# Bellrock Offshore Wind Farm

# Wind Farm Development Area

## Environmental Impact Assessment Report - Volume II

## Chapter 15: Marine Archaeology and Cultural Heritage

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# Contents

## List of Tables

## List of Figures (Volume III)



## List of Appendices (Volume IV)

## Glossary of Terminology

| Term | Definition |
|---|---|
| Applicant | Bellrock Offshore Wind Farm Limited, the legal entity submitting Section 36 Consent and Marine Licence applications for the Bellrock Wind Farm Development Area. |
| Aviation archaeology | The remains of crashed aircraft and archaeological material associated with historic aviation activities. |
| Bathymetry | Topography of the seabed. |
| Bellrock Offshore Wind Farm<br>(Bellrock Project) | An offshore wind farm capable of exporting up to 1.8 GW of renewable energy to the National Electricity Transmission System.<br>The Wind Farm Development Area is located 120 km east of Stonehaven, and will connect to the National Electricity Transmission System at the proposed SSEN Transmission Hurlie substation, west of Stonehaven in Aberdeenshire. The Bellrock Offshore Wind Farm comprises of the following Development Areas:<br>▪ Wind Farm Development Area;<br>▪ Offshore Transmission Development Area; and<br>▪ Onshore Transmission Development Area. |
| Cable protection | Protective measure to minimise the effects of scour and hazards along the inter-array cables, and protecting these cables at infrastructure crossing points. |
| Dead wreck | A wreck which has not been detected by repeated surveys and is therefore considered not to exist. |
| Development Area | For consenting purposes, the area for which separate consents and/or Marine Licences will be sought by the Applicant, comprising:<br>▪ Wind Farm Development Area;<br>▪ Offshore Transmission Development Area; and<br>▪ Onshore Transmission Development Area. |
| Floating substructure | A floating structure which provides buoyancy and, in conjunction with the station keeping system, supports a superstructure (e.g. wind turbine generator or offshore substation), and maintaining its position within the structure's excursion limit. |
| Inter-array cable | Armoured cable containing electrical and fibre optic cores, which link the wind turbine generators to each other and to the subsea cable hubs and/or the offshore substations and include dynamic inter-array cable and static inter-array cable sections. |
| Marine isotope stage | Marine isotope stages are alternating warm and cool periods in the Earth's paleoclimate, deduced from oxygen isotope data reflecting changes in temperature derived from data from deep sea core samples. |
| Maritime archaeology | The remains of boats and ships and archaeological material associated with prehistoric and historic maritime activities. |

| Term | Definition |
|---|---|
| Mean High Water Springs | The average over a year of the heights of two successive high waters during those periods of 24 hours (once every fortnight) when the range of the tide is greatest. |
| Mesolithic | 10,000 to 4,000 Before Christ, The Middle Stone Age, falling between the Palaeolithic and Neolithic and marking the beginning of a move from a hunter gatherer society towards a food producing society. |
| Nanotesla | A unit of measurement of a magnetic field, equal to one billionth of a tesla. |
| Offshore Transmission Development Area | The boundary within which the Offshore Transmission Infrastructure will be constructed, operated and maintained, and decommissioned (and includes the whole of the Wind Farm Development Area). |
| Offshore Transmission Infrastructure | Infrastructure located within the Offshore Transmission Development Area including fixed bottom and/or floating offshore substations, offshore reactive compensation station(s) and associated scour protection; interconnector cables and associated cable protection; and offshore export cables and associated cable protection (including activities associated with the Offshore Transmission Infrastructure construction, operation and maintenance, and decommissioning). |
| Onshore Transmission Development Area | The boundary within which the Onshore Transmission Infrastructure will be constructed, operated and maintained, and decommissioned. |
| Onshore Transmission Infrastructure | Infrastructure located within the Onshore Transmission Development Area including transition joint bay(s); onshore export cables; onshore substation; temporary construction compounds; temporary working areas; environmental mitigation areas; drainage/irrigation infrastructure; access works; and any other associated infrastructure (including activities associated with the Onshore Transmission Infrastructure construction, operation and maintenance, and decommissioning). |
| Operational life | The expected operational life of the Wind Farm Infrastructure from the Commercial Operation Date to the first floating offshore unit being decommissioned. |
| Palaeoenvironmental analysis | The study of sediments and the organic remains of plants and animals to reconstruct the environment of a past geological age. |
| Palaeolithic | 500,000 to 10,000 Before Christ, The Old Stone Age, defined by the practice of hunting and gathering and the use of chipped flint tools. This period is usually divided into Lower, Middle and Upper Palaeolithic. |
| Project design envelope | Includes all relevant technical, spatial and temporal elements of the Wind Farm Infrastructure, and the proposed methodology to be employed for construction, operations and maintenance, and decommissioning. |
| Scour protection | Protective material positioned around anchors to avoid sediment being eroded as a result of the flow of water. |
| Seabed features | Features seen on the seafloor in the sidescan sonar or multibeam bathymetry data which are interpreted to represent heritage assets, or potential heritage assets. Also includes magnetic anomalies which |

| Term | Definition |
|---|---|
| | may represent shallow buried ferrous material of archaeological interest |
| Seabed prehistory | Archaeological remains on the seabed corresponding to the activities of prehistoric populations that may have inhabited what is now the seabed when sea levels were lower. |
| Site preparation works | Preparatory activities undertaken within the Wind Farm Development Area prior to the commencement of construction of the Wind Farm Infrastructure, which may comprise (and which may require separate consents):<br>▪ Geophysical surveys, geotechnical surveys, and non-archaeological/archaeological diver/ remotely operated vehicle surveys;<br>▪ Seabed preparation including sand wave levelling, slope levelling for gravity based anchors (if selected), boulder clearance, and pre-lay grapnel runs;<br>▪ Unexploded ordnance survey and/or clearance;<br>▪ Debris clearance; and<br>▪ Out of service cable/pipeline removal. |
| SSEN Transmission Hurlie substation | The onshore substation to be developed by SSEN Transmission, which will receive renewable electricity from the Bellrock Project onshore substation and allow supply of renewable electricity from the wind farm to the National Electricity Transmission System. |
| Station keeping system | The system (including mooring lines and anchors) used to hold a floating offshore unit within its excursion limit and maintain the intended orientation of the floating offshore unit. |
| Subsea cable hub | A subsea device, with a gravel pad foundation, which allows the connection of multiple inter-array cables. |
| Wind Farm Development Area | The boundary within which the Wind Farm Infrastructure will be constructed, operated and maintained, and decommissioned. |
| Wind Farm Infrastructure | Infrastructure located within the Wind Farm Development Area including wind turbine generators; floating substructures, station keeping systems and associated scour protection; inter-array cables and associated cable protection; subsea cable hubs; and ancillary infrastructure including buoys (including activities associated with the Wind Farm Infrastructure construction, operation and maintenance, and decommissioning). |
| Wind turbine generator | A wind turbine generator converts wind energy into electrical energy. The main components include rotor assembly (composed of three blades and a hub); nacelle (containing the generator, shaft and gearbox, power electronic converter and transformer); and a tower (containing lifting equipment and switchgear). |
| Written Scheme of Investigation | Specific document forming the agreement between the Applicant, the appointed archaeologists, contractors and the relevant stakeholders seaward of Mean High Water Springs. The document sets out the methods to mitigate the effects on all the known and potential archaeological receptors within the Bellrock Wind Farm Development Area. |

## Glossary of Abbreviations

| Term | Definition |
|---|---|
| AEZ | Archaeological exclusion zone |
| BC | Before Christ |
| CEA | Cumulative Effects Assessment |
| CHIA | Cultural heritage impact assessment |
| CMS | Construction Method Statement |
| DP | Decommissioning Programme |
| EEA | European Economic Area |
| EIA | Environmental impact assessment |
| HEP | Historic environment policy |
| HEPS | Historic Environment Policy for Scotland |
| HES | Historic Environment Scotland |
| HMPA | Historic Marine Protected Area |
| IAC | Inter-array cable |
| IA-CaP | Inter-array Cable Plan |
| ICOMOS | International Council on Monuments and Site |
| km | Kilometre |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MBES | Multibeam echosounder |
| MD-LOT | Marine Directorate – Licensing Operations Team |
| MHWS | Mean High Water Springs |
| nT | nanotesla |
| O&M | Operation and maintenance |
| OfTDA | Offshore Transmission Development Area |
| OMP | Operation and Maintenance Plan |
| OnTDA | Onshore Transmission Development Area |
| PAD | Protocol for Archaeological Discoveries |
| SBP | Sub-bottom profiler |

| Term | Definition |
|---|---|
| ScARF | Scottish Archaeological Research Framework |
| SKS | Station keeping systems |
| SSS | Side-scan sonar |
| TEZ | Temporary exclusion zone |
| UK | United Kingdom |
| UKHO | United Kingdom Hydrographic Office |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| UXO | Unexploded ordnance |
| VMNSP | Vessel Management and Navigational Safety Plan |
| WFDA | Wind Farm Development Area |
| WSI | Written Scheme of Investigation |
| WTG | Wind turbine generator |

# 15 Marine Archaeology and Cultural Heritage

## 15.1 Introduction

1. This Chapter of the Bellrock Wind Farm Development Area (WFDA) Environmental Impact Assessment (EIA) Report presents an assessment of potential effects on marine archaeology and cultural heritage from the construction, operation and maintenance (O&M), and decommissioning phases of the Bellrock Wind Farm Infrastructure.

