THISTLE WIND PARTNERS

Ayre Offshore Wind Farm Offshore EIA Report

Volume 2, Chapter 19: Marine Archaeology

TWP-AYR-RPS-OFE-RPT-00036 | November 2025

Contents

List of Tables

List of Figures

Glossary

Defined Term	Definition
Additional Mitigation	Also referred to as secondary mitigation which is defined by The Institute of Sustainability and Environmental Professionals (ISEP) (formerly Institute of Environmental Management and Assessment (IEMA) as: Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the EIA Report (sic).
Applicant (the)	Ayre Offshore Wind Farm Limited (AOWFL).
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located.
Ayre Offshore Wind Farm (OWF) Limited (AOWFL)	A Special Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. AOWFL are the Applicant for the Offshore Application.
Crown Estate Scotland (CES)	Public corporation accountable to Scottish Government, responsible for the management of land and property in Scotland owned by the monarch.
Cultural Significance	Cultural significance means aesthetic, historic, scientific or social value for past, present or future generations. Cultural significance can be embodied in a place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.
Cumulative Effects	The effects of the Proposed Development assessed together with effects from the Onshore Infrastructure forming the Project as well as one or more different projects on the same receptor/resource.
Effect	Term used to express the consequence of an impact i.e. the result of change or changes on specific environmental resources or receptors. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.
Embedded Mitigation	Measures that are adopted as part of the Proposed Development and therefore assessed within the EIA. The proposed approach for the EIA for the Proposed Development is that Embedded Mitigation includes both primary mitigation and tertiary mitigation. These are defined by the ISEP as follows: Primary: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken. Tertiary: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
Environmental Impact Assessment (EIA)	Assessment of the potential likely significant effects of the Proposed Development on the physical, biological, and human environment during construction, Operations and Maintenance (O&M) and decommissioning.

Defined Term	Definition
Environmental Impact Assessment Regulations (EIA Regulations)	Terminology used in the Offshore EIA Report to refer to three sets of regulations: • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and • The Marine Works (Environmental Impact Assessment) Regulations 2007.
Exclusive Economic Zone (EEZ)	An area from the outer limit of the territorial sea up to 200 nm from the coastal baseline, over which a sovereign state has rights regarding marine resources.
Export Cable Corridor	The area seaward of Mean High Water Springs (MHWS), which connects the Array Area with the Landfall area within which the Offshore Export Cables will be installed.
High Voltage Alternating Current (HVAC)	A system of power transmission and distribution that utilises alternating current at voltages typically exceeding 1000 volts, as defined by the International Electrotechnical Commission (2015). HVAC systems are designed to efficiently deliver electricity over long distances with minimal losses, leveraging transformers to modify voltage levels.
Impact	A change caused by an action that occurs during a project's lifetime.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the Offshore Substation Platforms (OSPs).
Inter-Related Effects	The potential effects of multiple impacts from the construction, O&M and decommissioning of the Project, affecting one receptor.
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Intertidal Area	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the intertidal area (see definition above) at Sinclair's Bay.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate - Licensing and Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Seas. The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Mean High Water Springs (MHWS)	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.

Defined Term	Definition
Mean Low Water Springs (MLWS)	The average tidal height throughout the year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.
National Grid	The national electricity transmission network.
Offshore Environmental Impact Assessment (EIA) Report (hereafter, 'Offshore EIA Report')	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. Submitted to support the Offshore Application for the Proposed Development.
Offshore Export Cable	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cables terminate, and the onshore cabling begins.
Offshore Generation Assets	The infrastructure of the Proposed Development required to generate electricity comprising of the Wind Turbines, Wind Turbine foundations and associated infrastructure e.g. IACs.
Offshore Scoping Report	The Report that presents the findings of the EIA scoping process undertaken for the Proposed Development with the purpose of obtaining a Scoping Opinion. The Report defines what is intended to be assessed and reported as part of the EIA.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Offshore Transmission Assets	The infrastructure of the Proposed Development required to transmit the generated electricity comprising of the OSPs, Offshore Export Cables and associated infrastructure up to MHWS.
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including interconnector and IACs), scour protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, and replacement of access ladders.
Palaeocoastline	A former coastline of a past geologic age.
Palaeolandscape	Topographic features of a past geological age.
Pathway	Describes the means or route by which a receptor (such as the coast) can be affected by an identified impact source (such as Wind Turbine foundations in the water column).
Physical Processes	The collective term for the following: hydrodynamics (water levels and currents); winds and waves; stratification and frontal systems; geology and seabed sediments (including sediment transport); seabed geomorphology; and coastal geomorphology.
Piling	The action of installing piles: installation can use various methodologies, the most common of which are impact piling (in which the piles are struck by a 'hammer') and drilling (during which a hole is drilled into the seafloor, the drilling tool is removed, and the pile is slotted into that hole).

Defined Term	Definition
Plan Option Area (POA)	A location identified in the SMP as a preferred area for commercial scale offshore wind development.
Project (the)	An overarching term for the Ayre Offshore Wind Farm comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore Grid Connection Point. The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Infrastructure.
Project Design Envelope (PDE)	A description of the range of possible elements that make up the design options for the Proposed Development under consideration when the exact engineering parameters are not yet known.
Quaternary	The period of geologic time from about 1.8 million years ago to the present, including the part of the Pleistocene (2.58 million to 11,700 BP) and Holocene (11,700 BP to present) Epochs.
Recorded Loss	Dataset entry of a maritime or aviation record that has no specific location attached to them but are given often arbitrary spatial attribution.
Scoping Opinion	A document produced by MD-LOT which is issued in response to submission and review of the scoping report. The scoping opinion is supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Scottish Local Authority	A council constituted under Section 2 of the Local Government etc. (Scotland) Act 1994, providing public services, including planning, and is accountable to their local electorate.
Scottish Marine Area	The area of sea within the seaward limits of the sea of the United Kingdom adjacent to Scotland as defined by the Marine (Scotland) Act 2010.
Scottish Ministers (the)	The decision makers with regard to Marine Licence(s) and Section 36 Consent applications in Scottish Offshore and Territorial Waters.
Scottish Offshore and Territorial Waters	These include territorial waters extending 12 nautical miles from the low water line along the coast, waters as defined in the Scottish Adjacent Waters Boundaries Order 1999, the Scottish Zone of the UK Exclusive Economic Zone, and waters included in the Scottish Offshore Marine Region.
ScotWind Leasing Round	A seabed leasing round run by CES to grant property rights for the seabed in Scottish waters for new commercial scale offshore wind project development. ScotWind Leasing must be sited within POA of the SMP.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Sectoral Marine Plan Iterative Plan Review (SMP IPR)	The iterative plan review process as new information becomes available (e.g. consented projects, environmental data, cumulative effects assessment, etc).

Defined Term	Definition
Setting	Setting is more than the immediate surroundings of a site or building, and may be related to the function or use of a place, or how it was intended to fit into the landscape or townscape, the view from it or how it is seen from areas round about, or areas that are important to the protection of the place, site or building. 'Setting' is the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Site Boundary	The boundary within which all elements of the Proposed Development will be located. The Site Boundary comprises the Array Area and Export Cable Corridor which ends at MHWS.
Study Area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Project may be experienced by the relevant receptors (i.e. Zone of Influence).
Thistle Wind Partners (TWP)	The Joint Venture (JV) of DEME Concessions, Qair Marine, and Aspiravi International that have partnered to develop the Project.
United Kingdom Hydrographic Office (UKHO) "Dead" record	In the UKHO dataset, previously identified material that has since not been detected by repeated surveys, therefore considered to no longer exist at the given location. It may be that the material has become buried, dispersed or has disintegrated over time.
UKHO 'Live' Record	Material that has been positively identified on the seabed and reported to UKHO, for example through geophysical survey or diver report.

Acronyms

Acronym	Definition
2D-UHRS	Two Dimensional – Ultra High Resolution Seismic
AD	Anno Domini
AEZ	Archaeological Exclusion Zone
AMAAA	Ancient Monuments and Archaeological Areas Act 1979
AOWFL	Ayre Offshore Wind Farm Limited
ASBL	Absolute Seabed Level
BC	Before Christ
BGS	British Geological Survey
BP	Before Present
CEA	Cumulative Effects Assessment
CES	Crown Estate Scotland
CMS	Construction Method Statement
CoCP	Code of Construction Practice
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
HEPS	Historic Environment Policy for Scotland
HER	Historic Environment Record
HES	Historic Environment Scotland
HMPA	Historic Marine Protected Area
HMS	His/Her Majesty's Ship
IAC	Inter-Array Cable
IEMA	Institute of Environmental Management and Assessment (now ISEP)
ISEP	Institute of Sustainability and Environmental Professionals (formerly IEMA)
MBES	Multibeam Echosounder
MCA	Maritime and Coastguard Agency
MD	Marine Directorate
MD-LOT	Marine Directorate - Licensing Operations Team
MDS	Maximum Design Scenario
MFE	Mass Flow Excavator
MHWS	Mean High Water Spring
MLWS	Mean Low Water Spring
MPA	Marine Protected Area
MPS	Marine Policy Statement
MSA	Merchant Shipping Act 1995
NMP	National Marine Plan
NRHE	National Record of the Historic Environment

Acronym	Definition
OIRMP	Orkney Islands Regional Marine Plan
OSP	Offshore Substation Platforms
OWF	Offshore Wind Farm
O&M	Operation and Maintenance
PAD	Protocol for Archaeological Discoveries
PDE	Project Design Envelope
PMRA	Protection of Military Remains Act 1986
PWA	Protection of Wrecks Act 1973
ROV	Remotely Operated Vehicle
RoW	Receiver of Wreck
SBP	Sub-bottom Profiler
SMP	Sectoral Marine Plan
SSC	Suspended Sediment Concentration
SSS	Side Scan Sonar
TCE	The Crown Estate
TEZ	Temporary Exclusion Zones
TSHD	Trailer Suction Hopper Dredger
TWP	Thistle Wind Partners Limited
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UXO	Unexploded Ordnance
WSI	Written Scheme of Investigation

19 Marine Archaeology

19.1 Introduction

19.1.1 This chapter of the Offshore Environmental Impact Assessment (EIA) Report presents the assessment of the likely significant environmental effects on marine archaeology, that may potentially occur as a result of the offshore infrastructure associated with the Ayre Offshore Wind Farm Project (hereafter referred to as the Proposed Development) during the construction, Operations and Maintenance (O&M) and decommissioning phases.

19.1.2 The assessment presented is informed by the following chapters and technical reports:

- Volume 2, Chapter 7: Physical Processes;
- Volume 3, Technical Appendix 7.1: Physical Processes Technical Report;
- Volume 3, Technical Appendix 7.3: Physical Processes Technical Assessment;
- Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report; and
- Volume 4, Appendix 33: Written Scheme of Investigation (WSI) and Protocol for Archaeological Discovery (PAD).

19.2 Marine Archaeology Study Area

19.2.1 The Marine Archaeology Study Area is shown in Figure 19.1 and is defined as the Site Boundary with an additional 2 km buffer. This encompasses all elements of the Array Area and Export Cable Corridor. This Marine Archaeology Study Area allows for the capture of inaccurately or imprecisely geolocated assets, a larger zone of influence for indirect effects and puts relevant archaeological assets in a broader archaeological context.

19.2.2 The Marine Archaeology Study Area extends seawards from MHWS and also includes the Intertidal Area.

19.2.3 The area subject to site-specific geophysical survey is coterminous with neither the Marine Archaeology Study Area nor the Site Boundary and is referred to as the Marine Archaeology Survey Area (Figure 19.1).

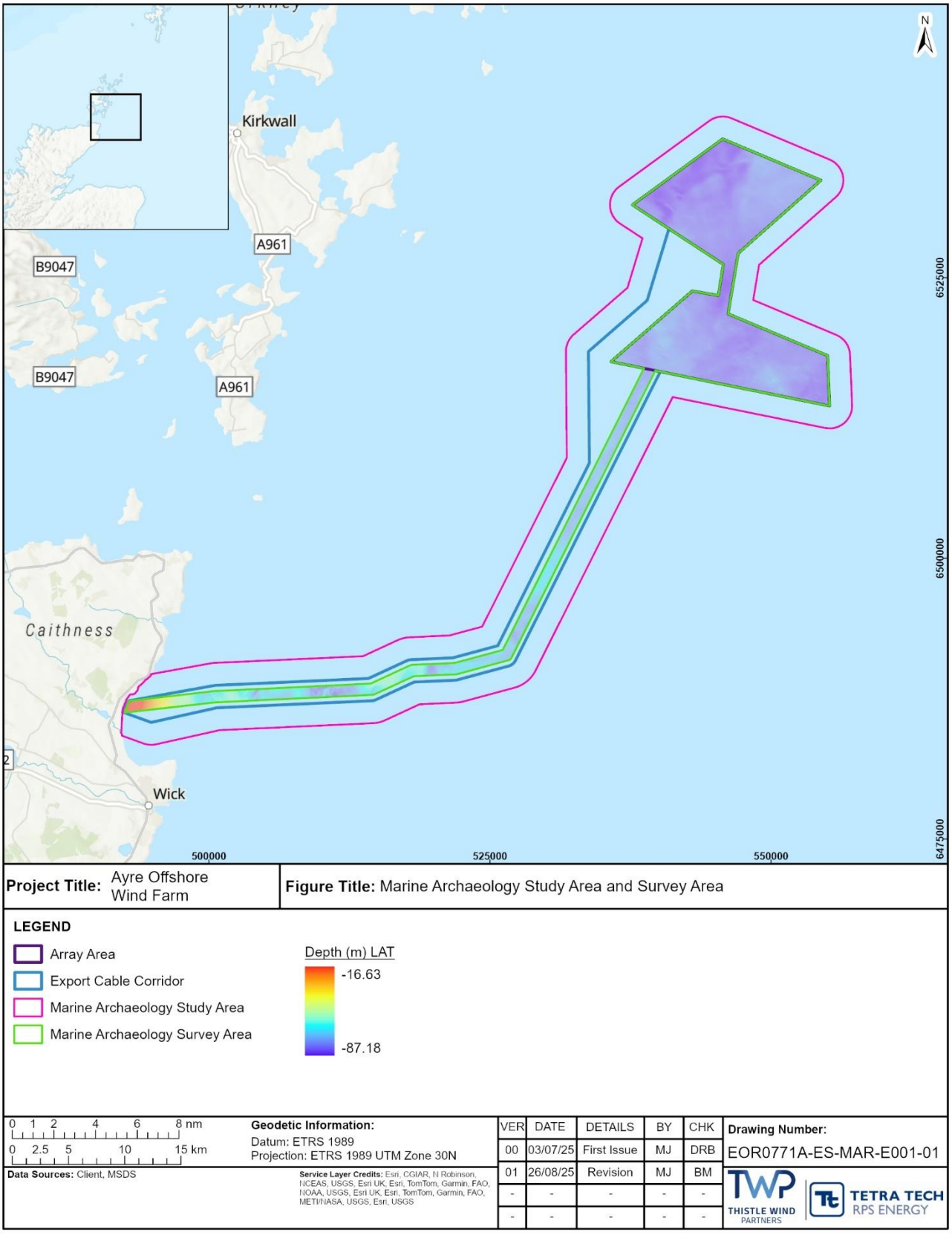

Figure 19.1: Marine Archaeology Study Area and Survey Area

19.3 Legislative and Policy Context

19.3.1 The overarching policy and legislation applicable to the Proposed Development is presented in Volume 1, Chapter 2: Policy and Legislation. A summary of the legislative provisions relevant to marine archaeology are provided in Table 19.1 below, with other relevant policy provisions set out in Table 19.2. These are summarised here with further detail presented in Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report.

19.3.2 This section sets out the legislation, policy, guidance and any development plans relevant to marine archaeology in the context of offshore renewable energy development to provide and appropriate context for the baseline assessment.

