the existing buildings in the immediate vicinity and the careful siting and screening of the proposal, the landscape effects arising from the substation would be low and neutral.

Test Area A: This area is potentially visible from large tracts of the coastline of the Mullet Peninsula. However visibility of this test site will be extremely low. There will be some change in the character of the landscapes and seascapes that currently experience uninterrupted views out to a wild and vast sea, but visibility of the test site from the land will only be possible under the clearest of atmospheric conditions. The nature of the development and its close relationship to the characteristics of the sea result in landscape and seascape effects that are low and neutral.

The impact of warning lighting on the marker buoys and wave energy converters will also be low, as one might expect to see occasional lighting associated with shipping or lighthouses over such distances in the sea. The impact will arise due to the

permanency of the lighting effect, as opposed to moving lights associated with shipping. Again, this lighting would only be visible from the land in the clearest of conditions.

Test Area B: This site is located in a seascape unit that is more enclosed due to the nature of the bay and the location of the island grouping around Inishglora. There are existing structures in this bay landscape including houses, roads, a graveyard and a golf course and therefore the landscape is not undisturbed. The effects here are different from the other seascape units as Test Area B would not be seen in the context of an expansive sea, but exhibits a closer relationship with the seascape of the bay. While the test site may be visible, it does not have a disproportionate effect on the character of the seascape.

The nature of the development and its close relationship to the characteristics of the sea result in Landscape and seascape effects that are moderate and neutral.

The impact of warning lighting will also be low as lighting associated with shipping or lighthouses is occasionally visible over such distances in the sea. Again, this lighting would only be visible from the coast in reasonably clear conditions.

It may be possible to view both test

sites from this seascape unit in extremely clear weather conditions; the seascape impact would remain moderate and neutral in this case.

A map of the zone of theoretical visibility indicates that the substation would be visible from areas in the immediate vicinity up to 1km distance, from the approach to Emlybeg Beach, from parts of Annagh peninsula and from parts of elevated areas more than 4km to the north.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
15	Material Assets, Fishing Industry	Receiving environment	<p>Inshore fishing activities within the project area consists mainly of brown crab and lobster fishing by members of the Erris Lobster Conservation and Restocking Association (ELCRA) and the Erris Inshore Fishermen’s Association (EIFA), and trawling by members of the Killybegs Fishermen’s Organisation (KFO).</p> <p>The test areas are located on seabed areas that are largely sandy, adjacent to hard bedrock substrate. The seabed in the transition zone between the hard rock and the sandy seabed is a recognised crab fishing zone.</p> <p>Depending on time of year, strings of crab pots may be laid in this zone.</p> <p>Lobster potting generally takes place on the shallower hard ground bedrock</p>		<p>During the construction and decommissioning phases, and during WEC deployment and recovery operations, the project’s impacts on the fishing industry in the area will be temporary in nature and of low significance overall. During the operational phase, the test area locations will effectively constitute fishing exclusion zones. The impact on the crab and lobster fishing industry will, however, be low because of the design of Test Area A following the consultation process. Test Area B, at the 50m water depth, will not impact significantly on fishing activity in the area.</p> <p>Trawling activity will also be impacted, with a reduction in access to the</p>

	<p>areas closer to the coast, Trawling is carried out in an area which comprises some 110 km². Test Area A, located at the 100m water depth contour, has the potential to impact on both the crab potting area and the trawling area. The location of the test site is constrained by the project functional requirements and in particular by the mooring requirements for the WECs. Consultation with the fishing organisations resulted in the alteration in the shape of the test area, to the proposed 'boot' shape. This allows potting activity to be carried out around the test area, on the transition zone between hard rock and sandy seabed, with minimal loss of fishing ground. There will also be some unavoidable loss of the trawling area used by the KFO. Test Area B, at the 50m water depth contour, will not impact on fishing activity to any significant extent.</p>	<p>trawling ground adjacent to Test Area A of some 9%. However, this impact, although negative, can be considered as low, given that the area is one of five such areas fished in the region and the overall impact will be small.</p>
<p>Construction</p>	<p>During the construction phase, while the test area is being established and marker buoys are being deployed and while the cables are being laid, there may be some short-term disruption to fishing activity. Cable laying is expected to take about one month overall, with each of the four cables deployed in a separate run. The cable vessel will</p>	<ul style="list-style-type: none"> • A specific communication forum will be established to facilitate consultation with and information dissemination to all stakeholders. • Advance notice of all marine operations, including cable laying, test area delineation with marker buoys, and WEC deployment, maintenance and recovery will be