2. The Bellrock Wind Farm Infrastructure comprises wind turbine generators (WTGs); floating substructures (FSSs), station keeping systems (SKSs) and associated scour protection; inter-array cables (IACs) and associated cable protection; subsea cable hubs; and ancillary infrastructure including buoys. Further detail on the Bellrock Wind Farm Infrastructure is provided in **Chapter 4: Project Description (Volume II)**.

3. This Chapter of the Bellrock WFDA EIA Report has been prepared to provide the Marine Directorate Licensing and Operations Team (MD-LOT) (on behalf of the Scottish Ministers) and stakeholders with sufficient information to determine the potential effect(s) of the Bellrock Wind Farm Infrastructure on marine archaeology and cultural heritage receptors.

4. Additional information to support the marine archaeology and cultural heritage assessment includes:

   - **Appendix 15.1**: **Archaeological Assessment of Geophysical Data (Volume IV)**; and
   - **Written Scheme of Investigation and Protocol for Archaeological Discoveries (Volume V)**.

5. This Chapter should be read in conjunction with the following chapters of the Bellrock WFDA EIA Report:

   - **Chapter 6: Marine Geology, Oceanography and Physical Processes (Volume II)**.

6. The marine archaeology and cultural heritage assessment is likely to have key inter-relationships with the above chapters, which will be considered appropriately throughout this Bellrock WFDA EIA Report.

7. This Chapter was prepared by Haskoning.

# 15.2 Legislation, Policy and Guidance

8. **Table 15.1** describes the legislation, policy and guidance which have been considered in the preparation of this Chapter. The overarching policy and legislation relevant to the Bellrock Wind Farm Infrastructure is described in **Chapter 2: Policy and Legislative Context (Volume II)**.

**Table 15.1: Summary of Key Legislation, Policy and Guidance Relevant for Marine Archaeology and Cultural Heritage**

| Relevant Policy or Guidance | Relevance to the Assessment |
|---|---|
| **International Legislation and Policy** | |
| United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972 | The Convention is a unique international instrument that seeks to protect both cultural and natural heritage.<br>Article 1. For the purposes of this Convention, the following shall be considered as "cultural heritage": […] sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.<br>Article 4. Each State Party to this Convention recognises that the duty of ensuring the identification, protection, conservation, presentation, and transmission to future generations of the cultural and natural heritage referred to in Articles 1 and 2 and situated on its territory, belongs primarily to that State. It will do all it can to this end, to the utmost of its own resources and, where appropriate, with any international assistance and co-operation financial, artistic, scientific, and technical, which it may be able to obtain.<br>This assessment describes the cultural heritage (known and potential heritage assets) within the Bellrock WFDA (**Section 15.6**) and assesses potential impacts to that cultural heritage (**Section 15.8**) taking account of embedded mitigation (**Section 15.7.3**) which aims to ensure the protection, conservation and/or investigation and recording of that heritage for transmission to future generations. |
| United Nations Convention for the Law of the Sea, 1982 | Article 303. Archaeological and historical objects found at sea: States have the duty to protect objects of an archaeological and historical nature found at sea and shall cooperate for this purpose. In order to control traffic in such objects, the coastal State may, […] presume that their removal from the seabed in the zone referred to in that article without its approval would result in an infringement within its territory or territorial sea of the laws and regulations referred to in that article.<br>The embedded mitigation (**Section 15.7.3**) aims to ensure the protection, conservation and/or investigation and recording of objects of an archaeological and historical nature found at sea. Consultation with heritage stakeholders will be undertaken throughout the process, to ensure that, where mitigation is required, approval is sought before commencement. |
| European Convention on the Protection of the Archaeological Heritage, Valletta, (Revised) 1992 | The 1992 Convention aims to protect the European archaeological heritage "as a source of European collective memory and as an instrument for historical and scientific study".<br>Article 1. The aim of this (revised) Convention is to protect the archaeological heritage as a source of the European collective memory and as an instrument for historical and scientific study<br>This assessment describes the cultural heritage (known and potential heritage assets) within the Bellrock WFDA (**Section 15.6**) and assesses potential impacts to that cultural heritage (**Section 15.8**) taking account of embedded |

| Relevant Policy or Guidance | Relevance to the Assessment |
|---|---|
| | mitigation (**Section 15.7.3**) which aims to ensure the protection, conservation and/or investigation and recording of that heritage for transmission to future generations. |
| UNESCO Convention on the Protection of the Underwater Cultural Heritage, 2001 | Although the United Kingdom (UK) has not ratified UNESCO, the principles set out in the Annex have been adopted.<br>Rule 1. of the Annex states: The protection of underwater cultural heritage through in situ preservation shall be considered as the first option. Accordingly, activities directed at underwater cultural heritage shall be authorised in a manner consistent with the protection of that heritage, and subject to that requirement may be authorised for the purpose of making a significant contribution to protection or knowledge or enhancement of underwater cultural heritage<br>As described is **Section 15.7.3** archaeological exclusion zones (AEZs) are the primary form of mitigation for known heritage assets, thus preserving them in situ. |
| **National Legislation** | |
| Protection of Military Remains Act 1986 | Provides protection for the wreckage of military aircraft and certain military wrecks. Designations can be either as a Controlled Site or Protected Place where access may be permitted but any operations that may disturb the site are illegal unless licenced by the Ministry of Defence. All military aircraft are automatically protected under this legislation; however, vessels must be designated individually.<br>There are currently no protected military aircraft or wrecks within the Bellrock WFDA. Should any military aircraft or wrecks be identified within the Bellrock WFDA during the course of the project these would be automatically protected. |
| Merchant Shipping Act 1995 | This Act sets out the procedures for determining the ownership of underwater finds classified as a 'wreck' (flotsam, jetsam, derelict and lagan) found in or on the shores of the sea or any tidal water. It includes ship, aircraft, hovercraft, parts of these, their cargo or equipment. The Receiver of Wreck is responsible for processing incoming reports of wreck and cargo.<br>There is potential for the identification of 'wreck' within the Bellrock WFDA during the course of its lifetime. Any finds, which fall within the definition of 'wreck', and which are removed from the seabed would be reported to the Receiver of Wreck. |
| Marine (Scotland) Act 2010 | The Marine (Scotland) Act 2010 provides the legislative and management framework for the marine environment within Scottish Territorial Waters (from MHWS out to 12 nm).<br>Section 67 of this act allows Scottish Ministers to designate a historic marine protected area (HMPA). HMPAs consist of marine historic assets (e.g. historic shipwrecks) of national importance within Scottish territorial waters (section 73).<br>HMPAs have replaced use in Scotland of Section 1 of the Protection of Wrecks Act 1973.<br>There are currently no HMPAs within the Bellrock WFDA. |
| **National Policy** | |
| Historic Environment Policy for Scotland | Scotland's Historic Environment Policy sets out the principles and policies that make up the Historic Environment Policy for Scotland (HEPS) and aiming to deliver the shared vision that: |

| Relevant Policy or Guidance | Relevance to the Assessment |
|---|---|
| (Historic Environment Scotland (HES), 2019a) | "*Scotland's historic environment is understood and valued, cared for, and protected, enjoyed, and enhanced. It is at the heart of a flourishing and sustainable Scotland and will be passed on with pride to benefit future generations*."<br><br>Although HEPS is non-statutory, HEPS is designed to support and enable good decision making about changes to the historic environment. It should be considered whenever a decision will affect the historic environment and is a material consideration for planning proposals that might affect the historic environment.<br><br>Historic Environment Policy (HEP) 1 - Decisions affecting any part of the historic environment should be informed by an inclusive understanding of its breadth and cultural significance.<br><br>HEP 2 - Decisions affecting the historic environment should ensure that its understanding and enjoyment as well as its benefits are secured for present and future generations.<br><br>HEP 3 - Plans, programmes, policies and strategies, and the allocation of resources, should be approached in a way that protects and promotes the historic environment.<br><br>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.<br><br>HEP 4 - 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.<br><br>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.<br><br>HEP 5 - Decisions affecting the historic environment should contribute to the sustainable development of communities and places.<br><br>HEP 6 - Decisions affecting the historic environment should be informed by an inclusive understanding of the potential consequences for people and communities. Decision-making processes should be collaborative, open, transparent, and easy to understand.<br><br>This assessment describes cultural heritage (known and potential heritage assets) (**Section 15.6**) and its cultural heritage significance in **Sections 15.6.1.3, 15.6.2.3, 15.6.3.3** within the Bellrock WFDA and assesses potential impacts to that cultural heritage (**Section 15.8**) taking account of embedded mitigation (**Section 15.7.3**) which aims to ensure the protection, conservation and/or investigation and recording of that heritage for transmission to future generations. |
| Scotland's National Marine Plan (Scottish Government, 2015) | Provides a comprehensive overarching framework for all marine activity in Scottish waters. It enables sustainable development and use of marine areas in a way which protects and enhances the marine environment whilst promoting both existing and emerging industries.<br><br>Policy GEN 6 Historic environment States: 'Development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance'.<br><br>**Section 15.7.3** sets out the mitigation measures embedded into the project design which aim to ensure the protection, conservation and/or investigation and recording of that heritage for transmission to future generations. |
| **Guidance** | |