19.3.3 The Scottish Territorial Seas is classed as the area of sea adjacent to Scotland that extend out to 12 nm of the coastline. Scottish Offshore Waters include any area of sea beyond 12 nm, which is within the Exclusive Economic Zone (EEZ) and the United Kingdom (UK) sector of the continental Shelf (up to 200 nm).

19.3.4 Within the Scottish Marine Area the following legislation applies to marine archaeology:

- The Protection of Wrecks Act 1973;
- The Ancient Monuments and Archaeological Areas Act 1979;
- The Protection of Military Remains Act 1986;
- The Merchant Shipping Act 1995; and
- The Marine (Scotland) Act 2010.

19.3.5 Beyond the Scottish Marine Area, archaeology is subject to the following legislation:

- The Merchant Shipping Act 1995; and
- The Protection of Military Remains Act 1986.

19.3.6 International policy and legislation to which marine archaeology is subject includes the United Nations Convention on the Law of the Sea 1982 (United Nations, 1982), the European Convention on the Protection of Archaeological Heritage (Council of Europe, 1992 (the Valetta Convention)) and the United Nations Educational, Scientific and Cultural Organisation's (UNESCO) Convention on the Protection of Underwater Cultural Heritage 2001 (UNESCO, 2001).

Legislation

Table 19.1: Summary of Legislation Relevant to Marine Archaeology and Where it Has Been Considered in This Report.

Summary of relevant legislation	How and where considered in the EIA Report
Protection of Wrecks Act 1973 (PWA) **Section 2 of the PWA provides protection for wrecks that are designated as dangerous due to their contents and is administered by the Maritime and Coastguard Agency (MCA) through the Receiver of Wreck (RoW).** **Section 1 of the PWA was superseded in Scotland by the Marine (Scotland) Act 2010.**	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. There are no wrecks protected under the PWA in the Marine Archaeology Study Area.
Ancient Monuments and Archaeological Areas Act 1979 (AMAAA) **Scheduled Monuments and Areas of Archaeological Importance or their equivalent are afforded statutory protection by the Secretary of State, and consent is required for any works impacting them. The AMAAA was primarily terrestrial, but in recent years it has also been used to provide protection for underwater sites.**	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. There are no scheduled monuments in the Marine Archaeology Study Area.
Protection of Military Remains Act 1986 (PMRA) **Under the Protection of Military Remains Act 1986, all aircraft that have crashed in military service are automatically protected as a "protected place". Named vessels can also be designated even if the position of the wreck is not known.** **The wreck of any maritime vessels or aircraft lost during military service can also be designated as a "controlled site".** **Outside UK territorial waters the Act applies to British citizens, subjects and registered companies.**	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is summarised in Section 19.6. There is one wreck protected under the PMRA present in the Marine Archaeology Study Area. Should material from an aircraft which crashed whilst in military service be present in the Marine Archaeology Study Area it will be automatically subject to legal protection under the PMRA. The Embedded Mitigation to be adopted as part of the Proposed Development (Section 19.9) includes an Archaeological Exclusion Zone (AEZ) around the wreck protected under the PMRA, and the development of and adherence to a WSI and PAD (Volume 4, Appendix 33) which outlines the reporting procedure for archaeological discoveries including aircraft material to the Ministry of Defence.
Merchant Shipping Act 1995 (MSA) **This Act details the procedures for determining the ownership of maritime finds that turn out to be 'wreck'. 'Wreck' is defined as any flotsam, jetsam, derelict and lagan and includes all craft, parts of these, their cargo or equipment.** **Section 236 of the MSA stipulates that all wreck within the UK's territorial waters (up to 12 nm) and any wreck landed in the UK from**	The Embedded Mitigation adopted as part of the Proposed Development (Section 19.9) includes the development of and adherence to a WSI and PAD (Volume 4, Appendix 33). The WSI details the procedure for contacting and reporting to the RoW.

Summary of relevant legislation	How and where considered in the EIA Report
outside the UK's territorial waters must be declared to the RoW. If any wreck is recovered, the RoW must be notified, and the wreck material must be kept until the RoW determines ownership or requests that they be given to the RoW. All items which are raised from the seabed, regardless of age or importance, must be reported to the RoW who will act to settle questions of ownership and salvage.	
Marine (Scotland) Act 2010 **This Marine (Scotland) Act states that an area may be designated as an Historic Marine Protected Area (HMPA) if Scottish Ministers consider it desirable to preserve a marine historic asset if it is located within the area. The Marine (Scotland) Act 2010 has superseded Section one of the PWA in Scotland.**	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. There are no HMPAs in the Marine Archaeology Study Area.

Policy

The relevant policy provisions of the Marine Policy Statement (MPS) (UK Government, 2011), Sectoral Marine Plan (SMP) (Scottish Government, 2020), Scottish National Marine Plan (NMP) (Scottish Government, 2015), the Historic Environment Policy for Scotland (HEPS) (Historic Environment Scotland, 2019b), the Pilot Pentland Firth, Orkney Waters Marine Spatial Plan (Marine Scotland, 2016) and the draft Orkney Islands Regional Marine Plan (OIRMP) (Orkney Islands Council, 2024) are described below in the following tables; Table 19.2, Table 19.3, Table 19.4, Table 19.5,

19.3.7 Table 19.6 and Table 19.7.

Table 19.2: Summary of Provisions Within the MPS Relevant to Marine Archaeology

Summary of relevant policy	How and where considered in this Offshore EIA Report
MPS Paragraph 2.6.6.3 Heritage assets in the marine environment "*should be conserved through marine planning in a manner appropriate and proportionate to their significance" and "opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost".*	This Offshore EIA Report has assessed the impacts on all known and potential heritage assets within the Marine Archaeology Study Area using their archaeological significance (i.e. their value) to determine the sensitivity of the receptor (Section 19.7). The Embedded Mitigation adopted as part of the Proposed Development, including archaeological analysis of any future geophysical surveys to be undertaken and the reporting of discoveries of heritage assets through the PAD, will produce new archaeological data and understanding of our past (Section 19.9).
MPS Paragraph 2.6.6.5 "*The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them [non-designated heritage] subject to the same policy principles as designated heritage*	This Offshore EIA Report has assessed the impacts on all known and potential heritage assets within the Marine Archaeology Study Area using their archaeological significance (i.e. their value) to determine the sensitivity of the receptor (Section 19.8). A precautionary approach has been taken where undesignated sites are

Summary of relevant policy	How and where considered in this Offshore EIA Report
assets…based on information and advice from the relevant regulator and advisers"	considered as of equivalent archaeological significance to designated sites until further information can lead to an updated assessment of their significance (Section 19.10).

Table 19.3: Summary of Provisions Within the SMP Relevant to Marine Archaeology

Summary of relevant policy	How and where considered in this Offshore EIA Report
SMP Section 4.1 "*The following types of potential negative impacts… will require further consideration (in addition to any specific potential impacts appropriate to the proposed development) at a project-level… loss of/damage to historic environment features and their settings*".	The loss of and damage to historic environment features have been assessed as part of the assessment of significant effects in Section 19.10 of this chapter. The impacts on the setting of onshore heritage assets are assessed in Volume 2, Chapter 21: Cultural Heritage.

Table 19.4: Summary of Provisions Within the Scottish NMP of Relevance to Marine Archaeology

Summary of relevant policy	How and where considered in this Offshore EIA Report
NMP Policy GEN 6 "*Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance.*"	This Offshore EIA Report has assessed the impacts on all known and potential heritage assets within the Proposed Development using their archaeological significance (i.e. their value) (Section 19.10). Embedded Mitigation adopted as part of the Proposed Development will ensure protection of heritage assets in a manner proportionate to their significance (i.e. their value) (Section 19.9).
NMP Section 4.23 "*Marine planners and decision makers should consider implications and opportunities for the historic environment taking into account the potential impacts of development and use on:* ***Designated heritage assets – representing sites of national or international significance for which statutory requirements apply. Designated assets should be protected in situ within an appropriate setting. Substantial loss or harm to designated assets should be exceptional and should only be permitted if this is necessary to deliver social, economic or environmental benefits that outweigh the harm or loss*** ***Undesignated heritage assets – those that meet designation criteria or make a positive contribution should also be protected in situ, wherever possible, and consideration given to the potential for new discoveries of historic or archaeological interest to arise.*"**	The marine archaeology baseline, which includes all known maritime vessels in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report. There is one site designated under the PMRA present in the Marine Archaeology Study Area. Known undesignated heritage assets are protected *in situ* through the implementation of AEZs (Section 19.9). The potential for new discoveries to arise has been discussed in the marine archaeology baseline (Section 19.6). Embedded Mitigation for the reporting and protection of currently unknown archaeological receptors is included in Section 19.9.

Summary of relevant policy	How and where considered in this Offshore EIA Report
NMP Section 4.24 Proposals for development that may "*affect the historic environment should provide information on the significance of known heritage assets and the potential for new discoveries to arise. They should demonstrate how any adverse impacts will be avoided, or if not possible, minimised and mitigated. Where it is not possible to minimise or mitigate impacts, the benefits of proceeding with the proposal should be clearly set out*"	The significance of all known heritage assets within the Marine Archaeology Study Area and the potential for as yet unknown archaeological material to be encountered is presented in Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report and summarised in Section 19.6 below. Avoidance is the preferred approach to known heritage assets, as such, the Applicant will adopt AEZs around anomalies identified through the geophysical survey to be of medium or high archaeological potential so that there is no potential for direct damage to these receptors (Section 19.9) where appropriate to do so. The Applicant has also committed to measures to report the discovery of currently unknown receptors through the PAD, and to measures to avoid or mitigate any impacts on these receptors, including through avoidance by the application of Temporary Exclusion Zones (TEZs) if appropriate (Section 19.9). The methods of reducing and mitigating unavoidable direct impacts, i.e. avoidance is not possible, are set out in Section 19.9. Further details of all these measures are contained in Volume 4, Appendix 33: Written Scheme of Investigation and Protocol for Archaeological Discovery.
NMP Section 4.25 "*Where the case for substantial change to heritage asset is accepted, marine decision-making authorities should require applicants to undertake suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost, in a manner proportionate to that significance*"	The Embedded Mitigation adopted as part of the Proposed Development, including archaeological analysis of any future geophysical surveys to be undertaken and the reporting of discoveries of heritage assets through the PAD will produce new archaeological data and understanding of our past (Section 19.9). The methods of reducing and mitigating unavoidable direct impacts are set out in Section 19.9. Such measures will be done on a case-by-case basis, in consultation with Marine Directorate - Licensing Operations Team (MD-LOT), but could include, *inter alia*, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor.

Table 19.5: Summary of Provisions Within the HEPS of Relevance to Marine Archaeology

Summary of relevant policy	How and where considered in this Offshore EIA Report
HEP2 "*Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations.*"	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. Embedded Mitigation adopted as part of the Proposed Development will ensure protection of

Summary of relevant policy	How and where considered in this Offshore EIA Report
	heritage assets in a manner proportionate to their significance (i.e. their value) (Section 19.9).
HEP4 "*Changes to specific assets and their context should be managed in a way that protects the historic environment. Opportunities for enhancement should be identified where appropriate. If detrimental impact on the historic environment is unavoidable, it should be minimised. Steps should be taken to demonstrate that alternatives have been explored, and mitigation measures should be put in place.*"	Embedded Mitigation is set out in Section 19.9. The Embedded Mitigation adopted as part of the Proposed Development, including archaeological analysis of any future geophysical surveys to be undertaken and the reporting of discoveries of heritage assets through the PAD, will produce new archaeological data and understanding of our past (Section 19.9). The methods of reducing and mitigating unavoidable direct impacts are set out in Section 19.9. Such measures will be done on a case-by-case basis, in consultation with MD-LOT, but could include, *inter alia*, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor.

Table 19.6: Summary of Provisions Within the Pilot Pentland Firth and Orkney Waters Marine Spatial Plan of Relevance to Marine Archaeology

Summary of relevant policy	How and where considered in this Offshore EIA Report
General Policy 6: Historic Environment ***"Development(s) and/or activities with potential to have an adverse effect on the archaeological, architectural, artistic or historic significance of heritage assets, including their settings, will be expected to demonstrate that all reasonable measures will be taken to mitigate any loss of significance, and that any lost significance which cannot be mitigated is outweighed by social, economic, environmental, navigation or safety benefits."***	This Offshore EIA Report has assessed the impacts on all known and potential heritage assets within the Marine Archaeology Study Area using their archaeological significance (i.e. their value) to determine the sensitivity of the receptor (Section 19.7). The Embedded Mitigation adopted as part of the Proposed Development, will mitigate any loss of significance (Section 19.9).
General Policy 6: Historic Environment ***"Preservation in situ will always be the preferred form of mitigation. The results of any mitigation measures must be published in an agreed format, and all supplementary material lodged with an agreed publicly accessible archive."***	Avoidance (i.e. preservation *in situ*) is the preferred approach to known heritage assets, as such, the Applicant will adopt AEZs around anomalies identified through the geophysical survey to be of medium or high archaeological potential so that there is no potential for direct damage to these receptors (Section 19.9). A WSI and PAD has been prepared alongside this Offshore EIA Report which sets out publication and archiving procedures (Volume 4, Appendix 33).
General Policy 6: Historic Environment ***"Heritage assets of very high significance should be protected from all but minor adverse effects to their significance unless there are overwhelming social, economic or environmental benefits from the development(s) and/or activities. For these sites the highest levels of mitigation will be required. This includes sites where there is***	There is one wreck protected under the PMRA present in the Marine Archaeology Study Area. The Applicant will adopt AEZs around this and anomalies identified through the geophysical survey to be of medium or high archaeological potential so that there is no potential for direct damage to these receptors (Section 19.9). Should material from an aircraft which crashed whilst in military service be present in the Marine

Summary of relevant policy	How and where considered in this Offshore EIA Report
a substantial likelihood of the survival of human remains, and protected sites"	Archaeology Study Area it will be automatically subject to legal protection under the PMRA.
General Policy 6: Historic Environment ***"Proposals for development(s) and/or activities that may affect the historic environment should provide information on the significance of known heritage assets and the potential for new discoveries to arise. They should demonstrate how any adverse impacts will be avoided, or if not possible minimised and mitigated. Where it is not possible to minimise or mitigate impacts, the benefits of proceeding with the proposal should be clearly set out"***	Significance of known heritage assets has been used to determine the sensitivity of the receptors in the EIA (Section 19.10). The potential for new discoveries to arise has been discussed in the marine archaeology baseline (Section 19.6). Embedded Mitigation including avoidance is set out in Section 19.9.

Table 19.7: Summary of Provisions Within the OIRMP of Relevance to Marine Archaeology.