	<p>generally be slow-moving and easily avoided, so the risk of collision with fishing vessels will be very low.</p> <p>The physical presence of slow-moving vessels could interrupt normal fishing practices and exclude fishermen from the area during cable laying operations, with some potential economic loss.</p>	<p>notified to all marine stakeholders.</p>
<p>Operation</p>	<p>The operational phase of the project will last 15 years, during which WECS will be deployed, tested and recovered from the test areas. This will involve movements of vessels such as barges, tugboats, support vessels and the WECS themselves, some of which may be towed into position.</p> <p>The test areas will be established by a combination of marker and special buoys and will effectively become exclusion zones for all fishing activity for the project duration. This may lead to some economic loss, but this could be offset by the creation of de facto nursery areas.</p> <p>Given the manoeuvring requirements of trawlers, the test area will result in restricted access to an area greater than that taken up by the test area itself. The estimated reduced access to the trawl area indicated west of Test Area A is approximately 9%. This trawl area is one of five areas used by the KFO between Slyne Head and Donegal Bay, so that the impact on the overall fishery</p>	<ul style="list-style-type: none"> • Information dissemination and consultation will continue throughout the operational phase. • A specific project to determine the influence of the wave energy test site on crab and lobster numbers and the effectiveness of the site as a nursery area should be established. • All operations at the test site will be governed by a strictly binding operational plan that sets out the rules for the test site users and for their interaction with other stakeholders.

		<p>will be low, but of medium duration. There may be some short-term disruption to fishing activity during WEC deployment and recovery operations, but the impact of this on the fishery will be insignificant. The test areas, with their effective exclusion on fishing activity, may result in the development of nursery areas which could enhance fish and shellfish stock. Mooring systems may also create artificial reef structures which could also lead to enhanced fish and shellfish stock in the area. Such nursery areas may lead to increased catch in future, enhancing fishermen's income on a sustainable basis.</p>	
	Decommissioning	<p>During the decommissioning phase, there may be short-term disruption to fishing activities as the marker buoys and mooring systems are removed. If the sub-sea cables are also to be lifted, there would be some additional short-term disruption of fishing activity in the area.</p>	<ul style="list-style-type: none"> • A decommissioning plan will be prepared and agreed with the Department of the Environment, Community and Local Government, Foreshore Leasing Unit. Consultation on the plan will be held with the fishing community.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
15	Material Assets, Land Use	Receiving environment	<p>The submarine electricity cables will land at Belderra Strand. A small car park has been provided at this location by Mayo County Council at this location to facilitate users of the amenity. The land area to the south, south east</p>		<p>The project will result in medium-term loss of two acres of pasture land at the substation site. It will also lead to temporary loss of use of the beach area at Belderra for a very short period during cable conduit installation. In</p>

	<p>and south west of Belderra Strand is classed mainly as pasture, with some areas of non-irrigated arable land. To the north of Belderra Strand the land is classed as beaches, dune and sand, and as sport and leisure facilities (Carne Golf Links).</p> <p>The proposed construction lay-down area will be located in a triangular area of land south of the beach and car park. The cable interface joint bay will also be located in the adjacent road and car park. The triangular area originally formed part of the foreshore; it was cut off in the 1970s by the construction of the local road and was eventually filled in by wind-blown sand.</p> <p>The substation and its access road are to be located on lands in the townland of Ballymacsherron. The existing land use at this location is agricultural pasture land.</p>	<p>addition there will be some local road closures of short duration during the landside cable trenching and construction of the cable transition joint bay. The impact of these activities will not be significant. No additional impact is predicted during the operational phase and the site will be subject to a decommissioning plan.</p>
<p>Construction</p>	<p>There will be a temporary impact on the beach area during the installation of conduits for the submarine electricity cables.</p> <p>There will also be temporary loss of amenity for the general public and other users of the Belderra Strand area. After installation of the cable duct, the beach is expected to return to its original state following a few tidal cycles – that is, within a few days.</p> <p>The cable transition joint bay will be</p>	<ul style="list-style-type: none"> • The construction area for the submarine cable ducting through the Belderra Strand will be confined to a narrow corridor to minimise the impact area on the beach itself • Construction of the conduits will also be undertaken in advance of the main cable lay operations and will be timed so that the impact on amenity users will be minimal. • Construction activities will be confined to the land-side cable