| Relevant Policy or Guidance | Relevance to the Assessment |
|---|---|
| Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021) | This document sets out high level guidance on a range of archaeological methodologies that may be required in the production of Written Schemes of Investigation (WSIs) and Method Statements.<br>A **WSI and Protocol for Archaeological Discoveries (PAD)** have been prepared and provided as an appendix of this Bellrock WFDA EIA Report (**Volume V**). |
| Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007) | Guidance on the survey, appraisal and monitoring of the historic environment during the development of offshore renewable projects in the UK. |
| Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008) | Guidance on the assessment of cumulative impacts on the historic environment arising from offshore renewable energy projects.<br>The guidance applies to all areas which are likely to be affected by an offshore energy development, thus covering onshore as well as the coastal and marine environments. |
| Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011) | Guidance on how best to achieve the integration of offshore geotechnical investigations and their data outputs, arising from offshore renewable projects, with archaeological historic environment analysis and ensure optimal use of geotechnical data, |
| Principles of Cultural Heritage Impact Assessment in the UK (Institute of Environmental Management and Assessment, Institute of Historic Building Conservation and Chartered Institute of Archaeologists, 2021) | This publication provides a set of guiding principles to supplement existing guidance and give a consistent framework for cultural heritage impact assessment in a variety of settings. The application of these principles and good practice is intended to enable practitioners to improve the standard of cultural heritage impact assessment (CHIA), regardless of their specialism within the discipline.<br>The impact assessment methodology for CHIA described in **Section 15.4.1** is based on these Principles. |
| Code for Practice for Seabed Development (Joint Nautical Archaeology Policy Committee, 2006) | The objective of the Code is to present an overview of procedures for consultation and cooperation between seabed developers and marine archaeologists. It is designed to help facilitate a smooth and cost effective process. It describes the top-level relationships that will ensure a best practice model for development both within and beyond the remit of the formal EIA process.<br>The consultation undertaken to date is presented in **Section 15.3**. Consultation will be maintained with HES and any other relevant heritage stakeholders through all stages of the project as set out in the **WSI and PAD** (**Volume V**). |
| Managing Change in The Historic Environment: Conserving our Underwater Heritage (HES, 2025) | This guidance is a practical guide on how to assess and manage the impacts of change while respecting the cultural significance of underwater heritage sites.<br>This guidance is about conserving underwater heritage around the coasts of Scotland and in freshwater environments such as lochs and rivers. |

| Relevant Policy or Guidance | Relevance to the Assessment |
|---|---|
| | This guidance is primarily for practitioners and decision-makers who encounter underwater heritage in the course of their duties. |

# 15.3 Consultation

9. Consultation to date for the Bellrock WFDA relevant to marine archaeology and cultural heritage has been in line with the general process described in **Chapter 5: EIA Methodology (Volume II)**. Key consultation pertinent to this Chapter is provided in **Table 15.2**.

**Table 15.2: Consultation Relevant to Marine Archaeology and Cultural Heritage**

| Consultee | Date/Document | Comment | How/Where Comment is Addressed |
|---|---|---|---|
| HES | Representation on the Bellrock WFDA Scoping Report (2024) | We welcome that palaeo-landscape features, sub-seabed deposits of palaeo-environmental interest, prehistoric occupation sites and wreck and aviation remains will be considered within the EIA report. We note that an initial 'high-level desk-based review' (paragraph 1042) has been undertaken to inform the scoping exercise and that the study area for this only includes the proposed development site boundary. We would recommend that the applicant also considers assessing potential impacts out with this area for the assessment of indirect physical impacts on marine archaeology. | Indirect effects on marine archaeology, which includes consideration of effects which could extend beyond the Bellrock WFDA are described in **Section 15.8**. |
| HES | Representation on the Bellrock WFDA Scoping Report (2024) | The applicant identifies that geophysical survey (magnetometer, side-scan sonar, sub bottom profiler and multi beam echosounder) took place between August and September 2023 Within the proposed development site boundary (paragraph 1048), however, detailed results of the survey are not provided. The applicant predicts a moderate potential for archaeological remains within the site boundary, with a single wreck identified on the UKHO dataset - *'the Karen'* (UKHO ID: 3029). In addition, within the scoping report, a further three unrecorded wrecks are also identified from geophysical survey. | The assessment of geophysical data acquired for the Bellrock WFDA is provided in **Appendix 15.1: Archaeological Assessment of Geophysical Data** (**Volume IV**). A summary of the assessment is provided in **Section 15.6**. |
| HES | Representation on the Bellrock WFDA Scoping Report (2024) | There is the potential for adverse effects on marine archaeology, and detailed assessment has not yet been undertaken to identify these effects and their significance. In addition, the proposed 'Archaeological Desk Based Assessment' has not yet been supplied, so we cannot be confident at this stage what the full potential impact of the proposed development in the site boundary may be and whether any effects on marine archaeology might be significant.<br>We would welcome sight of the Archaeological Desk Based Assessment, the Written Scheme of Investigation and Protocol of Archaeological Discoveries, to ensure that the assessment and any mitigation proposed are appropriate. | The identification of heritage assets is provided in **Section 15.6** along with an assessment of their cultural significance and importance. Potential impacts upon marine archaeology and cultural heritage are assessed in **Section 15.8**, taking account of embedded mitigation (**Section 15.7.3**) designed to avoid, or reduce as far as possible, significant effects to heritage assets.<br>A **WSI and PAD** accompanies this Bellrock WFDA EIA Report (**Volume V**). |
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.1 | The Scottish Ministers are broadly content with the study area as defined in Section 14.4.1 of the Scoping Report and that the baseline data gathered for the assessment is appropriate. This view is supported by HES. | Noted. |

| Consultee | Date/Document | Comment | How/Where Comment is Addressed |
|---|---|---|---|
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.2 | The Scottish Ministers are broadly content with the impact pathways scoped into the EIA as outlined in Table 14.3 of the Scoping Report, however in line with HES representation, request that the Developer considers assessing potential impacts out with the Proposed Development site boundary for the assessment of indirect physical impacts on marine archaeology. In addition, the Scottish Ministers highlight the advice from HES regarding the potential for adverse effects on marine archaeology and note that detailed assessment has not yet been undertaken to identify these effects and their significance. | Indirect effects on marine archaeology, which includes consideration of effects which could extend beyond the Bellrock WFDA are considered in **Section 15.8**. |
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.3 | The Scottish Ministers recommend that the Developer provides the Written Scheme of Investigation, Archaeological Desk Based Assessment and Protocol for Archaeological Discoveries to HES to ensure that the assessments and any mitigation measures proposed are appropriate. | The outcomes of the desk-based assessment are presented in **Section 15.6**. A **WSI and PAD** accompanies this Bellrock WFDA EIA Report (**Volume V**). |
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.4 | The methodology, as outlined in Section 14.7, is acceptable to the Scottish Ministers which is in agreement with the HES representation. | Noted. |
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.5 | The Scottish Ministers are content that the mitigation measures outlined in Section 14.5.1 of the Scoping Report are sufficient to manage and mitigate impacts on the marine historic environment, however, note that these may change as an outcome of the above discussions still to take place. | Mitigation measures are discussed in **Section 15.7.3** and further in **Section 15.8**.<br><br>A proposed approach to the delivery of mitigation post-consent, and how the outcomes of additional investigation will influence the final design of the Bellrock WFDA, is set out in the **WSI and PAD** (**Volume V**), which has been prepared in accordance with industry good practice guidance on Archaeological WSIs (The Crown Estate, 2021), and which accompanies this Bellrock WFDA EIA Report. |
| MD-LOT | Bellrock WFDA Scoping Opinion (2024), Paragraph 5.11.6 | The Scottish Ministers agree with the proposed approach to cumulative impact assessment and transboundary impacts. | Noted. |

# 15.4 Assessment Methodology

## 15.4.1 Impact Assessment Methodology

10. **Chapter 5: EIA Methodology (Volume II)** provides a summary of the general impact assessment methodology applied in this Bellrock WFDA EIA Report. The assessment will use the conceptual 'source-pathway-receptor' model. The model identifies potential impacts resulting from the proposed activities on the environment and sensitive receptors within it. The following section describes the specific methods used to assess the likely significant effects on marine archaeology and cultural heritage.

11. The 'Principles of Cultural Heritage Impact Assessment in the UK' (Institute of Environmental Management and Assessment, Institute of Historic Building Conservation and Chartered Institute of Archaeologists, 2021), define CHIA as "understanding the consequences of change to cultural significance". The principles of assessment are:

- Principle A. understanding cultural heritage assets; and
- Principle B. evaluating the consequences of change.

12. Principle A 'understanding cultural heritage assets' distinguishes between:

- Describing the asset (what it is and what is known about it);
- Ascribing cultural significance (a description of what is valued about it); and
- Attributing importance (a scaled measure of the degree to which the cultural significance of that asset should be protected).