Summary of relevant policy	How and where considered in this Offshore EIA Report
General Policy 8a: All Development and/or activities ***"Proposals for development and/or activities with a potentially significant impact on historic assets of place should be accommodated by and assessment which is based on an understanding of the cultural significance of the historic asset and/or place."*** ***"Proposals should also be informed by national policy and guidance and information held within Historic Environment Records."*** ***"Proposals for development and/or activities should, where appropriate, include a PAD"***	The assessment in this EIA is based upon the understanding of the cultural significance of marine archaeology receptors (Section 19.8). The policy and guidance used to inform this assessment is listed in Section 19.3. A WSI and PAD has been prepared for submission with this Offshore EIA Report (Volume 4, Appendix 33).
General Policy 8b: Recording ***"Where developments and/or activities are permitted in areas known to contain, or where there are reasonable grounds to believe they contain, archaeological deposits, conditions may be attached to a licence or consent to ensure the effective assessment, analysis, archiving and publication of any archaeological remains to an agreed timeframe."*** ***"Where a historic environment asset, or a significant element thereof, will be lost as a result of a development and/or activity, it may be necessary to record the site to an agreed level prior to the commencement of development and/or demolition".***	A WSI and PAD has been prepared for submission with this Offshore EIA Report (Volume 4, Appendix 33), and includes further measures for assessment, analysis, archiving and publication of certain marine archaeology receptors. The methods of minimising and mitigating unavoidable direct impacts are set out in Section 19.9. Such measures will be done on a case-by-case basis, in consultation with MD-LOT, but could include, *inter alia*, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor.
General Policy 8d: Historic Marine Protected Areas (Historic MPA) ***"Development and/or activities capable of affecting a Historic MPA will be managed in***	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is presented in Section 19.6. Full details are given in

Summary of relevant policy	How and where considered in this Offshore EIA Report
accordance with the requirements of the Marine (Scotland) Act 2010."	Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. There are no HMPAs in the Marine Archaeology Study Area.
General Policy 8e: Controlled sites and protected places *"The protection of controlled sites and protected places will be managed in accordance with the requirements of the Protection of Military Remains Act (1986)."*	The marine archaeology baseline, which includes all known maritime vessels and military aircraft in the Marine Archaeology Study Area is summarised in Section 19.6. There is one wreck protected under the PMRA present in the Marine Archaeology Study Area. It will be subject to an AEZ (Volume 4, Appendix 33). Should material from an aircraft which crashed whilst in military service be present in the Marine Archaeology Study Area it will be automatically subject to legal protection under the PMRA. The Embedded Mitigation to be adopted as part of the Proposed Development (Section 19.9) include the development of and adherence to a WSI and PAD (Volume 4, Appendix 33) which outlines the reporting procedure for archaeological discoveries including aircraft material.
General Policy 8f: Scheduled monuments *"Proposals for development and/activities that will affect scheduled monuments should: i. avoid direct impacts on the scheduled monument; and ii. Avoid significant adverse impacts on the integrity of the setting of the scheduled monument; or iii. demonstrate that there are exceptional circumstances to justify the impact on the scheduled monument and/or its setting, and that impacts on the monument or its setting have been minimised."*	The marine archaeology baseline is presented in Section 19.6. Full details are given in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report. There are no scheduled monuments in the Marine Archaeology Study Area.

Guidance

19.3.8 There are a number of guidance documents that are relevant to marine archaeology in the context of offshore renewable development which have been considered in the production of this Chapter. These include:

- Military Aircraft Crash Sites: Guidance on their Significance and future management (English Heritage, 2002 (now Historic England));
- Code of Practice for Seabed Development (JNAPC, 2006);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE, 2007);
- Making the Most of Scotland's Seas (Scottish Government, 2010);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);

- Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (2nd Edition) (Historic England, 2025);
- Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014);
- Code of Conduct (CIfA, 2014a (updated 2022));
- Environmental Impact Assessment Handbook (Scottish Natural Heritage (now NautreScot) and Historic Environment Scotland, 2018);
- Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA, 2014b (updated 2020));
- Designation Policy and Selection Guidance (Historic Environment Scotland, 2019a);
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021);
- Principles of Cultural Heritage Impact Assessment (IEMA[1] *et al.*, 2021);
- Curating the Palaeolithic (Historic England, 2023);
- Marine Licensing and Consenting: Offshore Renewable Energy Projects (Marine Directorate, 2025); and
- Conserving our Underwater Heritage (Historic Environment Scotland, 2025).

19.4 Consultation

19.4.1 The approach to consultation for the Proposed Development is set out in Volume 1, Chapter 5: Consultation and Engagement. A summary of the issues raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 19.8, together with how these issues have been considered in the production of this assessment. Further detail is presented within Volume 1, Chapter 5: Consultation and Engagement, Volume 3, Technical Appendix 5.1: Consultation Logs and Volume 3, Technical Appendix 5.2: Pre-Application Consultation Report.

[1]The Institute of Environmental Management and Assessment (IEMA) is now known as the Institute of Sustainability and Environmental Professionals (ISEP); however, this guidance was produced prior to the organisation's name change, therefore, citations referencing 'IEMA' remain.

Table 19.8: Summary of Key Consultation Issues Raised During Consultation Activities Undertaken for the Proposed Development Relevant to Marine Archaeology

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
06 March 2024	Historic Environment Scotland (HES), MD-LOT, NatureScot, Orkney Islands Council Scoping Workshop Seascape, Landscape and Visual Impacts and Cultural Heritage	Impact on the seabed needs to be assessed. Informed consultees that within the Export Cable Corridor there is a gap in geophysical data to the west of the Array Area, MD-LOT raised no concerns.	All impacts have been scoped into this Offshore EIA and are assessed in Section 19.10. The gap in geophysical data to the west of the Array Area is visible in Figure 19.1. The area will be subject to geophysical survey and archaeological analysis prior to impacts, should any activities be planned in this area (Section 19.9).
02 October 2024	MD-LOT Scoping Opinion	Agreement with Marine Archaeology Study Area and data sources	Details of the Marine Archaeology Study Area are set out in Section 19.2.
		Direct physical impacts to identified wrecks, particularly those relevant to the Protection of Military Remains Act 1986, should be avoided.	Avoidance will be the primary mitigation implemented by the Proposed Development for known archaeological features, including through micrositing and AEZs (see Section 19.9). Wrecks have been identified through desk-based assessment and archaeological analysis of geophysical data.
		Content with approach to marine archaeological baseline. Consultation requested with Orkney Island Council (OIC) archaeologist on the criteria for levels of the importance/significance of identified assets, and the criteria for evaluating the levels of impacts.	Levels of importance/significance will primarily follow national guidance, (e.g. Designation Policy and Selection Guidance (Historic Environment Scotland, 2019)), and criteria for evaluating the levels of impact will follow relevant EIA regulations and guidance (Volume 1, Chapter 6). The Applicant has consulted with the OIC archaeologist on the specific marine archaeology EIA methodology in an email

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
			dated 21 July 2025. HEPS (Historic Environment Scotland, 2019b) and the Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (Marine Scotland, 2016) have been added to Section 19.3 as a result.
		Potential impacts have been identified appropriately, no potential impacts are to be scoped out.	All impacts that have been scoped into this Offshore EIA are assessed in Section 19.10.
		Content with proposed Embedded Mitigation. Support the production of a technical report that will identify appropriate AEZs. Note that adherence to post-consent plans, such as the development of a WSI and a PAD does not strictly constitute mitigation.	Embedded Mitigation measures are set out in Section 19.9.
	HES Scoping Response	Direct physical impacts to identified wrecks, particularly those relevant to the Protection of Military Remains Act 1986, should be avoided.	Avoidance will be the Embedded Mitigation measure implemented by the Proposed Development for known archaeological features, including through micrositing and AEZs (Section 19.9). Wrecks have been identified through desk-based assessment and archaeological analysis of geophysical data.
		Content potential impacts on Marine Archaeology and Cultural Heritage are identified adequately.	The potential impacts on marine archaeology receptors are described in more detail in Section 19.7.
		Content with use of Embedded Mitigation.	Embedded Mitigation measures to be adopted as part of the Proposed Development are listed in Section 19.9.
		Content with development of WSI and PAD.	A WSI and PAD has been prepared alongside this Offshore EIA Report (Volume 4, Appendix 33)
	OIC	Agreed that the potential for submerged prehistoric archaeology within the Scoping	Further detail on the potential of submerged prehistoric archaeology is presented in Section 19.6.

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
	Scoping Response	Boundary as low, with the greatest potential as likely to be localised and found closer to shore.	
		Agreed that the archaeological assessment of the site-specific geophysical survey data will provide further information on the potential for submerged prehistoric archaeology within the Marine Archaeology Study Area.	Site-specific geophysical data has been assessed and used to inform the Marine Archaeology Technical Report (Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report). This is also summarised in Section 19.6.
		Agreed that the methodology for identification of known and unknown vessels and aircraft is appropriate.	Identified wrecks and the potential for unknown wrecks are listed in detail in the Marine Archaeology Technical Report (Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report).
		Agreed that archaeological assessment of site-specific geophysical survey data will inform the further characterisation of maritime archaeology in the Marine Archaeology Study Area.	Further characterisation of wrecks and potential wrecks, along with any identified geophysical anomalies can be found in the Marine Archaeology Technical Report (Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report).
		The identified Embedded Mitigation measures are appropriate.	Embedded Mitigation to be adopted as part of the Proposed Development are listed in Section 19.9.
		The identified impacts to be assessed at EIA are appropriate.	The potential impacts on marine archaeology receptors are described in more detail in Section 19.7.
		The proposed assessment methodology is appropriate. Consultation with the Islands Archaeologist on the criteria for levels of the importance/significance of identified assets, and the criteria for evaluating the levels of impacts is expected.	Levels of importance/significance will primarily follow national guidance, (e.g. Designation Policy and Selection Guidance (Historic Environment Scotland, 2019a)), and criteria for evaluating the levels of impact will follow relevant EIA regulations and guidance (Volume 1, Chapter 6). The Applicant has consulted with the OIC archaeologist on the specific marine archaeology EIA methodology.
		Agreed with the identified potential for inter-related, cumulative and transboundary effects.	The potential inter-related effects, cumulative effects assessment and potential transboundary effects are discussed in Sections 19.11, 19.12 and 19.14 respectively.

Date	Consultee and Type of Consultation	Summary of Issue(s) Raised	Response to Issue Raised and/or Where Considered in this Chapter
		Production of a Marine Archaeology Technical Report is supported.	A Marine Archaeology Technical Report has been produced, which is intended to be read alongside this chapter (Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report).
21 July 2025	OIC Correspondence	Suggested guidance and policy to include including the Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (Marine Scotland, 2016).	All suggested guidance is included in Section 19.3 and Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report. The Pilot Pentland Firth and Orkney Waters Marine Spatial Plan (Marine Scotland, 2016) has been considered in Table 19.6.
26 September 2025	OIC Correspondence	Noted that the guidance Conserving our Underwater Heritage was published by HES in August 2025 (Historic Environment Scotland, 2025). Suggested that, as regards sensitivity and value, local significance does not automatically equate to low value.	Guidance included in Section 19.3, Local significance changed from low to medium sensitivity in Table 19.15.
24 October 2025	Ministry of Defence Correspondence	The Ministry of Defence has no concerns with respect to the proposed embedded mitigation for the wreck of *Duke of Albany*, designated under the Protection of Military Remains Act 1986, subject to these being approved by Historic Environment Scotland.	The wreck of *Duke of Albany* will be subject to an AEZ (Section 19.9; Volume 4, Appendix 33). The WSI containing this mitigation (Volume 4, Appendix 33) was sent to HES, and they offered no comments (see correspondence dated 27 October 2025).
27 October 2025	HES Correspondence	No comments to offer on the WSI and PAD (Volume 4, Appendix 33) as HES no longer provide advice on undesignated underwater cultural heritage, including the preparation of documents for post-consent activities including WSIs and PADs.	The WSI and PAD (Volume 4, Appendix 33) was sent to HES for pre-application consultation in line with the relevant MD-LOT guidance (Marine Directorate, 2025).

19.5 Data Sources

19.5.1 Information on marine archaeology within the Marine Archaeology Study Area has been reviewed and analysed to inform this marine archaeology baseline.

Desktop Study

19.5.2 Information on marine archaeology within the Marine Archaeology Study Area was collected through a detailed desktop review of existing studies and datasets which are summarised in Table 19.9.

19.5.3 Both the literature review of the reports and review of the datasets were used to characterise the baseline. Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report includes full details of the analysis undertaken to develop the marine archaeology baseline.

Table 19.9: Summary of Key Data Sources

Title	Source	Year	Author
United Kingdom Hydrographic Office (UKHO) Wreck and Obstructions Data	UKHO	2025	UKHO
National Record of the Historic Environment (NRHE) records (Canmore)	HES	2025	HES
The Highland Council Historic Environment Record (HER) records	The Highland Council	2023	The Highland Council
Protected Wrecks Map	Marine Directorate	2023	Marine Directorate
GeoIndex	British Geological Survey (BGS)	2023	BGS

Site-Specific Surveys

19.5.4 Site-specific surveys were undertaken to inform this assessment (see Table 19.10 for further details).

19.5.5 The site-specific geophysical survey was carried out by G-tec between 27 March and 23 August 2023, and consisted of Sidescan Sonar (SSS), Multibeam Bathymetry (MBES), Magnetometer (Mag), Parametric Sub-bottom Profiler (SBP), and Sparker (2D Ultra High Resolution Seismic (UHRS)) (G-tec, 2024a and, G-tec, 2024b). The extent of the survey area can be seen in. The Marine Archaeology Survey Area does not cover the entire extent of the Export Cable Corridor (Figure 19.1). However, this was agreed with MD-LOT through consultation (Table 19.8) and the area will be subject to geophysical survey and archaeological analysis prior to impacts, should any activities be planned in this area (Section 19.9).

19.5.6 MSDS Marine undertook archaeological analysis of the site-specific geophysical survey data (Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report). The technical specifications of the site-specific surveys listed in Table 19.10 can be found in Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report.

Table 19.10: Summary of Site-Specific Survey Data

Title	Extent of Survey	Overview of Survey	Survey Contractor	Date
Geophysical Survey Campaign	Array Area; part of Export Cable Corridor	SSS, MBES, Mag, SBP and 2D UHRS	G-tec	2023

19.6 Baseline Environment

Overview of Baseline Environment

19.6.1 The following sections provide a summary of the marine archaeology baseline environment. Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report includes full details of the analysis undertaken to develop the marine archaeology baseline.

Designated Sites

19.6.2 One designated site has been identified within the datasets listed in Section 19.5 for the Marine Archaeology Study Area. HMS *Duke of Albany* is designated as a protected place under the Protection of Military Remains Act 1986 (UKHO 70429). HMS *Duke of Albany* was initially a passenger vessel owned and operated by rail companies from its launch in 1907, until it was requisitioned by the Royal Navy in 1914. It was torpedoed and sunk in 1916 by the German submarine SM UB-27. The wreck was located in 2007 following a hydrographic survey, and the bell was salvaged shortly after by divers, confirming its identity (UKHO 70429).

Submerged Prehistory

19.6.3 The potential for submerged prehistoric archaeology is considered to be generally low, due primarily to high sea levels and the likelihood of ice coverage of the Marine Archaeology Study Area for much of prehistory. However, there is some archaeological potential in the Export Cable Corridor.

19.6.4 Following the Loch Lomond Stadial (12,900 Before Present (BP) to 11,700 BP) sea levels were lower than present but rising (from c. 11,000 BP). In this period parts of the Marine Archaeology Study Area are likely to have been sub-aerially exposed. There is considerable variation in postulated sea levels for the area which impacts assessment of archaeological potential, however, potential is greatest in the nearshore area. Potential is primarily associated with Unit 2 which is thought to have been in formation at this time. Unit 2 is marine, glacio-marine, fluviomarine and estuarine with palaeochannel and outwash sediments, and is interpreted as the local equivalent of the Forth Formation dating to the Late glacial and early Holocene (15,000 BP onward).

19.6.5 During the Late Upper Palaeolithic (45,000 BP to 12,000 BP) and Mesolithic (10,000 Before Christ (BC) to 4000 BC), sea levels may have been as low as -35 m and -40 m, though other estimates place it much higher at -4 m or -6 m. However, taking the lower estimates may indicate exposure of Unit 2A and 2D within the nearshore section of the Export Cable Corridor (within 4 km of the coast). The –40 m contour is of interest as it coincides with a series of bathymetric features which appear to represent submerged channels, also

evident within the SBP data. These may represent outwash or palaeochannels known to be present within the Forth Formation, with which Unit 2 has been correlated. The potential for exposure of these channels in the Late Upper Palaeolithic and Mesolithic demonstrates the archaeological and palaeoenvironmental potential of this area, and Unit 2A and 2D.

19.6.6 Submergence of the Marine Archaeology Study Area was likely complete by 3,000 BC to 2,000 BC (i.e. during the Late Neolithic (3,000 BC to 2,500 BC), Chalcolithic (2500 BC to 2200 BC) and Early Bronze Age (2200 BC to 1500 BC)).

