

Potential key interactions between tidal stream energy installations and the receiving environment

Development phase	Activity	Impact mechanism	Interactions with the physical environment	Interactions with the biological environment	Interactions with conservation (ecological designations, natural heritage, anthropogenic heritage etc.)	Interactions with the socio-economic environment
Preparatory works	Surveying	Disturbance of seabed through sampling	Minor impacts may result from baseline environmental surveys. For example, localised loss of substrates, plants and animals on the seabed through coring, boring and grab sampling, disruption to mammals from seismic and other vessel-based surveys.			Local contractors and scientific experts can be employed to conduct and support baseline surveys for example, vessel operators, consultants and divers etc.
		Noise disturbance through increased vessel activity and sonar / seismic surveying	No key interactions anticipated	Potential harm to fish species	Disruption of marine mammal behaviour	No key interactions anticipated
	Site preparation	Disruption of seabed and water column during and after dredging	Areas of the seabed may be dredged affecting seabed morphology and increasing water turbidity	Plants and animals may be removed and directly impacted by any dredging prior to construction	Protected migratory fish species and protected predatory bird species may be affected.	Temporary disruption to other sea users and navigation resulting from vessel activity and marine works.
Construction, installation and commissioning	Transporting tidal stream device /support structures to site	Physical presence of vessels and associated equipment/structures	No key interactions anticipated	No key interactions anticipated	Potential disturbance to marine mammals	Increased risk to other vessels from slow towing of large objects.
		Local business and employment opportunities	No key interactions anticipated	No key interactions anticipated	No key interactions anticipated	Potential economic benefits from utilisation of local resources, support companies and services
	Mooring and infrastructure installation	Disturbance to seabed and water column through installation of gravity anchors	Localised impact on seabed morphology – cuttings will become established on the seabed. These may subsequently be distributed over a wider area. Re-suspension of particulate matter into the water column	Direct localised impact on seabed habitats and species Gravity anchors may become colonised	Assuming all the relevant baseline studies have been efficiently completed, no impacts are anticipated	Loss of fishing grounds Fish may aggregate towards structures away from traditional fishing areas Additional hazard to navigation
		Disturbance to seascape and generation of noise through piling (if required)	No key interactions anticipated	No key interactions anticipated	Underwater noise may impact marine mammal species over significant distances	Unfamiliar vessels and superstructures associated with onsite fabricating and installation will be visible within the local seascape for extended periods of time
		Local business and employment opportunities	No key interactions anticipated	No key interactions anticipated	No key interactions anticipated	Potential economic benefits from utilisation of local resources, support companies and services
	Tidal stream device installation and commissioning	Introduction of moving parts into the water column	No key interactions anticipated	Potential interactions with fish species	Potential interactions with marine mammals and protected diving bird species	Potential for entanglement of 3 rd party moorings and fishing gear.

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Operation and maintenance	Extraction of energy from the tide	Reduction in tidal current energy downstream of the installation	Increased sediment settlement in predominantly downstream area Changes in local hydrographic conditions including tidal current profile over the seabed	Potential surface smothering of existing seabed species and habitats Potential alterations to seabed communities through reduction in water flow	No key interactions anticipated	No key interactions anticipated
	Sustained physical presence of tidal stream device, moorings and support structures at sea	Introduction of structures onto the seabed	Scouring may occur around structures on the seabed	Fish may aggregate around structures and increased predator activity may result.	Protected marine mammals may be enticed towards installation by aggregating food sources	Sustained additional hazard to other sea users Sustained exclusion of other vessels including fishing boats from around some installations
		Introduction of structures into the water column	Hydrographic conditions may be affected by the presence of structures in the water column	Fish may aggregate around structures and increased predator activity may result	Protected marine mammals may be enticed towards installation by aggregating food sources	Sustained exclusion of other vessels including fishing boats from around some installations Sustained additional hazard to other sea users
		Introduction of structures on the water surface	Wave action may potentially be reduced downwind of any large surface piercing structures Potential impact on coastal processes i.e. erosion and sediment transport	Birds may roost on surface piercing structures Potential changes to intertidal and sublittoral habitats resulting from any reduced wave action	Protected intertidal and foreshore community structures may be altered due to any reduced wave action and storm effects	Sustained presence of device(s) on the seascape Sustained exclusion of other vessels including fishing boats from around some installations Sustained additional hazard to other sea users Potential reduction in affects of coastal erosion and storm surge damage Potential effects on anchoring, sailing and other maritime activities within any wave shadow
		Production of Electro-magnetic Fields (EMF)	No key interactions anticipated	Electrical and magnetic interference with movements of fish species e.g. sharks and rays	EMF may affect protected species passing through the vicinity of the installation	Fisheries dependent on vulnerable species may be affected May be some implications for local divers
	Generation and transmission of electricity	Generation of underwater noise	No key interactions anticipated	Localised avoidance by some fish species	Protected species foraging and migrating within the water column may be harmed/disrupted Noise from installation during operation may affect the normal behaviour of marine mammals in the area	Potential effects on those dependent upon affected species Potential effects on local diving activities
		Reduction of greenhouse gas and exhaust emissions from fossil fuel combustion	Reduction in air pollution and atmospheric anthropogenic greenhouse gasses	Ecological effects resulting from greenhouse gas emissions and air pollution will be reduced		Local communities may benefit from any revenue generated from the development The social and economic impacts of climate change will be mitigated
		<ul style="list-style-type: none"> Local business and employment opportunities 	<ul style="list-style-type: none"> No key interactions anticipated 	<ul style="list-style-type: none"> No key interactions anticipated 	<ul style="list-style-type: none"> No key interactions anticipated 	<ul style="list-style-type: none"> No key interactions anticipated

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Accidental events	Incident leading to chemical spill	Chemical pollution	Local/widespread changes in water and sediment chemistry	Species and habitats may be harmed and damaged by chemical pollution		Chemical pollution may affect other sea users for example; fish farmers, tourists and mariners etc.
	Incident leading to oil/fuel spill	Oil pollution	Transitory oil slicks on surface waters and risk of long-term seabed and shoreline pollution	Species and habitats may be harmed and damaged by oil pollution		Oil pollution may affect other sea users for example; fish farmers, tourists and mariners etc.
	Loss of equipment / structural components	Disruption to the seabed from sinking debris	Changes to the seabed profile and sediment composition	Localised disruption to seabed species and habitats.		Additional hazard to navigation, disruption of fishing grounds
		Disruption of surface waters and shorelines from floating debris	No significant impact	Disruption to shoreline habitats through smothering and harm to species through ingestion/entanglement		Loss of amenity value, disruption to intertidal fisheries
Decommissioning	Total removal of installation	Reversion to baseline hydrographic conditions	Dispersal of any accumulated sediments around installation Loss of any calming effects around installation and in coastal waters	Potential disruption to ecosystems established and adapted to post-installation hydrographic conditions	Protected intertidal and foreshore communities adapted to post-installation structures may be altered due to any increased wave action and storm effects Protected species foraging and migrating within the water column may be disrupted	Loss of benefits gained from any wave shadow effects to intertidal / inshore fisheries etc
		Local business and employment opportunities	No significant additional impact anticipated	No significant additional impact anticipated		Potential economic benefits from utilisation of local resources, support companies and services
	Replacement of tidal stream device	Local business and employment opportunities	No significant additional impact anticipated	No significant additional impact anticipated		Potential economic benefits from utilisation of local resources, support companies and services