13. Cultural heritage assets are the 'known' physical elements of the historic environment. These include any buildings, monuments, archaeological sites and finds, places, areas or landscapes that have cultural significance. As defined by HES (2025), underwater heritage includes:

- The remains of vessels or aircraft, and items dropped or lost overboard from them;
- The remains of structures which were originally built wholly or partly under water, such as fishtraps and crannogs;
- The remains of human activity which originally took place on dry or marshy land which has since been inundated, either by water levels rising relative to land or by marine or fluvial (river) erosion; and
- Sediments which can sometimes provide evidence of past environment and therefore have archaeological value.

14. Historic environment records of findspots (the place where an archaeological object has been found), heritage assets which are no longer extant (e.g. a coastal archaeological site which has eroded into the sea) and documentary evidence (e.g. the reported loss of a vessel) are not heritage assets in themselves. Rather these are used to inform professional judgement of the likely 'potential heritage' assets within a study area which are yet undiscovered.

15. The Burra Charter (Australia International Council on Monuments and Sites (ICOMOS), 2013) defines cultural significance as the aesthetic, historic, scientific, social, or spiritual value heritage assets hold for past, present or future generations, embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects. In accordance with this definition, a description of cultural significance will include consideration of a heritage assets age, type, rarity, survival and condition, fragility and vulnerability, group value, documentation, associations, scientific potential and outreach potential. These factors help to characterise a heritage asset and to assess how representative it is in comparison to other similar archaeological, architectural, artistic or historic heritage assets.

16. In the majority of cases, statutory protection is only provided to a site or feature judged to be an above average example in regard to these factors. Importance, therefore, is determined using professional judgement to identify a scaled measure (

17. **Table** 15.6) of the degree to which the sum of values which make up a heritage assets cultural significance should be protected.

18. The three stages of 'understanding cultural heritage assets' (a description of the assets and their cultural significance, including the contribution of setting to that significance, and attributing importance) are described in **Section 15.5**.

19. Principle B 'evaluating the consequences of change' additionally distinguishes between three separate analytical stages:

- Understanding change (a factual statement of how a proposal would change a cultural heritage asset or its setting, including how it is experienced);
- Assessing impact (a scaled measure of the degree to which any change would impact on cultural significance); and
- Weighting the effect (the measure that brings together the magnitude of the impact and the cultural heritage asset's importance).

20. An evaluation of the consequences of change is presented in **Section 15.8** as set out below.

21. Under the 'source-pathway-receptor' model, as described in **Chapter 5: EIA Methodology** (**Volume II**):

- The 'source' or 'origin of a potential impact' is an activity or indirect impact which has the potential to damage, or destroy, a heritage asset, or result in a change to its setting;
- The 'pathway' or 'the means by which the impact of the activity could impact a receptor' is the physical change to the heritage asset, or its setting. For marine archaeology and cultural

heritage, this could be direct (e.g. from the physical siting of the Wind Farm Infrastructure) or indirect (e.g. physical change to a heritage asset as a result of the effects of changes to hydrodynamic and sedimentary processes); and

- The 'receptor' or 'the element of the receiving environment that is impacted' is the cultural significance of the heritage asset (i.e. how the change 'impacts' what is valued about it). It is important to note that change to a heritage asset may or may not lead to an effect on its cultural significance and that this impact can be beneficial or adverse.

22. The weighted measure of effects for each impact (defined in terms of their significance) is the consequence of combining the importance (sensitivity) of heritage assets and the magnitude of potential impacts (based on expert judgement).

#### 15.4.1.1 Definitions of Sensitivity and Magnitude

23. The sensitivity of a receptor is a function of its capacity to accommodate change and reflects its ability to recover if it is affected. However, while impacts to a heritage asset's setting or character can be temporary, impacts which result in damage or destruction of the heritage assets themselves, or their relationship with their wider environment and context, are permanent. Once destroyed an asset cannot recover. On this basis, it is the importance ('value' as defined in **Chapter 5: EIA Methodology (Volume II)**) of a heritage asset (as a scaled measure of the degree to which we seek to protect and preserve the cultural significance of that asset through, for example, legislation and planning policy) rather than the sensitivity which forms the basis for assessment.

24. For the purposes of this Bellrock WFDA EIA Report, the criteria for determining the heritage importance of any relevant heritage assets are described in **Table 15.3.**

25. These categories and definitions of heritage importance do not necessarily reflect a definitive level of importance of an asset. Instead, they should be regarded as providing a preliminary or likely heritage importance based on information available to date. The heritage importance of an asset can therefore be amended or revised as more information comes to light. Where uncertainty occurs, the precautionary approach is to assign high importance (and hence high sensitivity). This precautionary approach represents good practice in archaeological impact assessment and reduces the potential for impacts to be under-estimated.

**Table 15.3: Definition of Importance for Marine Archaeology and Cultural Heritage**

| Importance | Definition |
|---|---|
| High | Designated heritage assets.<br>Non-designated assets of acknowledged international/national importance with the potential to be designated, and which contribute significantly to acknowledged international/national research objectives and to education and outreach. |
| Medium | Heritage assets which are not considered to warrant designation, but which have potential to contribute to knowledge and understanding in line with acknowledged research objectives and to education and outreach. |
| Low | Heritage assets with limited potential to contribute to knowledge and understanding, education or outreach. |

| Importance | Definition |
|---|---|
| Negligible | Not considered to be important and not considered a heritage asset in its own right. |

26. The finite nature of archaeological remains means that direct impacts (e.g. from the physical siting of the Wind Farm Infrastructure within the Bellrock WFDA) are almost always adverse, permanent and irreversible; the 'fabric' of the asset and, hence, its potential to inform our historical understanding, will be removed.

27. By contrast, changes to the setting of heritage assets will depend upon the scale and longevity of the project and the sensitivity with which the landscape is re-instated subsequent to decommissioning, if applicable. Similarly, indirect impacts (e.g. physical change to a heritage asset as a result of the effects of changes to hydrodynamic and sedimentary processes) may also depend upon scale and longevity.

28. The magnitude of adverse impact with respect to marine archaeology and cultural heritage directly relates to the extent of harm to, or loss of, key elements of the heritage asset's cultural significance, which may include its setting.

29. The magnitude of beneficial impact directly relates to the level of public benefit associated with an individual impact. Benefits may correspond directly to the project itself where a project will enhance the historic environment (e.g. through measures which will improve the setting of a heritage asset or public access to it). Alternatively, benefits may occur on the basis of data gathering exercises undertaken for the purpose of a project which will enhance public understanding by adding to the archaeological record (e.g. through the accumulation of publicly available information and data).

30. The probability of an impact occurring will be discussed as part of the narrative description for each impact. Definitions of the magnitude levels are given in **Table 15.4**.

**Table 15.4: Definition of Magnitude of Impact to Heritage Assets**

| Magnitude | Definition |
|---|---|
| High Adverse | Key elements of the asset's fabric and/or setting are lost or fundamentally altered, such that the asset's cultural significance is lost or severely compromised. |
| Medium Adverse | Elements of the asset's fabric and/or setting which contribute to its significance are affected, but to a more limited extent, resulting in an appreciable, but partial, loss of the asset's cultural significance. |
| Low Adverse | Elements of the asset's fabric and/or setting which contribute to its cultural significance are affected, resulting in a slight loss of cultural significance. |
| Negligible | The asset's fabric and/or setting is changed in ways which do not materially affect its cultural significance. |
| Low Beneficial | Elements of the asset's physical fabric which would otherwise be lost, leading to a slight loss of cultural significance, are preserved in situ; or<br>Elements of the asset's setting are improved, slightly enhancing its cultural significance; or |

| Magnitude | Definition |
|---|---|
| | Research and recording leads to a slight enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss. |
| Medium Beneficial | Elements of the asset's physical fabric which would otherwise be lost, leading to an appreciable but partial loss of cultural significance, are preserved in situ; or<br>Elements of the asset's setting are considerably improved, appreciably enhancing its cultural significance; or<br>Research and recording leads to a considerable enhancement to the archaeological or historical interest of the asset. This only applies in situations where the asset would not be otherwise harmed i.e. it is not recording in advance of loss. |
| High Beneficial | Elements of the asset's physical fabric which would otherwise be lost, severely compromising its cultural significance, are preserved in situ; or<br>Elements of the asset's setting, which were previously lost or unintelligible, are restored, greatly enhancing its cultural significance. |
| No change | No measurable or discernible change from baseline conditions. The impact does not result in any alternation to the receptor. |

### 15.4.1.2 Effect Significance

31. The potential significance of effect for a given impact, is a function of the overall sensitivity and the magnitude of the impact (see **Chapter 5: EIA Methodology (Volume II)** for further details). A matrix is used (**Table 15.5**) as a framework to determine the significance of an effect. Definitions of each level of significance are provided in **Table 15.5**. Effects may be either positive (beneficial) or negative (adverse). Impacts that are moderate or major adverse are considered to be significant in EIA terms.