19.6.7 While Units 2A and 2D may hold potential for submerged prehistoric archaeology the extent of this potential is highly dependent on sea levels. Geoarchaeological work should be conducted to hone understanding of this potential, in particular within the nearshore area focused on Units 2A and 2D (Table 19.18; Volume 4, Appendix 33). Investigations should also seek to sample the channel features evident around the –40 m contour to determine their origin and date, and to further inform understanding of past sea levels and therefore archaeological and palaeoenvironmental potential.

19.6.8 The potential for submerged prehistoric archaeology within the Marine Archaeology Study Area is characterised by proximity to the Landfall; the Array Area is likely to have no potential for submerged prehistoric archaeology, with the potential increasing closer to the Landfall.

Known Maritime and Aviation Archaeology Receptors

19.6.9 Within the desktop data listed in Table 19.9 there are a total of 26 records identified in the Marine Archaeology Study Area. Of these, 14 are named wreck locations. There are a further four unnamed wrecks in the Marine Archaeology Study Area. There are eight obstructions. One designated wreck has been identified within the Marine Archaeology Study Area, HMS *Duke of Albany*.

19.6.10 Three records of aviation losses are located within the Marine Archaeology Study Area, all of which were from World War II. These are all considered recorded losses, as no material has been confirmed at their recorded locations. The aircraft types were:

- Handley Page Hampden;
- Gloster Sea Gladiator; and
- Bristol Beaufort.

19.6.11 A total of 164 surface anomalies of potential archaeological interest have been identified within the Marine Archaeology Study Area during the archaeological assessment of the geophysical data. Of these, 70 surface anomalies are within the Array Area and the remaining 94 are within the Export Cable Corridor (Table 19.11). The distribution of anomalies is shown in figures within the Marine Archaeology Technical Report (Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report).

Table 19.11: Distribution of Archaeological Anomalies by Potential

Potential	Array Area	Export Cable Corridor	Total
Low	65	86	151
Medium	2	5	7
High	3	3	6
Total	70	94	164

19.6.12 Six anomalies are interpreted as being of high potential, three located in the Array Area and three in the Export Cable Corridor. Seven anomalies of medium archaeological potential have been identified with two being located in the Array Area and five in the Export Cable Corridor. The remaining anomalies are considered as low potential.

19.6.13 There were 719 magnetic anomalies, with amplitudes ranging between 5.0 nT and 8,136.4 nT, were identified within the geophysical survey data extents, of these 244 do not correlate with known, or visible, features or infrastructure.

Maritime Archaeology and Aviation Potential

19.6.14 There is potential for currently unknown maritime archaeology receptors from all periods to be present in the Marine Archaeology Study Area (Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report).

19.6.15 There is potential for unknown aviation assets to be present in the Marine Archaeology Study Area. While the aviation archaeology record is potentially very large, the ephemeral nature of aircraft wrecks ensures that many sites remain unknown and unrecorded. In addition, despite the potential extensive losses at sea, records are seldom tied to an accurate position. These difficulties complicate any assessment of the likely presence of aircraft wreckage on any particular area of seabed.

Intertidal Archaeology

19.6.16 The Intertidal Area of the Export Cable Corridor is large and has a variety of records from a wide range of time periods, including World War II defensive structures, a peat bank and a wreck. There are eight records of known archaeological assets in the Intertidal Area.

19.6.17 There is potential for unknown archaeological assets from all periods, from Prehistory to Modern, to be present in the Intertidal Area of the Marine Archaeology Study Area.

Future Baseline Scenario

19.6.18 The EIA Regulations require that ‘a description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the project as far as natural changes from the baseline scenario can be assessed with reasonable effort, on the basis of the availability of environmental information and scientific knowledge’ is included within the Offshore EIA Report.

19.6.19 An assessment of the ‘without development’ future baseline conditions has also been carried out and is described within this section.

19.6.20 The baseline environment of the Marine Archaeology Study Area as described in Section 19.6 should be considered as a snapshot of gradually changing marine archaeology receptors within a dynamic environment. All marine archaeology receptors will be subject to natural processes, physical, chemical and biological, and so will deteriorate over time. The greatest change will typically be seen in upstanding metal wrecks, which will corrode and collapse over time. In addition, sediment mobility will likely continue, and this natural process will potentially expose marine archaeology receptors, allowing their deterioration to accelerate. It is also possible that sediment mobility will bury or rebury marine archaeology receptors, resulting in a deceleration of their deterioration. The effects of climate change on the marine environment may also cause impacts on marine archaeology receptors in the mid to long term (DECC, 2016).

19.6.21 The current baseline as described in Section 19.6 will change, albeit slowly. It is unlikely that significant change will occur to marine archaeology within the Marine Archaeology Study Area over the next few decades (over the lifespan of the Proposed Development), although some visible deterioration may be seen on the high potential anomalies, three of which are largely intact wrecks with some elements still upstanding.

Data Limitations and Assumptions

19.6.22 The records held by the UKHO, HES and other sources used in this assessment are not a record of all surviving archaeological assets, but a record of discovery of a diverse range of archaeological and historical components of the marine environment. The datasets used are incomplete records of the totality of potential marine archaeology present on the seabed and do not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown.

19.6.23 The interpretation of geophysical and hydrographic data is, by its very nature, subjective. However, with experience and by analysing the form, size, and characteristics of an anomaly, a reasonable degree of certainty as to the origin of an anomaly can be achieved. Measurements can be taken in most data processing software; while this is reasonably accurate, some discrepancies may occur. Where there is uncertainty of an anomaly's potential or origin, a precautionary approach is taken to ensure the most appropriate mitigation for the historic environment is recommended. There may be instances where a receptor may exist on the seabed but is not visible in the geophysical data. This may be due to the anomaly being buried or out of the sonar's line-of-sight. The desktop sources and the site-specific data examined represent a comprehensive and robust sequence of datasets and observations that allow for a detailed assessment of archaeological constraints, however, there remains the possibility that as yet unknown marine archaeology receptors are present within the Marine Archaeology Study Area.

19.6.24 The Marine Archaeology Survey Area does not cover the entire extent of the Export Cable Corridor (Figure 19.1). However, this was agreed with MD-LOT through consultation (Table 19.8) and the area will be subject to geophysical survey and archaeological analysis prior to impacts, should any activities be planned in this area (Section 19.9).

19.7 Key Parameters for Assessment

Maximum Design Scenario

19.7.1 The Maximum Design Scenario (MDS) identified in Table 19.12 are those parameters expected to have the potential to result in the greatest effect on an identified receptor or receptor group. Any other development scenario within the Project Design Envelope (PDE), will result in the same, or less, level of environmental effect. The scenario has been selected from the details provided in Volume 1, Chapter 3: Project Description.

19.7.2 The assessment of indirect effects in Section 19.10 is informed by Volume 2, Chapter 7: Physical Processes and Volume 3, Technical Appendix 7.1: Physical Processes Technical Report.

Table 19.12: MDS Considered for Each Potential Impact as Part of the Assessment of Likely Significant Environmental Effects on Marine Archaeology

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	**Construction phase** <u>Drilling for anchor installation</u> Up to 692,701 m^3 of drill arisings for all piles, for the 25 MW semi-submersible and Tension Leg Platform (TLP) floating Wind Turbine layout, comprising: • Maximum number of drilled piles: 360 (max foundations = 40; max piles per foundation = 9) • Maximum dimensions of drilled pile section: 5 m diameter, 98 m max. penetration depth • Maximum volume of drill arisings per pile: 1,924 m^3 • Maximum concurrent drilling events: 2 • <u>Inter-Array Cable installation</u> • Maximum number of Inter-Array Cables (IAC): 133 (15 MW Wind Turbine layout) • Maximum total length of Inter-Array Cables in contact with seabed: 173 km • Trench dimensions: up to 6 m wide; 1.5 m deep (average); 'V' shape profile • Excavation method: Jetting, Mass Flow Excavation (MFE), Ploughing/Pre-Ploughing, Trenching/Pre-Trenching (incl. dredging, cutting) • MFE pre-lay trenching rate: 400 m/hour <u>Offshore Export Cable installation</u> • Maximum number of Export Cables: 4 • Maximum total length of each Export Cable: 90 km • Trench dimensions: up to 6 m wide; 1.5 m deep (average); 'V' shape profile • Excavation method: Jetting, MFE, Ploughing/Pre-Ploughing, Trenching/Pre-Trenching (incl. dredging, cutting) • MFE Pre-lay trenching rate: 400 m/hour • <u>Sandwave clearance</u> • Sandwave clearance width along IAC: 58.6 m • Area of IAC sandwave clearance: 39,613.6 m^2 • Sandwave clearance width for subsea collector: 53.6 m • Area of subsea collectors sandwave clearance: 2,144 m^2 • Sandwave clearance width along Export Cable Corridor: 58.6 m • Area of Export Cable Corridor sandwave clearance: 300,419 m^2 • Clearance method: MFE and/or Dredger	**Construction phase** The MDS corresponds to (a combination of) the greatest amount of material disturbed and the greatest geographical extent of the impact. <u>Drilling for anchor installation</u> Based on the greatest total amount of material disturbed, considering the largest pile dimension, number of pile anchors and number of concurrent drilling events. Assumes two concurrent drilling events can occur for the same foundation, resulting in the MDS for instantaneous suspended sediment concentrations (SSC). Piles relating to Offshore Substation Platforms (OSP)s are smaller in diameter and require less drilling depth than Wind Turbine foundations therefore do not represent the MDS. <u>Inter-Array Cable installation</u> Pre-lay trenching by MFE will give MDS for sediment disturbance. Conservatively assumes 100% fluidisation of material expelled from trench. In reality, pre-lay jetting will move a proportion of material rather than bringing it fully into suspension. Modelling was carried out for sediment release along a section of an indicative cable route which runs parallel and then perpendicular to the tidal axis for two full tidal cycles. <u>Offshore Export Cable installation</u> Pre-lay trenching by MFE will give MDS for sediment disturbance. Conservatively assumes 100% fluidisation of material expelled from trench. In reality pre-lay jetting will move a proportion of material rather than bringing it fully into suspension. Export Cable Corridor pre-lay trenching modelling assumes sediment release along the whole Export Cable Corridor. <u>Sandwave clearance</u> Sandwave clearance/levelling activities may be undertaken using a range of techniques – MFE and suction hopper dredging. Releases via both are modelled. A conservative MFE near-bed sediment release rate of 1000 kg/s conservatively estimated based on the MDS trench cross section dimensions, the speed of progress of the tool, and the bulk density of the local sediment type. Dredge spoil release is simulated as an instantaneous release at the water surface. 10% of a

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
				Horizontal Directional Drilling (HDD) exit pit excavation • Number of exit pits: 4 • 880 m^3 excavated material for each pit (3,520 m^3 for all pits) HDD drilling fluid release (at Landfall) • Number of exit/release events: up to 4 • Up to 1,030 m^3 drilling mud generated per HDD duct, based on bore diameter of 1.05 m and duct length of 1,190 m. (4,120 m^3 total for all four ducts) • 100,000 mg/l (100 kg/m^3) assumed conservative maximum concentration of Bentonite in drilling mud • Wet punch-out **O&M phase** Cable repairs • Number of annual IAC repairs: 1 • Number of annual dynamic IAC repairs: 1 • Maximum annual length of IAC reburial: 1,170 m • Number of annual static Export Cable repairs: 1 • Maximum annual length of Export Cable reburial: 1,170 m **Decommissioning phase** A Decommissioning Programme will be submitted to MD-LOT for consultation and approval. The Decommissioning Programme will be updated during the Proposed Development's lifespan to take account of changing best practice and new technologies. The approach for decommissioning is yet to be determined, however, for the purposes of this MDS total removal of all infrastructure including buried cables and cable protection has been assumed, and as such the environmental impact of decommissioning will be the same if not lower than construction.	11,000 m^3 hopper is assumed to form the passive phase of the plume. Other seabed preparation such as boulder clearance is not considered here as the activity does not represent the MDS in terms of potential increases in SSC and associated changes to seabed substrate. HDD exit pit excavation Based on maximum exit pit dimensions. HDD drilling fluid release (at Landfall) Based on maximum HDD duct dimensions. Assumes a conservative Bentonite concentration of 100 kg/m^3 in drilling mud. Other stages of drilling (pilot hole drilling and stages of reaming) may result in smaller release events separated in time. But the MDS is considered as a release of drilling mud from a single conduit. **O&M phase** The MDS for sediment disturbance during operation will be no greater than that set out for the construction phase of the Proposed Development. Cable repairs These limited activities would disturb a much smaller volume of material for each repair/reburial event than simulated for the construction phase. **Decommissioning phase** The MDS for sediment disturbance during decommissioning will be no greater than that set out for the construction phase of the Proposed Development.
Direct damage to maritime archaeology receptors	✓	✓	✓	**Construction Phase** • Up to 15,328,304 m^2 of seabed impact in total due to: Wind Turbines • a footprint area of 230,240 m^2 due to floating Wind Turbines with gravity based anchors (up to 40 foundations with a seabed footprint of 5,756 m^2 each, including scour protection). OSPs • a footprint area of 13,800 m^2 due to OSPs (up to two OSPs with a seabed footprint of 6,900 m^2 each, including scour protection)	The MDS for this impact considers the maximum seabed footprint which would be affected during the construction, O&M and decommissioning phases. **Construction Phase** Cable protection and cable crossings are within the installation footprint for inter-array, interconnector and export cables, so have been excluded from MDS.

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
				Inter-array cables • Sandwave clearance area of 39,613.6 m^2 on 0.37% of IACs with a width of 58.6 m • 239,368 m^2 of boulder clearance along 5.2% of IACs, with a width of 25 m. • 2,768,000 m^2 for pre-lay ploughing. 173,000 m of IAC. Pre-lay ploughing of 16 m width, trench width of 6 m. • Total area of seabed disturbance 4,325,000 m^2 Interconnector cables • 60,000 m of Interconnector cable. Pre-lay ploughing of 16 m width, trench width of 6 m. Total area of seabed disturbance 1,500,000 m^2 Export Cable • Sandwave clearance area of 300,419 m^2 on 1.40% of Export Cable with a width of 58.6 m • 770,139 m^2 of boulder clearance along 9.7% of Export Cable, with a width of 25 m. • 90,000 m of Export Cable per cable, up to 4 cables. Pre-lay ploughing of 16 m width, trench width of 6 m. Total area of seabed disturbance 9,000,000 m^2. Subsea Collectors • Sandwave clearance area of 2,144 m^2 for Subsea Collectors. • 8,000 m^2 footprint for 20 subsea collectors. Disused cable removal • Up to 50,000 m^2 from the removal of 2,000 m of disused cables. Landfall • Total area of Transition Joint Bays at Landfall 320 m^2. Jack-ups • a footprint area of 193,200 m^2 due to jack up vessel use for the installation of up to two OSPs and up to 67 Wind Turbine foundations. • Up to 5,600 m^2 of intertidal footprint, due to jack up vessel use for the installation of up to four export cables in the Intertidal Area of the Export Cable Corridor near Landfall. Unexploded Ordnance (UXO) • In addition, seabed disturbance could occur due to crater formation from the clearance of UXO. This value has not been included in the total presented above, as the footprint from UXO clearance will likely overlap with area subject to impact from other site preparation activities.	