	<p>buried below ground and the surface area reinstated after construction.</p> <p>The construction of the substation and its approach road will lead to the permanent loss of two acres of pastureland at the substation site. This is small in the context of the total land bank in the area.</p>	<p>corridor, the substation location and the lay-down area.</p>
Operation	<p>Should a cable fault occur on one of the land-side cables then maintenance and repair work would need to be carried out. This could lead to temporary loss of land use in the area associated with the repair.</p>	<ul style="list-style-type: none"> The earthen embankments will be re-vegetated using local native plants and grasses and maintained during the operational phase. No additional mitigation is foreseen.
Decommissioning	<p>Decommissioning of the substation will be subject to agreement between SEAI and the Mayo County Council. Decommissioning may require the demolition of the substation building. If this occurs then the site will be restored to its original land use.</p>	<ul style="list-style-type: none"> A decommissioning plan will be prepared for approval of Mayo County Council and implemented accordingly. This will include a requirement for land use restoration.

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
15	Material Assets, Tourism	Receiving environment	The Belderra Strand in Annagh Bay is used as an amenity area both by walkers and surfers. The area is rarely used for bathing purposes due to the nature of the currents in the area. A clear warning sign indicates that the area is dangerous for bathing. A small		Although there will be some temporary loss of amenity value to the area during the construction and decommissioning stages this will be short-term and the impact will be very low. Careful design of the submarine electricity cable corridor on the approach to Belderra

	<p>car park has been provided by Mayo County Council at Belderra Strand to facilitate users of the amenity.</p> <p>In discussions with the local surfing community it was established that the waters in Annagh Bay are used regularly for</p> <ul style="list-style-type: none"> • Towed surfing, sail boarding and kite surfing (generally off Emlybeg Beach area) • Windsurfing (generally from Emlybeg Beach down to Cross Beach) • Local surfing off Belderra Strand <p>In particular the surfers were concerned at the potential impact the cable installation could have on a sand bank fronting Belderra Strand which enhances the generation of good surfing waves. This has been taken into account in the project design.</p>	<p>Strand will ensure minimum impact on the sand bank immediately offshore to the beach area.</p>
<p>Construction</p>	<p>The laying of submarine electricity cables on the approach to Belderra Strand and their subsequent ducting through the beach will lead to temporary loss of amenity use of the beach area and may disrupt tourism use of the area.</p> <p>The cable lay also has the potential to impact on the sand bank important to the surfing community.</p> <p>Traffic and other activities associated with the construction will lead to temporary impairment of the amenity</p>	<ul style="list-style-type: none"> • The sand bank that is important for surfing waves will be avoided during cable laying operations on the approach to Belderra Strand. • Construction of the conduits will also be undertaken in advance of the main cable-lay operations and will be timed so that impact on amenity users will be minimal. • The local community will be kept informed of the timing of operations to ensure minimum disruption to

		<p>value of the area but this will be of low significance as predicted traffic is well within the carrying capacity of the local roads.</p> <p>The cable-laying operation may also attract visitors to the immediate area to view the event as this will be an unusual and infrequent activity in the location involving a large cable-lay vessel.</p> <p>The overall impact will be temporary, of short duration and will not be significant.</p>	<p>normal amenity use in of the area.</p>
	Operation	<p>During the operational phase the presence of the test site may result in increased visitor numbers to the area due to the uniqueness of the facility in Ireland. It could provide a first-hand opportunity to view marine renewable resources in operation.</p>	<p>No mitigation required</p>
	Decommissioning	<p>During decommissioning, there will be some short-term disruption to the amenity value of the area.</p>	<p>No mitigation required</p>