**Table 15.5: Evaluating the Significance of an Effect**

| Importance | Magnitude | | | | |
|---|---|---|---|---|---|
| | High | Medium | Low | Negligible | No Change |
| High | Major | Major | Moderate | Minor | No effect |
| Medium | Major | Moderate | Minor | Negligible | No effect |
| Low | Moderate | Minor | Minor | Negligible | No effect |
| Negligible | Minor | Negligible | Negligible | Negligible | No effect |

**Table 15.6: Definitions of Effect Significance**

| Effect Significance | Definition |
|---|---|
| Major | Changes in cultural significance, both adverse or beneficial, which are likely to be important considerations at a national or regional level because they contribute to achieving national or regional objectives.<br>Effective/acceptable mitigation options may still be possible, to offset and/or reduce residual impacts to satisfactory levels. |
| Moderate | Changes in cultural significance, both adverse or beneficial, which are likely to be important considerations at a local level.<br>Effective/ acceptable mitigation options may still be possible, to offset and/or reduce residual impacts to satisfactory levels. |
| Minor | Changes in cultural significance, both adverse or beneficial, which may be raised as local issues but are unlikely to be considerations in the decision-making process.<br>Industry standard mitigation measures may still apply. |
| Negligible | No change to cultural significance as a result of changes to the heritage asset's fabric or setting. |
| No effect | No change to cultural significance as a result of no change to the heritage assets fabric or setting. |

## 15.4.2 Cumulative Effects Assessment Methodology

32. The Cumulative Effects Assessment (CEA) considers the likely significant effects of impacts arising from the Bellrock Wind Farm Infrastructure cumulatively with other relevant plans, projects and activities. The general approach to the CEA for marine archaeology and cultural heritage includes defining a CEA plans and projects screening area of search, identifying a short list of plans and projects for consideration, identifying potential cumulative impacts, and evaluating the significance of cumulative effects. The screening for this Chapter has been based on a four-month cut off period for other projects and plans, which represents a shorter cut-off than the six months that was proposed in the Scoping Report (**Appendix 1.1: Bellrock WFDA Scoping Report (Volume IV)**). MD-LOT were consulted during the screening process as part of ongoing consultation in the pre-application phase. **Chapter 5: EIA Methodology** (**Volume II**) provides further details on the general approach to the CEA, including the CEA with the Bellrock Offshore Transmission Development Area (OfTDA) and Onshore transmission Development Area (OnTDA).

33. The plans and projects selected as relevant to the CEA for marine archaeology and cultural heritage are based upon the results of a screening exercise (see **Appendix 5.3: Cumulative Effect Assessment Long List of Projects** (**Volume IV**) for details). Each plan or project has been considered on a case-by-case basis for screening in or out of this assessment based upon data confidence, impact-receptor pathways and the spatial/temporal scales involved.

34. The likely significant effects of the Bellrock Wind Farm Infrastructure together with the Bellrock Offshore Transmission Infrastructure and Onshore Transmission Infrastructure, so far as these can be ascertained at this stage, are assessed as part of this Bellrock WFDA EIA Report.

35. Further assessment of the effects of the Bellrock Project as a whole will be included within the Bellrock OfTDA EIA Report and OnTDA EIA Report, which will include updated assessments of cumulative environmental impacts of the different components of the Bellrock Project.

36. In line with the methodology set out in **Chapter 5: EIA Methodology** (**Volume II**), three tiers have been applied to the Bellrock WFDA CEA. As the site selection process for the Bellrock OfTDA and OnTDA is ongoing (see **Chapter 4: Project Description** (**Volume II**) for details), activities and infrastructure associated with the Bellrock OfTDA and Bellrock OnTDA was treated as 'other projects' for the purposes of the CEA, but have been considered within Tier 1 where relevant, due to their essential requirement for the function of the Bellrock Project.

37. The three tiers for CEA are:

- Tier 1 assessment: The Bellrock WFDA plus plans/projects which are operational, under construction, those with consent or a consent application submitted but not yet determined, plus the Bellrock OfTDA and Bellrock OnTDA;
- Tier 2 assessment: The Bellrock WFDA plus all plans/projects assessed under Tier 1, plus those projects with a Scoping Report and/or Scoping Opinion; and
- Tier 3 assessment: The Bellrock WFDA plus all plans/projects assessed under Tier 1 and Tier 2, plus those projects likely to come forward where a Crown Estate Scotland Option to Lease Agreement or equivalent has been granted.

### 15.4.3 Transboundary Effects Assessment Methodology

38. The transboundary effect assessment considers the potential for effects to occur as a result of the Bellrock Wind Farm Infrastructure on marine archaeology and cultural heritage receptors within the exclusive economic zone of other European Economic Area (EEA) member states or other interests of EEA member states. **Chapter 5: EIA Methodology** (**Volume II**) provides further details on the approach to the transboundary effects assessment.

39. For marine archaeology and cultural heritage, the potential for transboundary effects has been identified in relation to relation to wrecks or aircraft of non-British nationality which could be subject to impact from development. Such wrecks may fall within the jurisdiction of another country, and may include, for example, foreign warships lost in UK waters.

40. In addition, there is potential for developments, individually and cumulatively, to affect larger-scale archaeological features such as palaeolandscapes which may also extend across these boundaries. This may also include sensitivities in conjunction with local community groups and interests.

41. These potential transboundary effects are considered for inclusion in the assessment in **Section 15.10**.

# 15.5 Scope of the Assessment

## 15.5.1 Study Area

42. The study area for marine archaeology and cultural heritage corresponds to the pre-defined boundary of the marine geophysical survey which includes the Bellrock WFDA plus a 1 km buffer (see **Figure 15.1** in **Volume III**). This study area covers the full extent of the archaeologically assessed survey data and incorporates the area within which development activities could occur and, consequently, the area of potential direct impacts to marine archaeology and cultural heritage.

43. As set out in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**), and as assessed in **Section 15.8** below, changes to marine physical processes beyond the immediate vicinity of the installed Wind Farm Infrastructure within the WFDA is assessed as negligible. These changes will be insufficient to result in an indirect effect on heritage assets (i.e. increased exposure or burial). Therefore, there is no pathway for indirect impacts on heritage assets beyond this defined study area (the Bellrock WFDA plus a 1 km buffer).

## 15.5.2 Data and Information Sources

44. **Table 15.7** sets out the key desk-based information and data sources that have been used to inform the marine archaeology and cultural heritage baseline.

**Table 15.7: Key Data and Information Sources for Marine Archaeology and Cultural Heritage**

| Dataset | Year(s) | Description |
|---|---|---|
| United Kingdom Hydrographic Office (UKHO) wrecks and obstructions | 2025 | Data set containing details of charted, uncharted, live, and dead wrecks and obstructions and shared on the Admiralty Marine Data Portal by the UKHO. |
| Maritime records maintained by CANMORE (National Record of the Historic Environment) | 2025 | Maritime records, including documented losses of vessels, and records of terrestrial monuments and findspots, including the archaeological excavation index. |
| Data held by HES | 2025 | Records of designated heritage assets within Scotland, maintained by HES. Geographical information system data for all Protected Wrecks, Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields. |
| British Geological Survey | Various | Historic borehole logs and the wider geological background for the region. |
| Scottish Archaeological Research Framework (ScARF) | Various | The primary resource for Scottish archaeology, one which provides an overview of the subject and a set of relevant research questions to guide assessment. |
| Existing archaeological studies and published sources | Various | Background information on the archaeology of the North Sea. |

| Dataset | Year(s) | Description |
|---|---|---|
| Results of the archaeological assessment of site-specific survey data (see **Section 15.5.2.1**) by MSDS Marine. | 2025 | Document outlining the specification of the data and the method of archaeological assessment, the presentation of the results, and recommendations for mitigation strategies for the Bellrock WFDA. Included as **Appendix 15.1: Archaeological Assessment of Geophysical Data** (**Volume IV**). |

### 15.5.2.1 Site-specific Surveys

45. Site-specific surveys have been undertaken to support the desk-study by providing accurate and detailed environmental information. **Table 15.8** summarises the site-specific surveys relevant to marine archaeology and cultural heritage undertaken to date.

**Table 15.8: Summary of Site-specific Surveys for Marine Archaeology and Cultural Heritage**

| Survey | Spatial Coverage | Year(s) | Description |
|---|---|---|---|
| Geophysical survey | Bellrock WFDA | 2023 | The geophysical and hydrographic survey was conducted by TerraSond Limited (TerraSond) between 24 June 2023 and 12 August 2023 and consisted of side-scan sonar (SSS), multibeam echosounder (MBES), magnetometer, parametric sub-bottom profiler (SBP), and Sparker. |
| Geotechnical survey | Bellrock WFDA | 2023 | The scope of work consisted of 20 cone penetration test locations from mudline to a target depth of 20 m below mud line with 20 adjacent sampling locations from mudline to a target depth of 6 m below mud line. |

### 15.5.2.2 Assumptions and Limitations

46. The records held by the UKHO, HES, CANMORE, and the other sources used in this assessment are not a record of all surviving cultural heritage assets. Rather, they are a record of the discovery of a wide range of archaeological and historical components of the marine historic environment. The information held within these datasets is not complete and does not preclude the subsequent discovery of further elements of the historic environment that are, at present, unknown. This particularly relates to buried archaeological features. However, alongside the site-specific survey data this suite of data sources are considered appropriate for the assessment of the existing historic environment for the purposes of EIA.