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
				O&M Phase • O&M phase up to 30 years. • Up to 258,680 m^2 of seabed impact may occur in the O&M phase due to mooring lines coming into contact with the seabed. This value has been based on up to 40 floating semi-submersible Wind Turbine foundations and nine shared catenary or semi-taut mooring lines each. The area of mooring line on the seabed during normal operations for each foundation is up to 6,467 m^2 and the width is 0.737 m. • Footprints of other impacts due to the O&M phase are considered to be of a similar or lower extent to those of the construction phase (given the absence of site preparation activities in the decommissioning phase). **Decommissioning Phase** A Decommissioning Programme will be submitted to MD-LOT for consultation and approval. The Decommissioning Programme will be updated during the Proposed Development's lifespan to take account of changing best practice and new technologies. The approach for decommissioning is yet to be determined, however, for the purposes of this MDS total removal of all infrastructure including buried cables and cable protection has been assumed, and as such the environmental impact of decommissioning will be the same if not lower than construction.	**O&M Phase** The seabed impact associated with cable maintenance is assumed to fall within the footprint of cable installation so is excluded from the MDS. The seabed impact associated with mooring line movement on floating Wind Turbines is assumed to fall within the footprint of Wind Turbine construction so is excluded from the MDS. **Decommissioning Phase** Parameters for decommissioning will be significantly lower than for the construction phase, as sandwave clearance and pre-lay preparation will not be required.
Direct damage to deeply buried marine archaeology receptors	✓	X	X	**Construction Phase** Wind Turbine mooring and anchoring systems: up to 40 floating or floating semi-submersible wind turbines with up to 9 driven piles per foundation with a diameter of 5 m and a pile penetration depth of 98 m. • OSP foundation installation: two OSP foundations requiring 18 piles of 4.5 m diameter per foundation with a pile penetration depth of 60 m.	Maximum depth of pile penetration for foundation installation represents the maximum impact to submerged prehistoric archaeology receptors. Potential impacts could only occur during piling in the construction phase.
Alteration of sediment transport regimes and scour	X	✓	X	**Tidal Regime** **O&M phase** Wind Turbine foundation - Floating substructures • TLP (tilted tendon, gravity bases) for the 15 MW Wind Turbine layout • Maximum number of Wind Turbines: 67 • Width of structure: 126 m • Draft of structure: 45 m below Lowest Astronomical Tide (LAT) • Minimum separation between Wind Turbine: 1,086 m Wind Turbine foundation - Mooring system and electrical cables • Maximum number of mooring lines present in the water column: 402 (67 foundations x 6 lines per foundation)	Sediment transport is driven by the combination of waves and tides. The relative contribution of these driving processes will vary spatially and temporally in response to, amongst other things, variation in water depth, tidal strength and meteorological events.) **Tidal Regime** **O&M phase** Wind Turbine foundation The MDS for changes to the tidal regime is given by the greatest depth-average blockage width for the Array Area as a whole. This considers the number of Wind Turbine foundation, floating substructure type (assumes a solid structure), mooring configuration, anchor system and electrical cabling. OSP foundation

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
				• Maximum number of IACs: 133 • Mooring line diameter: 737 mm • Electrical cable diameter: 200 mm <u>Wind Turbine foundation - Anchors</u> • Gravity based anchors (6 per foundation, 402 in total) • Anchor dimensions: 18 m x 20 m • Maximum height above seabed: 10 m <u>OSP Foundation</u> • 6-legged jacket on pin piles • Maximum number of structures: 2 • Diameter of jacket leg: 3.5 m **Wave Regime** **<u>O&M phase</u>** <u>Floating substructures</u> • Semi-submersible for the 15 MW Wind Turbine layout • Maximum number of Wind Turbines: 67 • Width of structure: 130 m • Draft of structure: 22 m below LAT • Minimum separation between Wind Turbine: 1,086 m <u>Mooring system and electrical cables</u> • Maximum number of mooring lines present in the water column: 402 (67 foundations x 6 lines per foundation) • Maximum number of IACs: 133 • Mooring line diameter: 737 mm • Electrical cable diameter: 200 mm <u>Anchors</u> • Gravity based anchors (6 per foundation, 402 in total) • Anchor dimensions: 15 m x 15 m • Maximum height above seabed: 10 m <u>OSP</u> • 6-legged jacket on pin piles • Maximum number of structures: 2 • Diameter of jacket leg: 3.5 m	The MDS option is given by the greatest OSP depth-average blockage for the Array Area as a whole. This considers the number of OSP foundations, primary and secondary jacket member diameters and anchor system. **Wave Regime** **<u>O&M phase</u>** <u>Wind Turbine foundation</u> The MDS for changes to the wave regime is given by the greatest near-surface blockage width for the Array Area as a whole. This considers the floating foundation substructure presenting the greatest blockage in the upper water column (i.e. at/close to the sea surface) and the number of substructures. <u>OSP foundation</u> The MDS option is given by the greatest OSP near-surface blockage for the Array Area as a whole. This considers the number of OSP foundations and near-surface dimension of the jacket. Jacket is assumed to be a solid structure (no gaps).

Potential Impact	Phase*			Maximum Design Scenario (MDS)	Justification
	C	O	D		
				Scour **<u>O&M phase</u>** <u>Wind Turbine foundation - Fixed substructures</u> • 3-legged piled jacket foundations for the 15 MW Wind Turbine layout • Maximum number of Wind Turbines: 67 • Width of structure base: 44 m • Diameter of jacket legs: 3.5 m • Scour area for whole Array: 409,913 m^2 <u>Cable protection</u> • Maximum number of Export Cables: 4 • Cable protection height (above actual seabed level (ASBL)): 2 m • Cable protection width: 9 m	**Scour** Each foundation type and anchor arrangement may produce different scour patterns. The foundation and anchor type, size and number producing the greatest area and/ or volume of influence is defined based on the outputs of the scour assessment in Volume 3, Technical Appendix 7.3: Physical Processes Technical Assessment. Scour protection may be used to protect the stability of foundations if necessary. Where scour protection is used, primary scour is unlikely to occur, although a small amount of secondary scour may develop at the edges of the scour. However, the extent and volume of secondary scour will be considerably less than that described for the jacket foundations.

* Proposed Development Phase refers to construction (C), O&M (O) and decommissioning (D).

Impacts Scoped Out of the Assessment

19.7.3 On the basis of the baseline environment and the Project Description outlined in Volume 1, Chapter 3: Project Description, no impacts are scoped out of the assessment for marine archaeology. However, impacts in some phases were proposed to be scoped out in the Ayre Offshore Scoping Report (TWP, 2024) and this was confirmed in the Scoping Opinion received. A list of the potential impacts scoped out of this assessment for certain phases is listed in Table 19.13.

19.7.4 Impacts from the alteration of sediment transport regimes were proposed to be scoped out for the construction and decommissioning phases in the Ayre Offshore Scoping Report (TWP, 2024) and this was confirmed in the Scoping Opinion received (Section 19.4). This impact is outlined, together with a justification for scoping it out, in Table 19.13.

19.7.5 It is also proposed to further scope out direct damage to deeply buried marine archaeology receptors in the O&M and decommissioning phases, despite these being scoped in in the Ayre Offshore EIA Scoping Report (TWP, 2024). Justification is provided in Table 19.13.

Table 19.13: Impact Scoped Out of the Assessment for Marine Archaeology

Potential Impact	Phase*			Justification
	C	O	D	
Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors	✓	×	✓	The physical presence of infrastructure associated with the Proposed Development and any scour/cable protection may lead to localised changes in tide and wave climate. These changes could affect the distribution of sediment, which could then be directed towards or away from known archaeological receptors. There will be no, or fewer, infrastructure present in the construction and decommissioning phases, so the O&M phase represents the MDS and the other phases are not assessed. This was confirmed in the Scoping Opinion received (Section 19.4).
Direct damage to deeply buried marine archaeology receptors	×	✓	✓	The impact-receptor pathway is through construction activities, such as piling, that penetrate the shallower marine sediments to those which represent potentially submerged palaeolandscapes. There are no activities during the O&M and decommissioning phases that will do this. For this reason, this impact is assessed for the construction phase but not assessed for the O&M and decommissioning phases.

*Phase refers to construction (C), O&M (O) and decommissioning (D).

19.8 Methodology for Assessment of Effects

Overview

19.8.1 The marine archaeology assessment of effects has followed the methodology set out in Volume 1, Chapter 4: EIA Methodology. Specific to the marine archaeology assessment of effects, the following guidance documents have also been considered:

- Designation Policy and Selection Guidance (Historic Environment Scotland, 2019a);
- HEPS (Historic Environment Scotland, 2019b);
- Principles of Cultural Heritage Impact Assessment (IEMA *et al.*, 2021).

Criteria for Assessment

19.8.2 When determining the significance of effects, a process is used which involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 4: EIA Methodology.

19.8.3 The criteria for defining magnitude in this chapter are outlined in Table 19.14. Each assessment considered the spatial extent, duration, frequency and reversibility of impact when determining magnitude which are outlined within the magnitude section of each impact assessment (e.g. a duration of hours or days would be considered for most receptors to be of short term duration, which is likely to result in a low magnitude of impact).

19.8.4 The approach for determining the significance of effects is a two-stage process that involves defining the magnitude of the potential impacts and the sensitivity of the receptors. This section describes the criteria applied to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 4: EIA Methodology.

Table 19.14: Definition of Terms Relating to Magnitude

Magnitude of Impact	Description
High	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements; loss of cultural significance (Adverse).
	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality; enhancement of cultural significance; a considerable enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial).
Medium	Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements; partial loss of cultural significance (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality; enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial).
Low	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements; slight loss of cultural significance (Adverse).

Magnitude of Impact	Description
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring; slight enhancement to the archaeological or historical interest and knowledge of the asset (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements; cultural significance not materially affected (Adverse).
	Very minor benefit to, or positive addition of one or more characteristics, features or elements; cultural significance not materially affected (Beneficial).

19.8.5 The capability of a receptor to accommodate change and its ability to recover, if affected, is a function of its sensitivity. Receptor sensitivity is typically assessed by its:

- adaptability: the degree to which a receptor can avoid or adapt to an effect;
- tolerance: the ability of a receptor to accommodate temporary or permanent change without significant adverse impact;
- recoverability: the temporal scale over and extent to which a receptor will recover following an effect; and
- value: a measure of the receptor's importance, rarity and worth (Highways England et al., 2019).

19.8.6 For indirect impacts such as smothering, burial or exposure, marine archaeology receptors can typically tolerate some temporary change without significant adverse impact.

19.8.7 However, marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, or their context and relationship with their wider environment. As a result, the sensitivity of a marine archaeology receptor to direct damage can only be determined through its value.

19.8.8 Based on current policy and guidance, the cultural significance (i.e. value) of a historic asset means the aesthetic, historic, scientific or social value for past, present or future generations (Historic Environment Scotland, 2019b). Cultural significance can be embodied in a place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.

19.8.9 Criteria of value for assessing if marine historic assets are of cultural significance for designation purposes in Scotland are:

- **Intrinsic characteristics**: how the physical remains of a marine historic asset contributes to our understanding of the past;
- **Contextual characteristics**: how a marine historic asset relates to its surroundings and/or to our existing knowledge of the past; and

- **Associative characteristics**: how a marine historic asset relates to people, events and/or historic and social movements (Historic Environment Scotland, 2019a).

19.8.10 The understanding of the value of a receptor can be revised as more information becomes available (e.g. through further investigation). Both designated and undesignated receptors can hold value, as can both known and unknown receptors.

19.8.11 The criteria for defining sensitivity in this chapter are outlined in Table 19.15 below.

Table 19.15: Definition of Terms Relating to Sensitivity of the Receptor

Value (sensitivity of the receptor)	Description
Very High	Very high importance and rarity, "international" significance. Wrecked ships and aircraft that are protected under the Marine (Scotland) Act 2010, Ancient Monuments and Archaeological Areas Act 1979, or Protection of Military Remains Act 1986 with an international dimension of their importance, as well as currently undesignated sites that are demonstrably of equivalent value. Known submerged prehistoric sites and landscapes with a confirmed presence of largely *in situ* artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape. For indirect effects, this may include receptors with a very high level of vulnerability.
High	High importance and rarity, "national" significance. This category includes sites designated by the laws as above, as well as currently undesignated sites that do not have statutory protection or equivalent significance, but have a high potential for archaeological interest based on an assessment of their importance in terms of relevant designation criteria (Historic Environment Scotland, 2019a). Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a high level of vulnerability.
Medium	High or medium importance and rarity, "regional" or "local" significance. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance but have moderate archaeological interest. Also includes isolated finds of wreck material. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a medium level of vulnerability.
Low	Low or medium importance and rarity.

Value (sensitivity of the receptor)	Description
	Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance and have a low archaeological interest. Also includes finds of wreck material with little context or potential. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment. For indirect effects, this may include receptors with a low level of vulnerability.
Negligible	Very low importance and rarity. Assets with little or no surviving archaeological interest. For indirect effects, this may include receptors with a very low level of vulnerability.

19.8.12 The magnitude of the impact and the sensitivity of the receptor are combined when determining the significance of the effect upon marine archaeology receptors. The particular method employed for this assessment is presented in Table 19.16 and Table 19.17.

19.8.13 Where a range is suggested for the significance of effect, for example, minor to moderate, it is possible that this may span the significance threshold. The technical specialist's professional judgement will be applied to determine which outcome defines the most likely effect, which takes in to account the sensitivity of the receptor and the magnitude of impact. Where professional judgement is applied to quantify final significance from a range, the assessment will set out the factors that result in the final assessment of significance. These factors may include the likelihood that an effect will occur, data certainty and relevant information about the wider environmental context.

19.8.14 The EIA Regulations require the identification and reporting of significant environmental effects. For the purposes of this assessment:

- a level of moderate or more will be considered a 'significant' effect in terms of the EIA Regulations; and
- a level of minor or less will be considered 'not significant' in terms of the EIA Regulations.

Table 19.16: Matrix Used for the Assessment of the Significance of the Effect

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	**Low**	**Medium**	**High**
Negligible	Negligible	Negligible of Minor	Negligible of Minor	Minor
Low	Negligible of Minor	Negligible of Minor	Minor	Minor or Moderate
Medium	Negligible of Minor	Minor	Moderate	Moderate or Major

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
High	Minor	Minor or Moderate	Moderate or Major	Major
Very High	Minor	Moderate or Major	Major	Major

Table 19.17: Definition of Significance

Impact	Justification
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation, or within the margin of forecasting error.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the Proposed Development.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Major	These beneficial or adverse effects are very important and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national, or regional importance. However, a major change in a site or feature of local importance may also enter this category.

19.9 Embedded Mitigation

19.9.1 As part of the Proposed Development design process, a number of Embedded Mitigation measures have been proposed to reduce the potential for impacts on marine archaeology (see Table 19.18). They are considered at every stage of the Proposed Development through design and best practice and, as there is a commitment to implementing these measures, these have been considered in the assessment presented in Section 19.10 (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). These Embedded Mitigation measures are considered standard industry practice for this type of development.

Table 19.18: Embedded Mitigation Adopted as Part of the Proposed Development

ID*	Embedded Mitigation Adopted as Part of the Proposed Development	Justification
7	Development of, and adherence to a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).	Construction procedures will follow the CMS and CoCP, with measures to control specific health and safety risks identified.
8	All relevant Health and Safety Executive (HSE) procedures will be followed.	As with the CMS, construction procedures will consider all relevant health and safety risks and follow HSE legislation and guidance to mitigate these potential identified risks.