Chapter	Title	Development phase	Predicted impacts	Mitigation	Conclusion
16	Coastal processes	Receiving environment	<p>The protection of the cable with rock armouring which will take place from beyond Test area B (50m water depth) in various linear lengths for 4 km creating in total 4 artificial reefs. These reefs will only have an elevation of 1m above the seabed and will be 2m wide. Their very small footprint and low</p>		<p>The general conclusion is that neither the construction works or the operation of the wave energy convertors will have an impact on coastal processes at the relevant locations of interest.</p>

	<p>elevation at such a relatively large water depth the overall impact is expected to be negligible.</p> <p>Scouring around anchoring systems will depend on the nature of the anchors and the mooring system but given that there will be a large separation between devices the anchors should be sufficiently spaced such that only local scouring will occur. Sediment that will be mobilised due to scouring will settle in the manner as described below. Mitigation measures may be required again depending on the nature of the anchor system.</p> <p>The stability of the coast means that allowance has to be made (when designing the cable route below the beach) for significant bed level changes or coastal protection works need to be planned.</p>		<p>There may be minor changes to wave heights under certain wave conditions after the deployment of WECs. These if they occur are not expected to have any impact on coastal processes or surfing activity.</p> <p>Wave periods and directions will not be affected by the presence of WECs.</p> <p>The laying of the cables is likely to mobilise limited sediment but the analysis has shown that it will not impact on seabed morphology and that sediment mobilised naturally by waves and currents is far more significant.</p> <p>The study indicates that surfing activity will not be affected by the development of the AMETS site.</p>
<p>Construction</p>	<p>Given the magnitude of the waves at the site, the sea bed material has high natural mobility and the limited time and space scale of the cable laying operations would have minimal impact on bed movements. In addition the cable laying method will be chosen to give low levels of sediment mobilisation. Therefore the calculations carried out firstly show</p>	<ul style="list-style-type: none"> • The cable laying method will be chosen to give low levels of sediment mobilisation. 	

	<p>that the bed material is naturally mobile based on the forcings that result in an exceedance of the threshold of motion and secondly that any sediment that is mobilised by the cable laying operations will quickly settle back on the seabed.</p>	
<p>Operation</p>	<p>Due to its offshore location it requires a significant deployment of WECs in Test area A (5 Pelamis and 5 Wavebob devices) to give a wave height change of 0.8%.</p> <p>In the simulations for Test B site, modelled data output for the 28m water depth location indicated a maximum wave height change of 1.5% occurs. This is a relatively insignificant change and is likely to reduce further as the waves propagate onwards towards the shore and continue to lose energy.</p> <p>For the most conservative, worst case scenario of an array of 5 Pelamis's and 5 Wavebobs in Test area A + 2 Ocean Energy devices in Test area B the maximum order of change is only 2.7%. These changes are not deemed to be significant on terms of altering the nature of the inshore wave conditions.</p> <p>For all simulation setups the wave periods and wave directions did not change from the baseline conditions.</p> <p>Therefore given the conservative nature of the modelling process it can be stated that nearshore waves will</p>	<p>No mitigation required.</p> <ul style="list-style-type: none"> •

	<p>essentially be unaffected by the presence of WECs. Studies by Halcrow and Millar et al for the Wave Hub site in Cornwall have indicated significantly higher potential changes than shown in this study.</p>	
	<p>Longer swell wave periods ($T_z > 10s$) are usually more favoured by surfers and for these periods WECs only extract small amounts of energy so offshore devices will have no impact on these waves.</p> <p>Changes of less than 1% occur for the 2 surf locations considered at Belderra and Emly beach. Obviously the impacts of WECs become less as energy is being lost by the waves by the various shallow water wave processes (breaking, refraction etc.).</p>	No mitigation required.
Decommissioning	<p>Similarly as for the construction phase, given the magnitude of the waves at the site, the sea bed material has high natural mobility and the limited time and space scale of the decommissioning operations would have minimal impact on bed movements.</p>	No mitigation required.