## 15.6 Existing Environment

47. The existing environment within the marine archaeology and cultural heritage study area is defined as the known archaeological and cultural heritage resource and the potential for previously unrecorded heritage assets and finds to be present within the Bellrock WFDA with respect to:

- Seabed prehistory (i.e. archaeological remains on the seabed corresponding to the activities of prehistoric populations that may have inhabited what is now the seabed when sea levels were lower);
- Maritime archaeology (i.e. the remains of boats and ships and archaeological material associated with prehistoric and historic maritime activities); and
- Aviation archaeology (i.e. the remains of crashed aircraft and archaeological material associated with historic aviation activities).

## 15.6.1 Seabed Prehistory

### 15.6.1.1 Description of Heritage Assets

48. There are no prehistoric sites or finds known from within the marine archaeology and cultural heritage study area. The potential for previously undiscovered prehistoric remains is summarised below.

49. At various times in the past, the North Sea has been exposed as dry land, including the Bellrock WFDA, which was dry land until sometime after c.16,000 Before Christ (BC) (World Ocean Review, 2017). This is due to sea level falls driven by climate change. Buried sediments related to these phases of terrestrial exposure may contain, not only direct archaeological evidence of the human occupation of the area, but also palaeoenvironmental data. This can be used to develop an understanding of past climatic changes and the wider natural environment within which early humans lived.

50. A range of Palaeolithic stone artefacts, as well as Pleistocene faunal remains, have been recovered in the North Sea. However, these have largely been found further south, from the Brown Ridge area and Dogger Bank, with the Scottish assemblage limited to two worked flints. One of these was obtained from a vibrocore (number 60+01/46) acquired as part of a British Geological Survey programme on the UK shelf, some 150 km northeast off Lerwick, near Viking bank further north of the Bellrock WFDA (ScARF, 2012). The other was recovered from a core taken from a depression of muddy sand off Halibut Bank (Flemming, 2003). A wide range of fossils have been identified in the Scottish North Sea (ScARF, 2012) including:

- Reindeer;
- Bison;
- Musk-ox;
- Woolly mammoth;
- Red deer; and
- Woolly rhinoceros.

51. The archaeological assessment of SBP data, the ground model (OWC, 2024), and a review of desk-based sources was undertaken by MSDS Marine (Appendix 15.1: Archaeological

Assessment of Geophysical Data **(Volume IV)**), to determine the likely chronostratigraphy within the Bellrock WFDA.

52. The geometry and distribution of the units is closely linked with a series of buried channels. Four principal channels were identified in the initial interpretation report (OWC, 2024) as (from west to east) channels A, B, C and D. A fifth channel was interpreted as more widespread in the ground model and identified in the archaeological assessment as Channel E. Channel locations are illustrated in Figure 28 to Figure 34 of **Appendix 15.1: Archaeological Assessment of Geophysical Data** (**Volume IV**). These channels are potentially associated with the group of features known as 'Devil's Hole'.

53. A summary of eight geological units identified within the study area (Table 16 in **Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**), and their archaeological potential, is provided in **Table 15.9** below. Overall, these units have a very low to low archaeological potential, while units D1 and D3 have a moderate and low to moderate potential for palaeoenvironmental remains respectively.

**Table 15.9: Summary of Identified Units and Horizons**

| Unit | Horizon | | Depth to Base (m Below Seafloor) | Seismic Character | Expected/ Demonstrated Lithology | Depositional Environment | Correlated Formation/ Member | Marine Isotope Stage | Age | Potential | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Top | Base | | | | | | | | Prehistoric Archaeology | Palaeo-environmental |
| A1 | H000 (Seabed) | H010/C4 (Partly) | <10.2 | Unit: low amplitude unit, generally structureless. Sometimes more layered reflectors observed in lenses. Best observed in SBP data. At channel bases discontinuous reflections become stronger, with low to moderate amplitudes and some onlap to channel margins.<br>Upper horizon (seabed): positive, high-amplitude acoustic reflector with sharp underlying trough.<br>Basal horizon: positive, low amplitude acoustic reflector. Often forms an undulating, smooth surface. Downward dip in channel areas following channel profiles. Irregular, undulating surface beneath seafloor topographic highs. | Loose, silty fine sand, slightly gravelly with frequent shell fragments. | Marine | Seabed sediments | 1 | Holocene | Very low | Negligible |
| A2 | H010 | H020/C1 | <56.5 | Unit: low amplitude unit, structureless and layered in appearance. Layering typically observed in channels and has continuous reflectors. Variable transparent to weak | Medium to very dense, fine- to medium grained silty sand, with rare | Shallow marine | Whitehorn Member, Forth Formation | 1 | Holocene | Very low | Negligible |

| Unit | Horizon | | Depth to Base (m Below Seafloor) | Seismic Character | Expected/ Demonstrated Lithology | Depositional Environment | Correlated Formation/ Member | Marine Isotope Stage | Age | Potential | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Top | Base | | | | | | | | Prehistoric Archaeology | Palaeo-environmental |
| | | | | reflectors, transitioning to strong parallel (sometimes horizontal) to discontinuous and hummocky/contorted reflectors. General lack of organisation. Chaotic to complex fill, onlap and divergent.<br>Basal horizon: Positive, moderate amplitude acoustic reflector with sharp overlying and underlying trough. Often forms an erosive surface that can be irregular. Major unconformity marks channel base. Cuts through most horizons mapped beneath. Topography potentially outcrops this horizon at, or very close to, the present seafloor. | shell fragments. | | | | | | |
| B | H020 | H030/P2 | <54.3 | Unit: moderate-high amplitude unit, often with well-layered appearance and continuous reflectors. Can also appear more structureless.<br>Basal horizon: positive, low-moderate amplitude acoustic reflection, often unclear and marked by change from | Extremely low to medium strength clay and silty clay, possibly interlaminated with slightly clayey, fine-grained sand. | Low energy marine; lagoonal or marginal marine. | Fitzroy Member, Forth Formation | 2 to 1 | Pleistocene - Holocene | Very low | Low |

| Unit | Horizon | | Depth to Base (m Below Seafloor) | Seismic Character | Expected/ Demonstrated Lithology | Depositional Environment | Correlated Formation/ Member | Marine Isotope Stage | Age | Potential | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Top | Base | | | | | | | | Prehistoric Archaeology | Palaeo-environmental |
| | | | | layered to chaotic texture. Forms an erosive surface. | | | | | | | |
| C | H030/P2 | H040 | <26.1 | Unit: moderate-low amplitude unit, typically structureless with discontinuous reflectors. Subtle layering can be observed in association with moderate amplitudes. Internal reflections weaker near incisions.<br>Basal horizon: positive, moderate-high amplitude acoustic reflector, sometimes overlying and underlying sharp troughs. Mostly planar surface. Characterised by major unconformity, marked by discontinuous strong events with wavy appearance of doublet. Generally, dips to west. | Dense to very dense, silty, fine-grained sand, possibly with occasional cobbles. | Shallow glaciomarine inner shelf to estuarine. | Marr Bank Formation | 2 | Pleistocene | Very low | Very low |
| D1 | H040 | H050 | <81.4 | Unit: low-moderate amplitude unit, chaotic or structureless in appearance. Reflectors discontinuous where present, stronger at base of channels. Some stronger and conformable | Medium density, very high strength interlaminated clay and silty, fine-grained sand, with occasional | Intertidal | Coal Pit Formation (channels) | 5d to 3 | Pleistocene | Very low | Moderate |

| Unit | Horizon | | Depth to Base (m Below Seafloor) | Seismic Character | Expected/ Demonstrated Lithology | Depositional Environment | Correlated Formation/ Member | Marine Isotope Stage | Age | Potential | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Top | Base | | | | | | | | Prehistoric Archaeology | Palaeo-environmental |
| | | | | reflectors suggest internal stratification.<br>Basal horizon: often lacks sharp boundary, instead marked by a cluster of moderate negative and positive amplitudes. Forms an irregular and erosive surface. | black, organic staining. | | | | | | |
| D2 | H050 | H060 | <37.6 | Unit: low-moderate amplitude unit, can exhibit bands of subtle layering and chaotic texture. Layered reflectors are semi-continuous. Reflections are conformable to base, suggesting stratification. Dipping to northwest.<br>Basal horizon: positive, low amplitude acoustic reflectors, sometimes with diffuse overlying trough. Often appearing as a faint reflection, difficult to discern. | Very dense clayey silt to silty clay and clean to silty sand. | Glaciomarine; possibly intertidal or glaciolacustrine | Coal Pit Formation (upper facies) | 6 to 3 | Pleistocene | Very low | Low |
| D3 | H060 | H070/P1 | <57.8 | Unit: low-moderate amplitude unit, structureless and mostly chaotic texture. Defined more in west by parallel, continuous reflections, indicating bedding. In east, transitions | Dense to very dense, high to very high strength sandy/silty clay and interlaminated | Glaciomarine; possibly intertidal or glaciolacustrine | Coal Pit Formation (lower facies) | 6 to 3 | Pleistocene | Very low | Low to moderate |

| Unit | Horizon | | Depth to Base (m Below Seafloor) | Seismic Character | Expected/ Demonstrated Lithology | Depositional Environment | Correlated Formation/ Member | Marine Isotope Stage | Age | Potential | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Top | Base | | | | | | | | Prehistoric Archaeology | Palaeo-environmental |
| | | | | to less continuous reflections.<br>Basal horizon: positive, low amplitude acoustic reflection, often with diffuse overlying and underlying troughs. In part forms an erosive and irregular surface. Base defined by a weak truncation event, minor topography of wavy character, generally dipping to west. | clay and fine-grained silty sand. | | | | | | |
| E | H070/P1 | Not identified | N/A | Unit: typically low amplitude, with some areas of moderate amplitude reflections. Exhibits both chaotic and layered appearance. | Very high to extremely high strength clay, with beds of sandy clay. Shell fragments and plant remains may be present and lenses and laminae of silt and fine-grained sand likely to be observed. | Subglacial to glaciomarine | Aberdeen Ground Formation | 100 to 13 | Tiglian to Cromerian | Very low | Low |

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### 15.6.1.2 Cultural Significance of Identified Assets

54. There are no known seabed prehistory sites within the marine archaeology and cultural heritage study area for which cultural significance can be described and the potential for previously undiscovered prehistoric archaeology is interpreted as very low.