ID*	Embedded Mitigation Adopted as Part of the Proposed Development	Justification
24	Development of, and adherence to, a Development Specification and Layout Plan (DSLP). The development of the DSLP includes consultation with the relevant authorities for approval, including the MCA and Northern Lighthouse Board (NLB).	Best practice favours the preservation *in situ* of archaeological remains (The Crown Estate, 2021), therefore the ideal preferred mitigation for archaeological remains is avoidance. The DSLP will detail the layout of the Proposed Development which will avoid known archaeological receptors where possible. Anomalies should be further investigated if direct impacts cannot be avoided. Reporting through the PAD will be undertaken should material of potential archaeological interest be encountered (The Crown Estate, 2014).
30	The identification and implementation of AEZs around receptors identified as having a known archaeological potential.	Best practice favours the preservation *in situ* of archaeological remains (The Crown Estate, 2021), therefore the ideal preferred mitigation for archaeological remains is avoidance. For the Proposed Development, AEZs have been proposed and will be agreed with MD-LOT through the WSI (Volume 4, Appendix 33).
31	The development and implementation of a Written Schemes of Investigation (WSI) and Protocol for Archaeological Discovery (PADs).	To ensure all development activities avoid significant impacts on marine archaeology receptors, and to ensure reporting and further mitigation is applied to discoveries on marine archaeology receptors (The Crown Estate, 2021). To ensure that discoveries of unknown archaeological receptors are reported and subject to suitable further mitigation (The Crown Estate, 2014). To ensure that further mitigation measures are implemented if a significant effect on a maritime archaeology receptor cannot be avoided. To be agreed on a case-by-case basis with MD-LOT as applicable (The Crown Estate, 2021).
32	Archaeological input into the specifications of relevant site geophysical, geotechnical and Remotely Operated Vehicle (ROV) surveys with appropriate monitoring or analysis, if necessary.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with MD-LOT (The Crown Estate, 2014).
35	Drafting and implementation of a decommissioning programme, prepared in accordance with requirements of the Energy Act 2004, which will set out the extent of infrastructure to be removed as well as the methods and processes which will be used.	The aim of this plan is to adhere to the existing legislation and guidance (at the time of writing) during the decommissioning phase. This programme will be developed to reduce the amount of long term disturbance to the environment as far as reasonably practicable.
41	Identification and implementation of Temporary Archaeological Exclusion Zones (TAEZs) around encounters of previously unknown archaeological sites.	To ensure that discoveries of unknown archaeological receptors of significance are avoided and subject to suitable mitigation (The Crown Estate, 2014).
42	Design and micrositing of Offshore Infrastructure to avoid known	Best practice favours the preservation *in situ* of archaeological remains (The Crown Estate,

ID*	Embedded Mitigation Adopted as Part of the Proposed Development	Justification
	archaeological receptors, including those identified in pre-construction surveys.	2021), therefore the ideal preferred mitigation for archaeological remains is avoidance. Anomalies should be further investigated if direct impacts cannot be avoided. Reporting through the PAD will be undertaken should material of potential archaeological interest be encountered (The Crown Estate, 2014).

*see Volume 3, Technical Appendix 4.6: Schedule of Mitigation and Commitments

19.10 Assessment of Significance

19.10.1 Table 19.12 summarises the potential effects arising from the construction, O&M and decommissioning phases of the Proposed Development, as well as the MDS against which each impact has been assessed. An assessment of the likely significance of the effects of the Proposed Development on the marine archaeology receptors caused by each identified impact is given below.

IMPACT 1 - SEDIMENT DISTURBANCE AND DEPOSITION LEADING TO INDIRECT IMPACTS ON MARINE ARCHAEOLOGY RECEPTORS

19.10.2 The seabed activities associated with the construction, O&M and decommissioning phases of the Proposed Development may produce sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors. The MDS includes drilling for anchor installation, sandwave clearance and cable installation in the construction phase, cable repair and reburial in the O&M phase and decommissioning activities, such as cable removal. These activities are presented in Table 19.12.

All Phases

Magnitude of Impact

19.10.3 Magnitude of SSC has been considered using numerical modelling, at locations in the Array Area, along the length of and in the middle of the Export Cable Corridor, and near to the Landfall. A full description and discussion of each event is set out in Volume 3, Technical Appendix 7.3: Physical Processes Technical Assessment.

19.10.4 For activities with long duration disturbance (such as pre-lay cable trenching and sandwave clearance using an MFE, and drilling for foundation installation), within 5 m of the activity, SSC might be millions of mg/l or more, (i.e. more sediment than water in parts of the local plume). The effect is very localised and of very short duration. As sediment in the plume is redeposited and dispersed both vertically and horizontally with distance and time downstream, SSC is expected to reduce to less than 1,000 mg/l within tens of metres. Following disturbance of the seabed by MFE, it is found that the coarser sand and gravel fractions at each site settle to the seabed within a limited time of release and so tend to be deposited within a relatively small footprint (from metres up to 200 m), resulting in a relatively greater local average thickness of <500 mm during spring tides in the Array Area and Export Cable Corridor; and

<800 mm during neap tides. The average sediment deposit thickness for a 6 m^2 trench cross section is 60 mm at 100 m downstream.

19.10.5 For releases of dredged sediment by Trailer Suction Hopper Dredger (TSHD), the level of SSC during the initial release is realistically expected to be locally very high at the location of the spoil release (millions of mg/l within 5 m of the activity, i.e. more sediment than water in the local plume). These sediments will settle to the bed within approximately 100 m for gravel, 500 m for coarse sand, 1,500 m for medium sand, and 5,000 m for finer sands from the release point. This distance will be proportionally shorter during periods of lower current speed, such as outside peak flow times and generally around neap tides. The sediment thickness deposited from this would vary, but a large hopper could cover an area of 220,000 m^2 with an average thickness of 50 mm.

19.10.6 The MDS for the O&M phase is represented by repair and reburial of cables in which may cause increases in SSC by similar amounts to those experienced during the construction phase, specifically as cable repair would be undertaken using similar methods as during the construction phase. The nature of the seabed sediments and the rate of sediment transport through the affected area are unlikely to be changed by sweeping of the seabed by mooring lines.

19.10.7 The MDS for the decommissioning phase assumes the total removal of the Offshore Infrastructure, this includes buried cables and associated cable protection. The decommissioning methods are assumed to be similar to those during the construction phase, with the magnitude of increased SSCs and associated deposition being no greater than those expected for the construction phase.

19.10.8 The changes in SSC and accompanying changes to seabed levels associated with decommissioning activities are expected to be less than or the same as that associated with construction.

19.10.9 For upstanding wrecks, overburden deposited as a result of sediment plumes from construction activities has the potential to compress and collapse the fabric of the wreck, leading to an adverse impact. For all other receptors, in general, burial will provide some level of protection from biological, chemical and physical erosion to the receptor, and could be classified as beneficial (Björdal and Nilsson, 2008).

19.10.10 The impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude of impact is therefore considered to be low.

Sensitivity of the Receptor

19.10.11 The seabed activities associated with the construction, O&M and decommissioning phases of the Proposed Development may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.

19.10.12 The disturbance of sediment/seabed deposits can result in the exposure or further exposure of known marine archaeology receptors (e.g. wreck sites and geophysical anomalies) and the exposure of as yet unknown marine archaeology

receptors. Such activities can also result in the burial or smothering of known and unknown receptors.

19.10.13 Whilst marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, they can tolerate some indirect impacts such as burial or exposure without significant adverse impact, particularly if these impacts are temporary and short term, and if they are subject to periodic burial or exposure through the normal physical processes of their environment. Marine archaeology receptors can typically tolerate some smothering caused by SSC.

19.10.14 Marine archaeology receptors still cannot recover from any changes in their fabric or context caused by these direct impacts, for instance, the collapse of their fabric through smothering effects. Upstanding wrecks are the most susceptible to these impacts and would usually also represent the most valuable receptors. There are high potential marine archaeology receptors in the Marine Archaeology Study Area that are upstanding wrecks but these are subject to AEZs which will preclude the largest impacts. It is likely that there are more upstanding wrecks within the Marine Archaeology Study Area in the area not subject to geophysical survey, particularly associated with, UKHO or Canmore records. These have also been given TEZs as a part of the Embedded Mitigation listed in Section 19.9. Therefore, the vulnerability of the receptor is considered medium.

19.10.15 Marine archaeology receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore considered to be high.

Significance of the Effect

19.10.16 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. The effect will therefore be of minor or moderate adverse significance, which is not significant in EIA terms.

19.10.17 Expert professional judgement has been used in concluding that the significance is minor, rather than moderate, which is not significant in EIA terms. This is due to the majority of receptors receiving a beneficial effect (i.e. protection through burial), with only high potential receptors susceptible to adverse effect. Due to the application of AEZs and TEZs, which will limit the magnitude of impact on high potential receptors, the significance of effect is considered **Minor** adverse.

Additional Mitigation and Residual Effect

19.10.18 No Additional Mitigation is considered necessary because the likely effect in the absence of mitigation is not significant in EIA terms.

IMPACT 2 - DIRECT DAMAGE TO MARINE ARCHAEOLOGY RECEPTORS

19.10.19 Direct Damage to marine archaeology receptors may arise through the construction, O&M and decommissioning phases. All activities that impact the seabed have the potential to directly impact archaeological material, and include:

- seabed preparation including sandwave clearance;
- the installation of the IACs, interconnector and Offshore Export Cables;
- the installation of Wind Turbine and OSP foundations;
- the installation of up to 20 Subsea Connectors; and
- any vessel anchoring and jack up activities associated with these.

19.10.20 Such activities may also impact the relationships between a receptor and the wider environment (a source of archaeological information known as archaeological context). Marine archaeological receptors with height, such as shipwrecks, may also be impacted by activities that occur within the water column, including mooring and anchoring activities. The MDS for direct damage to marine archaeology receptors is presented in Table 19.12.

19.10.21 Activities in the O&M and decommissioning phases will generally only affect areas of seabed that have already been impacted during construction.

Construction and O&M Phases

Magnitude of Impact

19.10.22 For known marine archaeology receptors, following the application of Embedded Mitigation measures as outlined in Section 19.9, impacts will be avoided. This is particularly the case through the implementation of AEZs around high and medium potential anomalies and known wrecks. These measures interrupt the impact pathway for direct impacts on known marine archaeology receptors.

19.10.23 Currently classified low potential geophysical anomalies are not presently believed to be of archaeological significance. Further investigation and classification of these can take place during the pre-construction phase and avoidance of receptors that transpire to be of archaeological significance can also take place, through the implementation of AEZs, TEZs and micrositing, as appropriate. More detail can be found in Volume 4, Appendix 33: Written Scheme of Investigation and Protocol for Archaeological Discovery.

19.10.24 However, it is not possible to plan to avoid heritage assets that have not yet been discovered and so the greatest magnitude of impact would involve impacts on potential receptors.

19.10.25 Much of the Embedded Mitigation measures set out in Section 19.9 will serve to reduce the likelihood of impacts, for instance archaeological assessment and interpretation of pre-construction geophysical data would reduce, as far as possible, the potential for unintended impacts on currently unknown receptors during construction phase activities. If features of archaeological interest are identified during these pre-construction surveys, they would be subject to the same mitigation as described for known heritage assets. Where impacts to potential marine archaeology receptors are foreseen (particularly low potential geophysical anomalies), typically they are subject to pre-construction site investigation geophysical survey, UXO identification surveys by ROV or diver, or potentially targeted archaeological works. Similarly, the PAD attempts to ensure that features of archaeological interest identified during all construction

activities are reported, following which the Embedded Mitigation can be applied as appropriate.

19.10.26 These Embedded Mitigation measures cannot exclude entirely the possibility of a significant effect to receptors that are not identified through geophysical survey (often very high value receptors such as aircraft material and buried wooden wrecks have little geophysical expression).

19.10.27 Where an unknown receptor is discovered through construction phase activities, often the act of discovery is through an impact of high adverse magnitude. There may also be situations where a receptor is discovered or already known, but impacts are unavoidable due to other project constraints. In these cases, the WSI and PAD (Volume 4, Appendix 33) sets out a framework for further remedial measures which will be applied on a case-by-case basis, in consultation with MD-LOT, but could include, *inter alia*, recovery, relocation, excavation, conservation, stabilisation and/or recording of the receptor. The level of mitigation would be determined by the importance of the archaeological receptor. For example, a World War II aircraft or medieval wooden shipwreck may require full excavation, whereas modern debris would require no Additional Mitigation.

19.10.28 In line with the MPS, opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost (UK Government, 2011). The discovery and subsequent investigation will provide new information on a previously unknown receptor of medium to very high value. This will create the potential for the site to contribute to regional, national and/or international research objectives and provide considerable enhancement to the archaeological or historical interest and knowledge of the asset. Thus, for sites with the highest archaeological value, previously unknown to the archaeological community and the public, this would be defined as an impact of high beneficial magnitude, allowing the application of a beneficial impact to counterbalance the magnitude of the adverse impact. A potential significant effect can therefore be offset by measures to research and publicise the previously unknown receptor.

19.10.29 Direct impacts will occur from a range of activities, most of which would be short term, and intermittent such as seabed preparation activities. In all cases the initial impact to the marine archaeology receptor is likely to be of the highest magnitude, and in all cases will be irreversible. The likelihood of the impact, following application of the Embedded Mitigation, is low.

19.10.30 The impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude of impact is therefore considered to be negligible adverse.

Sensitivity of the Receptor

19.10.31 Following the application of Embedded Mitigation as outlined in Section 19.9, there is no impact pathway for impacts to known marine archaeology receptors. It is not possible to plan to avoid heritage assets that have not yet been

discovered, and so the relevant receptors for this impact are potential (currently unknown receptors). Potential receptors could include maritime, aviation or seabed prehistory assets. Geophysical anomalies currently identified as being of low archaeological potential also have the possibility to be of higher archaeological value than is currently expected.

19.10.32 Marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, or their context and relationship with their wider environment. As a result, the sensitivity of a marine archaeology receptor to direct damage can only be determined through its value.

19.10.33 Shipwrecks of all periods and aircraft material have the potential to be of very high value, and so in line with the MPS (UK Government, 2011) and using the precautionary principle, these receptors should be classed as very high sensitivity, at least until further characterisation can be undertaken (Table 19.16).

19.10.34 Isolated maritime, aviation and prehistoric artefacts in secondary contexts have slightly more capacity to tolerate impacts. As their relationship to their context is of lesser meaning than *in situ* remains, impacts would result in a lesser loss of cultural significance. In the terminology of relevant guidance, such artefacts would have intrinsic characteristics, and possible associative characteristics, but fewer contextual characteristics (Historic Environment Scotland, 2019a). However, they still have the potential to be of medium archaeological value and so should be classified as having medium sensitivity.

19.10.35 The greatest sensitivity is for *in situ* currently unknown marine archaeology receptors.

19.10.36 Overall, the marine archaeology receptors are deemed to be of high vulnerability, low recoverability and very high value. The sensitivity of the receptor is therefore considered to be very high.

Significance of the Effect

19.10.37 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be very high. The effect will therefore be of **Minor** adverse significance, which is not significant in EIA terms.

19.10.38 As the relevant receptors are currently unknown, there is a level of uncertainty attached to this level of significance (i.e. it is not certain that any effects of this significance will occur). However, the assessment is based on the precautionary principle and so needs to highlight these potential effects.

Additional Mitigation and Residual Effect

19.10.39 No Additional Mitigation is considered necessary because the likely effect in the absence of mitigation is not significant.

Decommissioning Phase

19.10.40 For the purposes of this assessment, the impacts of decommissioning activities are predicted to be no greater than those for construction. As the construction phase represents the MDS, all impacts during decommissioning would take place entirely within the area impacted by construction activities. Therefore,

there is no impact pathway to novel direct impacts on marine archaeology receptors during the decommissioning phase.

IMPACT 3 - DIRECT DAMAGE TO DEEPLY BURIED MARINE ARCHAEOLOGY RECEPTORS

19.10.41 The seabed activities associated with the construction phase, particularly piling, theoretically have the potential to directly damage palaeolandscapes and associated archaeological material deeply buried within the Marine Archaeology Study Area that would be unaffected by other more superficial seabed impacts. The relevant receptors for this impact would usually be Pleistocene or Holocene deposits with archaeological or geoarchaeological potential that underlie more recent Quaternary units as well as the surface seabed sediments. This impact would only occur during piling which only takes place in the construction phase of the project, therefore there is no pathway to impact deeply buried receptors during the O&M and decommissioning phases.

Construction Phase

Magnitude of Impact

19.10.42 All direct impacts that result in damage to, or disturbance of, *in situ* prehistoric sites would result in a loss of resource and/or quality and integrity of resource or severe damage to key characteristics, features or elements. Any of these would result in the loss of cultural significance. Such an impact would be of high adverse magnitude.