55. As such, the cultural significance of the palaeolandscape within the marine archaeology and cultural heritage study area (the channel features and associated deposits) lies primarily in their research value, particularly when considered alongside survey data and interpretations produced for other seabed development projects in the North Sea.

56. Unit E is provisionally interpreted as representing the subglacial and glaciomarine facies of the Aberdeen Ground Formation, suggesting depositional conditions unsuitable for hominin occupation. Similarly, the Coal Pit Formation (Unit D, subdivided into D1 (channels), D2 ((upper facies) and D3 (lower facies)) is almost exclusively comprised of glaciomarine sediments, though the upper facies (Unit D2) may have been laid down in intertidal conditions. Unit C was laid down in shallow glaciomarine inner shelf and/or estuarine environments of the Late Devensian and Unit B is interpreted as a low energy marine deposit, suggesting a possible lagoonal, protected bay or marginal marine environment. Unit A (subdivided into A1 (seabed sediments) and A2 (Whitehorn Member, Forth Formation)) is a full marine deposit.

57. Overall, the palaeolandscapes within the study area, therefore, have limited research value for enhancing understanding of the wider environmental or geomorphological conditions associated with phases of possible human occupation of the seabed. The research value of Units D1 and D3, which have a moderate and low to moderate potential, respectively, for palaeoenvironmental remains, lies in their potential to further our understanding of environments and the timing of the marine inundation following the last glacial maximum.

58. In terms of the contribution that 'setting' makes to the significance of these features, former prehistoric landscapes, are largely experienced conceptually in terms of interpreted data and research. The setting of these assets (in terms of the surroundings in which they are experienced) does not, therefore, form a key part of their significance. Changes within the physical setting will occur (i.e. the introduction of the Bellrock Wind Farm Infrastructure into the seascape) but the potential for positive enhancement through the provision of publicly available data is considered to offset this change in contributing to a growing interest in, and understanding of, submerged landscapes.

### 15.6.1.3 Importance of Identified Assets

59. The rarity of in situ prehistoric sites offshore contexts means that, where such sites are encountered, these will be of national, or possibly international interest, with significant potential to contribute to acknowledged international and national research objectives. Given the particularly high importance of these in situ sites, the features and deposits which have the potential to contain in situ prehistoric archaeological material (i.e. interpreted palaeo-land surfaces and palaeolandscape features) should also be considered of high importance.

60. However, the palaeolandscape features and deposits interpreted within the study area have very low potential to contain prehistoric archaeological material and this is expected to be limited to isolated, reworked finds. As such, although palaeoenvironmental material encountered beyond the context of an in situ prehistoric site sill has evidential value for understanding changes in the climate

and environment with offshore contexts, this should be considered of low importance for the purposes of assessment.

61. Isolated finds of prehistoric archaeological material within secondary contexts, comprising material from terrestrial phases that may have been reworked by marine or glacial processes, also have evidential value for understanding patterns of population and exploitation of landscapes, for example. However, as these finds are derived, and out of context, they are regarded as being of medium rather than high importance.

62. The heritage importance of the potential heritage assets outlined above area presented in **Table 15.10**.

**Table 15.10: Heritage Importance (Seabed Prehistory)**

| Asset Type | Definition | Importance |
|---|---|---|
| Potential palaeoenvironmental evidence | Palaeoenvironmental material beyond the context of a site or palaeolandscape feature with archaeological potential. | Low |
| Potential derived prehistoric finds | Isolated discoveries of prehistoric archaeological material discovered within secondary contents. | Medium |

## 15.6.2 Maritime Archaeology

### 15.6.2.1 Description of Heritage Assets

63. Within the marine archaeology and cultural heritage study area there are no HMPAs designated under the Marine (Scotland) Act 2010 and no wrecks which are protected under the Protection of Military Remains Act 1986. SSS, MBES and magnetometer data interpreted by MSDS Marine (**Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) has demonstrated the presence of several seabed features which have been identified at varying levels of archaeological potential as set out in **Table 15.11**.

**Table 15.11: Criteria for the Assessment of Archaeological Potential**

| Potential | Criteria |
|---|---|
| Low | An anomaly potentially of anthropogenic origin but that is unlikely to be of archaeological significance – examples may include discarded modern debris such as rope, cable, chain, or fishing gear; small, isolated anomalies with no wider context; or small boulder-like features with associated magnetometer readings. |
| Medium | An anomaly believed to be of anthropogenic origin but that would require further investigation to establish its archaeological significance – examples may include larger unidentifiable debris or clusters of debris, unidentifiable structures, or significant magnetic anomalies. |
| High | An anomaly almost certainly of anthropogenic origin and with a high potential of being of archaeological significance – high potential anomalies tend to be the remains of wrecks, the suspected remains of wrecks, or known structures of archaeological significance. |

64. In total 184 surface anomalies of potential archaeological interest were identified within the study area by MSDS Marine (**Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**). The distribution of anomalies identified interpreted from the geophysical data is categorised by potential in **Table 15.12** with their spatial distribution illustrated in **Figure 15.2a** (**Volume III**).

**Table 15.12: Distribution of Archaeological Anomalies by Potential**

| Potential | Bellrock WFDA | 1 km Buffer | Total |
|---|---|---|---|
| Low | 108 | 62 | **170** |
| Medium | 8 | 2 | **10** |
| High | 3 | 1 | **4** |
| **Total** | **119** | **65** | **184** |

65. Anomalies interpreted as being of low archaeological potential are a mixture of small features, often boulder-like, or likely to represent modern debris such as chain, cable, or rope, or small items of debris with no features indicating archaeological potential. 170 of the anomalies within the study area were interpreted as being of low archaeological potential, 108 of these within the Bellrock WFDA. The low potential anomalies are further categorised as shown in **Table 15.13** with their spatial distribution illustrated in **Figure 15.2a** and **Figure 15.2b** (**Volume III**).

**Table 15.13: Low Potential Anomaly Categories**

| Anomaly Category | Bellrock WFDA | 1 km Buffer | Total |
|---|---|---|---|
| Chain, cable, or rope | 50 | 34 | 84 |
| Likely geological | 8 | 5 | 13 |
| Potential debris | 19 | 9 | 28 |
| Linear feature | 10 | 3 | 13 |
| Fishing gear | 14 | 9 | 23 |
| Seabed disturbance | 0 | 1 | 1 |
| Anchor – modern | 7 | 1 | 8 |
| **Total** | **108** | **62** | **170** |

66. Features interpreted as being of medium archaeological potential have characteristics that indicate possible anthropogenic material, or where a precautionary approach has been taken for anomalies where the identification is not clear. Ten anomalies were identified within the 1 km buffer which have been interpreted as medium archaeological potential, eight of which are located within the

Bellrock WFDA. These are categorised in **Table 15.14** with their spatial distribution illustrated in **Figure 15.2a** and **Figure 15.2b** (**Volume III**).

**Table 15.14: Medium Potential Anomaly Categories**

| Anomaly Category | Bellrock WFDA | 1 km Buffer | Total |
|---|---|---|---|
| Potential debris | 2 | 0 | 2 |
| Anchor | 2 | 0 | 2 |
| Wreck debris | 1 | 0 | 1 |
| Mound | 1 | 2 | 3 |
| Seabed disturbance | 2 | 0 | 2 |
| **Total** | **8** | **2** | **10** |

67. A full description of each of the medium potential seabed features is provided in **Section 6.2** of **Appendix 15.1: Archaeological Assessment of Geophysical Data** (**Volume IV**).

68. Four anomalies were interpreted as being of high archaeological potential within the geophysical 1 km buffer. Three of these lie within the Bellrock WFDA. The anomalies have been categorised as follows in **Table 15.15** with their spatial distribution illustrated in **Figure 15.2a** and **Figure 15.2c** (**Volume III**).