19.10.43 The impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude of impact is therefore considered to be high.

Sensitivity of the Receptor

19.10.44 Following the palaeolandscapes assessment in Volume 3, Technical Appendix 19.1: Marine Archaeological Technical Report, there is potential for deposits of archaeological value in the Export Cable Corridor. However, there is very low to no potential for the existence of palaeolandscapes in the Array Area, where piling activities will take place (Volume 3, Technical Appendix 19.1: Marine Archaeology Technical Report). As the only receptors that could be impacted by piling would be located in the Array Area, they can be classified as of negligible value.

19.10.45 Overall, the marine archaeology receptors are deemed to be of low vulnerability, low recoverability and negligible value. The sensitivity of the receptor is therefore considered to be negligible.

Significance of the Effect

19.10.46 Overall, for deeply buried marine archaeology receptors the magnitude of the impact is deemed to be high and the sensitivity of the receptor is considered to be negligible. The effect will, therefore, be of **Minor** adverse significance, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

19.10.47 No Additional Mitigation is considered necessary because the likely effect in the absence of mitigation is not significant.

IMPACT 4 - ALTERATION OF SEDIMENT TRANSPORT REGIMES LEADING TO INDIRECT IMPACTS ON MARINE ARCHAEOLOGY RECEPTORS

19.10.48 The presence of infrastructure on the seabed during the O&M phase has the potential to alter sediment transport regimes. As a result, changes in sediment may indirectly impact marine archaeology receptors present in the Marine Archaeology Study Area through burial or exposure. The MDS for the relevant activities are presented in Table 19.12.

19.10.49 The alteration of sediment transport regimes can result in the exposure or further exposure of known marine archaeology receptors (e.g. wreck sites and geophysical anomalies) and the exposure of as yet unknown marine archaeology receptors. Such processes can also result in the burial of known and unknown receptors.

O&M Phase

Magnitude of Impact

19.10.50 The installation of the Proposed Development may lead to altered sediment transport pathways (Volume 3, Technical Appendix 7.1: Physical Processes Technical Report). The MDS includes the installation of cable protection, Wind Turbine foundations and OSP foundations. These have the potential to alter sediment transport pathways in a manner that would impact marine archaeology receptors.

19.10.51 Numerical modelling of sediment transport (driven by tidal currents) was carried out in order to consider the changes associated with the MDS for blockage due to foundations within the Array Area. These are described in full in Volume 3, Technical Appendix 7.3: Physical Processes Technical Assessment. No measurable change in residual sand transport rate or direction is predicted either within the Array Area, or elsewhere, at the resolution of the model (approximately 100 m). Localised narrow wake features not resolved by the model may have a similarly localised effect on the texture (but not the morphology) of the seabed within their footprint; the wake is only likely to result in changes to seabed morphology immediately around the foundation bases in the form of scour. For all foundations, the footprint area of scour protection is larger than the predicted footprint of local scour.

19.10.52 In addition, for all areas in which cable protection is used (including where sandwaves are present), it is not expected that the presence of the cable protection devices will continuously affect patterns of sediment transport following the initial period of accumulation. It follows that any changes on seabed morphology away from the cable protection will also be very small. The extent of the cable protection measures does not constitute a continuous blockage along the Export Cable Corridor.

19.10.53 The impact is predicted to be of local spatial extent, medium term duration, continuous and high reversibility. It is predicted that the impact will affect the

receptor indirectly. The magnitude of impact is therefore considered to be negligible.

Sensitivity of the Receptor

19.10.54 Whilst marine archaeology receptors cannot typically adapt, tolerate, or recover from impacts resulting in damage or loss to the receptors themselves, they can tolerate some indirect impacts such as burial or exposure without significant adverse impact, particularly if these impacts are temporary and short term, and if they are subject to periodic burial/exposure through the normal physical processes of their environment.

19.10.55 However, marine archaeology receptors still cannot recover from any changes in their fabric or context caused by these indirect impacts, for instance deterioration in their fabric through increased erosion or scour causing undermining and collapse. The partially upstanding wrecks classified as high potential (Section 19.6) are most susceptible to these impacts. In addition, these indirect impacts may affect any unknown marine archaeology receptor and taking a precautionary approach the value of the receptor is considered to be very high.

19.10.56 Overall, the marine archaeology receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore considered to be high.

Significance of the Effect

19.10.57 Overall, the magnitude of the impact is deemed to be negligible and the sensitivity of the receptor is considered to be high. The effect will therefore be of **Minor** adverse significance, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

19.10.58 No Additional Mitigation is considered necessary because the likely effect in the absence of mitigation is not significant.

19.11 Inter-Related Effects

19.11.1 A description of the likely inter-related effects arising from the Proposed Development on marine archaeology receptors is provided in Volume 2, Chapter 23: Inter-Related Effects.

19.11.2 For marine archaeology, the following potential impacts have been considered within the inter-related assessment:

- sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors; and
- alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors.

19.11.3 Table 19.19 lists the inter-related effects (project lifetime effects) that are predicted to arise during the construction, O&M, and decommissioning of the Proposed Development and also the inter-related effects (receptor-led effects) that are predicted to arise for marine archaeology receptors.

Table 19.19: Summary of Likely Significant Inter-Related Effects for Marine Archaeology from Individual Effects Occurring Across the Construction, O&M and Decommissioning Phase of the Proposed Development (Project Lifetime Effects) and from Multiple Effects Interacting Across all Phases (Receptor-led Effects)

Description of Impact	Phase			Likely Significant Inter-Related Effects
	C	O	D	
Project Lifetime Effects				
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	When SSC and sediment deposition is considered additively across all phases, the volume of sediment deposited is larger than when considered across an individual phase (i.e. just construction). The majority of seabed disturbance (resulting in highest SSC and deposition) will occur during the construction and decommissioning phases, with any effects being short lived and intermittent across each phase. Meaningful sediment plume interaction generally only has the potential to occur if the activities generating the sediment plumes occur at the same time. Due to this, and the medium vulnerability and medium recoverability of marine archaeology receptors to indirect impacts from sediment disturbance and deposition, the interaction of these impacts across the stages of the Proposed Development lifecycle are not anticipated to interact in such a way as to result in inter-related effects of greater significance then the assessments presented for each individual phase. As a result, the inter-related effects are of minor adverse significance which is not significant in EIA terms.
Receptor-led Effects				
• **Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors** • **Alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors**	×	✓	×	Potential exists for spatial and temporal interactions between the effects arising from increased SSC and sediment deposition and alteration of sediment transport regimes on marine archaeology receptors during the O&M phase of the Proposed Development. Due to the impacts of sediment disturbance and deposition being short lived and intermittent, particularly in the O&M phase (the majority of seabed disturbance resulting in the highest SSC and deposition will occur during the construction and decommissioning phases), and the impact of the alteration of sediment transport regimes having negligible impact in the O&M phase, it is predicted that any inter-related effect will not be of any greater significance than those impacts already assessed in isolation (i.e. minor adverse). Furthermore, the impacts of the alteration of sediment transport regimes may expose or bury marine archaeology receptors, and sediment deposition could only bury them. In general, burial can be seen as a beneficial impact, as it slows the physical, chemical and biological deterioration of marine archaeology receptors (Björdal and Nilsson, 2008). The receptor-led impact would therefore likely be burial and therefore beneficial in nature. As a result, the receptor-led effects are of minor adverse significance which is not significant in EIA terms

19.12 Cumulative Effects Assessment

Methodology

19.12.1 The Cumulative Effects Assessment (CEA) assesses the impact associated with the Proposed Development together with other relevant projects and activities. Cumulative effects are defined as the effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource. Further details on CEA methodology are provided in Volume 1, Chapter 4: Environmental Impact Assessment Methodology.

19.12.2 The projects selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 3, Appendix 4.4: Cumulative Effects Assessment - Screening), which provides further information in relation to other projects and how this information is obtained and applied to the assessment. Each project has been considered on a case-by-case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved. For marine archaeology, projects that overlap the Marine Archaeology Study Area have been screened into the CEA.

19.12.3 In undertaking the CEA for the Proposed Development, it is important to bear in mind that other projects under consideration will have differing potential for proceeding to an operational stage and hence a differing potential to ultimately contribute to a cumulative impact alongside the Proposed Development. Therefore, a tiered approach has been adopted. This provides a framework for placing relative weight upon the potential for each project to be included in the CEA to ultimately be realised, based upon the project's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- Tier 1 – The onshore elements of the Project;
- Tier 2 – Projects that have an application submitted, are consented, under construction or operational to the extent not already captured with the baseline;
- Tier 3 – Projects which have submitted a scoping report and/or have received a scoping opinion; and
- Tier 4 – Reasonably foreseeable projects including those with Crown Estate Scotland option or lease agreements.

19.12.4 The specific projects scoped into the CEA for marine archaeology, are outlined in Table 19.20 and in Figure 19.2. The onshore elements of the Project in general have no physical effect-receptor pathway with marine archaeology receptors. The onshore application (AOWFL, 2025) assessed the same impacts in the intertidal area as assessed here, and concluded that the onshore elements of the Project have no potential to result in

cumulative effects with the Offshore Infrastructure. The onshore elements of the Project are therefore not scoped into the CEA. There are also no Tier 3 or Tier 4 projects within the Marine Archaeology Study Area that have a conceptual effect-receptor pathway with marine archaeology receptors. Therefore, only Tier 2 projects are assessed in the CEA.

19.12.5 The range of potential cumulative impacts that are identified and included in Table 19.24 below, is a subset of those considered for the Proposed Development alone assessment. This is because some of the potential impacts identified and assessed for the Proposed Development alone, are localised and temporary in nature. It is considered therefore, that these potential impacts have limited or no potential to interact with similar changes associated with other plans or projects. These have therefore been scoped out of the CEA. The potential impacts scoped out of the CEA are:

- alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors, as the project alone assessment considered the magnitude of this impact to be negligible; and
- direct damage to deeply buried marine archaeology receptors, as the relevant receptor is of negligible sensitivity, and there are no other projects that include piling overlapping the Marine Archaeology Study Area.

19.12.6 Similarly, some of the potential impacts considered within the Proposed Development alone assessment are specific to a particular phase of development (e.g. construction, O&M or decommissioning). Where the potential for cumulative effects with other projects only have potential to occur where there is spatial or temporal overlap with the Proposed Development during certain phases of development, impacts associated with a certain phase may be omitted from further consideration where no projects have been identified that have the potential for cumulative effects during this period.

Table 19.20: List of Other Projects Considered Within the CEA for Marine Archaeology

Project	Status	Distance from Proposed Development (km)	Description of Project	Dates of Construction (If Applicable)	Dates of Operation (If Applicable)	Overlap with the Proposed Development
Tier 2						
PIPER B 30" OIL EXPORT PIPELINE	Operational	0.00	Oil Pipeline	Operational	Present day – unknown	Project O&M phase overlaps with construction and O&M phase of the Proposed Development.
SHEFA-2 Seg 8	Operational	1.20	Subsea telecommunications cable.	Operational	Present day – unknown	Project O&M phase overlaps with construction and O&M phase of the Proposed Development.
SHEFA-2 Seg 9	Operational	0.00	Subsea telecommunications cable.	Operational	Present day – unknown	Project O&M phase overlaps with construction and O&M phase of the Proposed Development.
Shetland HVDC	Operational	0.00	260 km subsea power cable between Shetland and mainland Scotland.	Operational	Present day – unknown	Project O&M phase overlaps with construction and O&M phase of the Proposed Development.
SSEN-T Spittal to Peterhead HVDC	Planning	0.00	HVDC cable from Spittal to Peterhead.	2026 to 2029	2030 onward	Project construction phases may overlap with construction phase of the Proposed Development in 2030 only. Project O&M phase overlaps with O&M phase of the Proposed Development.

* Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

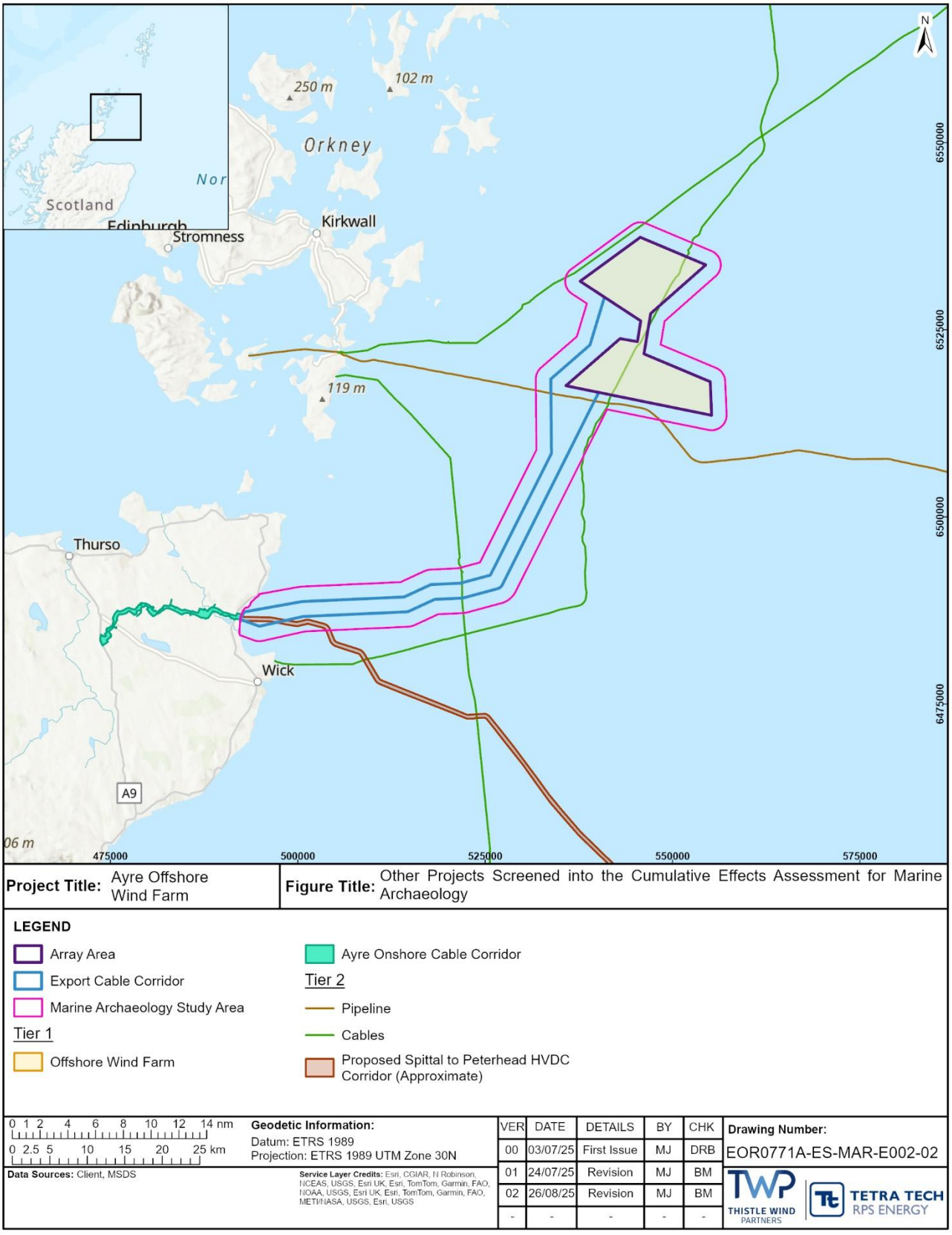

Figure 19.2: Other Projects Screened into the Cumulative Effects Assessment for Marine Archaeology

Maximum Design Scenario

19.12.7 The MDS identified in Table 19.21 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the details provided in Volume 1, Chapter 3: Project Description as well as the information available on other projects (see Volume 3, Technical Appendix 4.4: Cumulative Effects Assessment - Screening), to inform a 'MDS'. Any other development scenario within the PDE, will result in the same, or less, level of environmental effect.

Table 19.21: MDS Considered for Each Impact as Part of the Assessment of Likely Significant Cumulative Effects on Marine Archaeology

Potential Cumulative Effect	Phase*			Tier	MDS
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Tier 2	MDS as described for the Proposed Development (Table 19.12) assessed cumulatively with: • Piper B 30" Oil Export Pipeline • SHEFA-2 Seg 8 • SHEFA-2 Seg 9 • Shetland HVDC • SSE Spittal to Peterhead HVDC
Direct damage to marine archaeology receptors in the Marine Archaeology Study Area	✓	✓	✓	Tier 2	MDS as described for the Proposed Development (Table 19.12) assessed cumulatively with: • Piper B 30" Oil Export Pipeline • SHEFA-2 Seg 8 • SHEFA-2 Seg 9 • Shetland HVDC • SSE Spittal to Peterhead HVDC

* Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Cumulative Effects Assessment

19.12.8 An assessment of the likely significance of the cumulative effects of the Proposed Development upon marine archaeology receptors arising from each identified impact is given below.

CUMULATIVE SEDIMENT DISTURBANCE AND DEPOSITION LEADING TO INDIRECT IMPACTS ON MARINE ARCHAEOLOGY RECEPTORS

Tier 2

All Phases

19.12.9 There is potential for indirect impacts to marine archaeology receptors as a result of the Proposed Development's construction, O&M and decommissioning activities alongside other offshore cables and pipelines within the Marine Archaeology Study Area. The relevant activities include site preparation including sandwave clearance, foundation installation, cable installation, maintenance operations (e.g. cable repair/reburial and use of jack up vessels) and decommissioning activities (e.g. foundation removal), listed in full in Table 19.21. If these are undertaken concurrently, they could result in increased SSC, and associated deposition of sediment.

Magnitude of Impact

19.12.10 SSE Spittal to Peterhead HVDC construction phase will overlap with the construction phase of the Proposed Development for one year. Construction activities are predicted to be intermittent and short term, and likely to not be undertaken in the same location concurrently. The construction phase of the Proposed Development is not known to overlap the construction phases of any other project scoped into the CEA for marine archaeology (Table 19.20), all other cables and pipelines are currently operational. Particular O&M activities on these cables and pipelines are not likely to be in close proximity or undertaken at the same time as construction and O&M of the Proposed Development. There is therefore negligible potential for cumulative impacts from SSC to impact marine archaeology receptors.

19.12.11 The cumulative impact is predicted to be of regional spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude of impact is therefore, considered to be negligible.

Sensitivity of Receptor

19.12.12 The sensitivity of the receptor is in line with Section 19.10.

19.12.13 Marine archaeology receptors are deemed to be of medium vulnerability, medium recoverability and very high value. The sensitivity of the receptor is therefore considered to be high.

Significance of Effect

19.12.14 Overall, the magnitude of the cumulative effect is deemed to be negligible and the sensitivity of the receptor is considered to be high. The cumulative effect will, therefore, be of **Minor** adverse significance, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

19.12.15 No Additional Mitigation is considered necessary because the likely effect in the absence of Additional Mitigation (beyond the Embedded Mitigation outlined in Section 19.9) is not significant in EIA terms.

CUMULATIVE DIRECT DAMAGE TO MARINE ARCHAEOLOGY RECEPTORS IN THE MARINE ARCHAEOLOGY STUDY AREA

Tier 2

All Phases

Magnitude of Impact

19.12.16 Known seabed features will be avoided through Embedded Mitigation by the Proposed Development. The other relevant cable and pipeline projects have also gone, or will also go, through the EIA process, and known receptors are similarly expected to be avoided by those projects through mitigation.

19.12.17 Furthermore, whilst the general footprints of some of the projects overlap (some do not come within the Site Boundary, but merely the Marine Archaeology Study Area), activities will not likely affect the same receptors, largely affecting different areas of seabed.

19.12.18 Finally, if a receptor does receive a direct impact from a project (likely to be an unknown receptor), the impact is expected to be permanent and irreversible (Section 19.10). Therefore, the significance of any further impact from a separate project on the same receptor will then be negligible.

19.12.19 SSE Spittal to Peterhead HVDC construction phase will overlap with the construction phase of the Proposed Development for one year. Construction activities are not likely to impact the same receptors, except for submerged prehistory receptors in the nearshore area, should they be present. As the receptor is potentially extensive but largely natural in nature, mitigation for submerged prehistory receptors is usually agreed as further geoarchaeological analysis. This has been suggested for the Proposed Development (Section 19.9) and has also been suggested for the SSE Spittal to Peterhead HVDC application (Scottish and Southern Electricity Networks Transmission, 2025), reducing the magnitude of any impact. The construction phase of the Proposed Development is not known to overlap the construction phases of any other project scoped into the CEA for marine archaeology (Table 19.20), all other cables and pipelines are currently operational. Most direct impacts in the construction phases will have already happened in these projects and would form part of the baseline of the Proposed Development.

19.12.20 The cumulative impact is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor directly. The magnitude of impact is therefore, considered to be negligible.

Sensitivity of Receptor

19.12.21 The sensitivity of the receptor is in line with Section 19.10.

19.12.22 Overall, the marine archaeology receptors are deemed to be of high vulnerability, low recoverability and very high value. The sensitivity of the receptor is therefore considered to be very high.

Significance of Effect

19.12.23 Overall, the magnitude of the cumulative effect is deemed to be negligible and the sensitivity of the receptor is considered to be very high. The cumulative effect will, therefore, be of **Minor** adverse significance, which is not significant in EIA terms.

Additional Mitigation and Residual Effect

19.12.24 No Additional Mitigation is considered necessary because the likely effect in the absence of Additional Mitigation (beyond the Embedded Mitigation outlined in Section 19.9) is not significant in EIA terms.

19.13 Proposed Monitoring

19.13.1 All of the potential effects to marine archaeology receptors are identified as not significant in terms of the EIA Regulations, with the current acknowledgement of the Embedded Mitigation (e.g. the implementation of AEZs (Table 19.18)). However, in line with relevant guidance, monitoring is proposed to verify there have been no significant adverse impacts related to marine archaeology. Proposed monitoring measures are outlined in Table 19.22 below.

Table 19.22: Proposed Monitoring and the Method of Implementation for Marine Archaeology

Potential Environmental Effect	Monitoring Commitment	Means of Implementation
Direct or indirect impacts on marine archaeological receptors within the proposed AEZs	Monitoring of AEZs should be carried out to confirm that no impact has occurred to the archaeological receptors within the proposed AEZs (The Crown Estate, 2021). This should be undertaken at a minimum: • Post-construction; • Post-decommissioning.	Through the archaeological assessment of relevant geophysical data (acquired by the Applicant for any purpose) or by other means (such as ROV survey) agreed with HES in a method statement. Further details are provided in the WSI and PAD (Volume 4, Appendix 33).

19.14 Transboundary Effects

19.14.1 A screening of transboundary effects has been carried out (see Volume 3, Technical Appendix 4.5: Transboundary Impacts Screening) and has identified that there were no likely significant transboundary effects with regard to marine archaeology from the Proposed Development upon the interests of European Economic Area (EEA) states. All predicted impacts on marine archaeology are likely to be limited in extent to the Marine Archaeology Study Area. As such there is no pathway for impacts (direct or indirect) arising from the Proposed

Development to occur outside of the Marine Archaeology Study Area, and therefore there is no potential for transboundary impacts.

19.15 Summary of Impacts, Mitigation, Likely Significant Environmental Effects and Monitoring

19.15.1 Information on marine archaeology within the Marine Archaeology Study Area was collected through desktop review and site-specific geophysical survey. This information is summarised in Table 19.9 and Table 19.10.

19.15.2 Table 19.23 presents a summary of the assessment of significance in respect to marine archaeology.

19.15.3 Overall, it is concluded that there will be no likely significant environmental effects arising from the Proposed Development during the construction, O&M or decommissioning phases.

19.15.4 Table 19.24 presents a CEA on marine archaeology in EIA terms.

19.15.5 Overall, it is concluded that there will be no likely significant cumulative effects from the Proposed Development alongside other projects/plans.

19.15.6 No likely significant transboundary effects have been identified in regard to effects of the Proposed Development.

Table 19.23: Summary of Assessment of Significance

Description of Impact	Embedded Mitigation	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Additional Mitigation	Significance Residual Effect	Proposed Monitoring
All Phases							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	Various, including the Implementation of AEZs and the implementation of a WSI and PAD (Section 19.9).	Low	High	Minor adverse	None required.	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs.
Direct damage to marine archaeology receptors	Various, including the Implementation of AEZs and the implementation of a WSI and PAD (Section 19.9).	Negligible	Very High	Minor adverse	None required.	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs.
Construction Phase							
Direct damage to deeply buried marine archaeology receptors	Various, including the Implementation of AEZs and the implementation of a WSI and PAD (Section 19.9).	High	Negligible	Minor adverse	None required.	N/A	None
O&M Phase							
Alteration of sediment transportation	Various, including the Implementation	Negligible	High	Minor adverse	None required.	N/A	Monitoring of AEZs to confirm that no impact

Description of Impact	Embedded Mitigation	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Additional Mitigation	Significance Residual Effect	Proposed Monitoring
regimes to indirect impacts on marine archaeology receptors	of AEZs and the implementation of a WSI and PAD (Section 19.9).						has occurred to the archaeological receptors within AEZs

Table 19.24: Summary of Cumulative Effects Assessment

Description of Impact	Cumulative Effects Assessment Tier	Magnitude of Impact	Sensitivity of Receptor	Significance of Effect	Additional Mitigation	Significance Residual Effect	Proposed Monitoring
All Phases							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	Tiers 1 and 2	Negligible	High	Minor adverse	None required.	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs
Direct damage to marine archaeology receptors	Tiers 1 and 2	Negligible	Very High	Minor adverse	None required.	N/A	Monitoring of AEZs to confirm that no impact has occurred to the archaeological receptors within AEZs

References

AOWFL (2025). Ayre Offshore Wind Farm, Onshore EIA Report: Volume 1, Chapter 9: Cultural Heritage. Document Number Ref No. TWP-AYR-RPS-OSC-RPT-0001

Björdal, C.G. and Nilsson, T. (2008) *Reburial of shipwrecks in marine sediments: a long-term study on wood degradation*. Journal of Archaeological Science, 35(4), 862-872

CIfA (2014a). *Code of Conduct.* CIfA.

CIfA (2014b). *Standard and Guidance for Historic Environment Desk-Based Assessment.* Available at: https://archaeologists.net/work/standards. Accessed on: 24 July 2025.

Council of Europe (1992). *European Convention on the Protection of the Archaeological Heritage (Revised) 1992.* Available at: https://rm.coe.int/CoERMPublicCommonSearchServices/DisplayDCTMContent?documentId=090000168007b4d4. Accessed on: 24 July 2025.

COWRIE (2007). *Historic Environment Guidance for the Offshore Renewable Energy Sector.* Wessex Archaeology Ltd.

DECC (2016). *UK Offshore Energy Strategic Environmental Assessment 3, Post Consultation Report.* Department of Energy and Climate Change.

English Heritage (2002). *Military aircraft crash sites: Archaeological guidance on their significance and future management*. Available at: https://historicengland.org.uk/images-books/publications/military-aircraft-crash-sites/. Accessed on: 24 July 2025.

G-tec (2024a). *Geophysical Results Report Ayre NE2 AA.* A report produced by G-tec for Thistle Wind Partners.

G-tec (2024b). *Geophysical Results Report Ayre NE2 EXC*. A report produced by G-tec for Thistle Wind Partners.

Gribble, J. and Leather, S. (2011). *Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector.* COWRIE Ltd.

Highways England, Transport Scotland, Welsh Government and Department for Infrastructure (2019). Design Manual for Roads and Bridges (DMRB) LA 104, Environmental assessment and monitoring, Revision 1. Available at: https://www.standardsforhighways.co.uk/dmrb. Accessed on: 24 July 2025.

Historic England (2023). *Curating the Palaeolithic*. Available at: https://historicengland.org.uk/images-books/publications/curating-the-palaeolithic/heag313-curating-the-palaeolithic/. Accessed on: 24 July 2025.

Historic England (2025). *Marine Geophysics Data Acquisition, Processing, and Interpretation Guidance Notes (2nd Edition)*.

Historic Environment Scotland (2019a). *Designation Policy and Selection Guidance.* Historic Environment Scotland

Historic Environment Scotland (2019b). *Historic Environment Policy for Scotland*. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=1bcfa7b1-28fb-4d4b-b1e6-aa2500f942e7. Accessed on: 24 July 2025.

Historic Environment Scotland (2025) Managing Change in the Historic Environment: Conserving our Underwater Heritage. Available at: https://www.historicenvironment.scot/archives-and-research/publications/publication/?publicationId=32199b0c-f102-4548-97d7-a58e01023c9b Accessed on: 01 October 2025

IEMA, IHBC and CIFA (2021). *Principles of Cultural Heritage Impact Assessment*. Available at: https://ihbc.org.uk/brighton2021/resources/Principles-of-CHIA-V2%5B4%5D.pdf. Accessed on: 24 July 2025.

JNAPC (2006). *Joint Nautical Archaeology Policy Committee Code of Practice for Seabed Development*.

Marine Directorate (2025). *Marine licensing and consenting: offshore renewable energy projects*. Available at: https://www.gov.scot/publications/marine-licensing-and-consenting-offshore-renewable-energy-projects/pages/mitigation-and-monitoring-plans/ Accessed on: 28 October 2025.

Marine Scotland (2016). *Pilot Pentland Firth and Orkney Waters Marine Spatial Plan.* The Scottish Government.

Orkney Islands Council (2024). *Orkney Islands Regional Marine Plan: Consultation Draft*. Available at: https://www.orkney.gov.uk/media/hvipwofn/orkney-islands-regional-marine-plan-consultation-draft-final-2.pdf. Accessed on: 02 September 2025.

Scottish and Southern Electricity Networks Transmission (2025) Spittal-Peterhead HVDC Subsea Link: Marine Environmental Assessment. Available at: https://www.ssen-transmission.co.uk/projects/project-map/spittal--peterhead-subsea-cable-link/ Accessed on: 01 September 2025.

Scottish Government (2010). *Making the Most of Scotland's Seas*. Available at: https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2010/04/making-scotlands-seas-turning-marine-vision-reality/documents/0097196-pdf/0097196-pdf/govscot%3Adocument/0097196.pdf. Accessed on: 24 July 2025.

Scottish Government (2015). *Scotland's National Marine Plan A Single Framework for Managing Our Seas.* The Scottish Government.

Scottish Government (2020). *Sectoral Marine Plan for Offshore Wind Energy.* The Scottish Government.

Scottish Natural Heritage and Historic Environment Scotland (2018). *Environmental Impact Assessment Handbook*.

The Crown Estate (2014). *Protocol for Archaeological Discoveries: Offshore Renewable Projects.* The Crown Estate.

The Crown Estate (2021). *Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects*. The Crown Estate.

TWP (2024). *Ayre Offshore Wind Farm Offshore Scoping Report.* Thistle Wind Partners. Document Number Ref No. TWP-AYR-RPS-OFC-RPT-00031.

UK Government (2011). *Marine Policy Statement.* HM Government, Northern Ireland, Executive Scottish Government, and Welsh Assembly Government. The Stationery Office.

UNESCO (2001). *Convention on the Protection of Underwater Cultural Heritage*. Available at: https://unesdoc.unesco.org/ark:/48223/pf0000126065. Accessed on: 24 July 2025.

United Nations (1982). *United Nations Convention on the Law of the Sea 1982*. Available at: https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf. Accessed on: 24 July 2025.