**Table 15.15: High Potential Anomaly Categories**

| Anomaly Category | Bellrock WFDA | 1 km Buffer | Total |
|---|---|---|---|
| Wreck | 3 | 0 | 3 |
| Potential wreck | 0 | 1 | 1 |
| **Total** | **3** | **1** | **4** |

69. Wreck BR24_067 (Figure 18 in **Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) lies within the Bellrock WFDA approximately 4.5 km north-northeast of the south-western corner. It is visible in both the SSS and MBES data and has a corresponding magnetic anomaly of 127.3 nanoteslas (nT). It does not correspond to any UKHO or CANMORE records. The anomaly represents the remains of a wrecked vessel measuring 33.9 m x 7.5 m with a measurable height of 3.6 m. The overall form of the wreck can be seen although there appears to be some degree of collapse. Debris related to the wreck appears contained within the scour although small features can be noted within the immediate vicinity. A linear feature extends from the bow terminating in what is believed to be anchor (medium potential BR24_068). Whilst the feature could represent snagged fishing gear, the origination from the bow of the wreck likely indicates the anchor and associated chain. The form of the wreck and associated magnetic anomaly, suggests steel construction.

70. Wreck BR24_070 (Figure 19 in **Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) lies within the Bellrock WFDA approximately 5.8 km south-southeast of the north-western corner. It is visible in both the SSS and MBES data and has a corresponding magnetic anomaly of 148.7 nT. It does not correspond to any UKHO or CANMORE records. The anomaly represents the remains of a wrecked vessel measuring 31.8 m x 6.9 m with a measurable height of 3.4 m. The wreck is upright and orientated east-west with what appears to be the bow towards the west. Scour is visible predominantly to the east and the west, where there is also an accumulation of seabed to the southeast and southwest of the wreck. The wreck is largely intact however, there seems to be a degree of deterioration. The SSS data appears to show deck beams running port to starboard. Amidships there is an upstanding feature with debris extending outside of the line of the hull to the south by 2.4 m. One significant item of debris, medium potential BR24_071, lies 135 m to the east. BR24_071 is a broadly linear feature measuring 9.8 m x 1.6 m with an associated magnetic anomaly of 81.9 nT and a calculated mass of 1,099.0 kg. Whilst not conclusively related to the wreck, the distance increases the likelihood it is associated. The form of the wreck, and the associated magnetic anomaly, suggests steel construction.

71. Wreck BR24_142 (Figure 21 of **Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) lies within the Bellrock WFDA approximately 274 m northwest of the south-eastern boundary. It is visible in both the SSS and MBES data and has a corresponding magnetic anomaly of 140.8 nT. The anomaly corresponds with UKHO record 102075 (see **Table 15.17**). The anomaly represents the remains of wrecked vessel measuring 49.4 m x 8.9 m with a measurable height of 6.1 m. The form of the wreck suggests a large degree of collapse in particular towards amidships, it not clear whether this is from natural degradation or a break in the hull from the wrecking event. A number of small depressions, potentially indicating debris with scour, are noted around the wreck. Extending 108.3 m south-southwest from the bow is a linear feature terminating in what is believed to be the anchor (medium potential BR24_143). The form of the wreck and associated magnetic anomaly, suggests steel construction.

72. Potential wreck BR24_101 (Figure 20 in **Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) lies outside the Bellrock WFDA approximately 187 m north of the northern boundary. The anomaly is visible in both the SSS and MBES data and has no corresponding magnetic anomaly. The anomaly is a concentration of small features, including linear features, distributed over an area 43.5 m x 13.4 m with a measurable height of 1.3 m. The assessment as of high potential is precautionary, there is the potential for the features to represent geological material such as boulders, however, this is unusual in the surrounding area. The overall shape, dimensions, and the presence of linear features may indicate anthropogenic debris, and potentially the remains of a wrecked vessel.

73. In addition to these seabed features there are 202 magnetic anomalies, ranging between 5.0 nT and 309.9 nT, within the study area which do not correlate with known, or visible, features or infrastructure. The distribution of anomalies by amplitude is shown below in **Table 15.16** with their spatial distribution illustrated in **Figure 15.3** (**Volume III**).

**Table 15.16: Distribution of Magnetic Anomalies by Amplitude**

| Amplitude (nT) | Bellrock WFDA | 1 km Buffer | Total |
|---|---|---|---|
| 5 to 50 | 120 | 77 | 197 |
| 50 to 100 | 4 | 0 | 4 |
| 100 to 200 | 0 | 0 | 0 |
| 200 + | 0 | 1 | 1 |
| **Total** | **124** | **78** | **202** |

74. Anomalies identified from the magnetometer data are ferrous and thus generally anthropogenic in origin although they can be associated with geological features, however, there is no visual interpretation as with other geophysical data. All isolated magnetic anomalies of 50 nT or less are considered to be of limited potential to be of archaeological significance. This is however dependant on the distance from the sensor.

75. In addition to the geophysical anomalies identified by MSDS Marine, there are three records charted by the UKHO, and a single record charted by both UKHO and CANMORE. These are summarised in **Table 15.17** and illustrated in **Figure 15.4** (**Volume III**).

**Table 15.17: Historic Environment Records in the Bellrock WFDA**

| UKHO ID | CANMORE ID | Name | Status | Description |
|---|---|---|---|---|
| 102135 | N/A | N/A | Live | Non-dangerous wreck found in the 2023 *Ocean Fortune* survey data acquired for the Bellrock WDFA. The wreck has a length of 31.5 m and width of 8.7 m. |
| 102136 | N/A | N/A | Live | Non-dangerous wreck found in the 2023 *Ocean Fortune* survey data acquired for the Bellrock WDFA. The wreck has a length of 33.2 m and width of 6.7 m. |
| 102075 | N/A | N/A | Live | Non-dangerous wreck found in the 2023 *Ocean Fortune* survey data acquired for the Bellrock WDFA. The wreck has a length of 47.8 m and width of 9.8 m. The wreck has linear feature extending from it possibly representing fishing gear or an anchor. |
| 3209 | 322404 | *Karen* | Live | Motor fishing vessel which sunk on 17/07/1978 (reported sinking). |

76. As discussed above BR24_142 and UKHO 102075 represent the same vessel.

77. UKHO records 102135 and 102136 both have descriptions which indicate that they correspond to wrecks which were first located during the 2023 survey for the Bellrock WFDA (i.e. the data which was assessed to inform this Bellrock WFDA EIA Report). However, UKHO record 102136 is located beyond the extents of the Bellrock WFDA, whilst UKHO record 102135 is located within the boundary, but at a location where nothing was seen during the archaeological assessment of the data. It is, therefore, highly likely that there is an error in the positioning of these two UKHO records and that these correspond to high potential wreck BR24_070 and high potential wreck BR24_067.

78. UKHO record 3209 relates to the wreck of the *Karen,* a fishing vessel sunk in 1978. The record was created following a reported sinking, and no evidence of a potential wreck were identified within the geophysical and hydrographic data. Given the likely inaccurate position from which the record originated, and the lack of evidence within the geophysical and hydrographic data, it is highly unlikely that the remains of the vessel lie at the stated position. It is possible that any one of the three, unidentified wrecks, or the potential wreck, interpreted from the data by MSDS Marine, represents the physical remains of the *Karen*, although, as there is no record of, for example, the dimensions and construction type, there is no evidence to support a potential correlation at this time.

79. There are no further reported losses, nor any documentary evidence for maritime activities within the study area which could suggest a higher potential for previously unrecorded remains. Nonetheless, in addition to these wrecks, there is also potential for the presence of previously unrecorded maritime archaeological material to be present, dating from the Mesolithic period up to the present day. For example, unidentified seabed features and magnetic anomalies interpreted by MSDS Marine (**Appendix 15.1: Archaeological Assessment of Geophysical Data (Volume IV)**) may be of no archaeological interest (i.e. modern debris or potentially a natural feature) or may equally represent isolated finds lost from a vessel (e.g. ordnance, anchors, items of deck machinery, or broken super structure) or buried or dispersed wreckage, which could be previously unrecorded.

80. In general, the potential for undetected, buried archaeological material may be considered higher in areas of mobile sand waves and where greater depths of finer grained sediment would promote the survival of buried archaeological material. Seabed composition varies across the Bellrock WFDA predominantly comprising sands and slightly gravelly sand, with muddy sand, slightly gravelly muddy sand, and gravelly muddy sand to the east. Seabed features are characterised by large channels and dunes running north-south, with an area of sand waves to the south and east.

81. Overall, therefore, it is concluded that there is moderate potential for previously unrecorded maritime archaeological remains to be present within the marine archaeology and cultural heritage study area.

#### 15.6.2.2 Cultural Significance of Heritage Assets

82. The cultural significance of unidentified wrecks and debris, archaeological anomalies and potential wrecks, and isolated finds (which are yet to be discovered) is currently unknown. The archaeological interest (or otherwise) of these features will be further examined post-consent if they cannot be avoided (e.g. investigation of individual anomalies (ground truthing) through Remote Operated Vehicle (ROV) and/or diver survey).

83. Once the character, nature and extent of selected features are more fully understood, their cultural significance can be described, including any contribution setting makes to that significance, to inform any requirements for further work on a case-by-case basis.

84. The cultural significance of shipwrecks lies largely in their historic and archaeological interest, in terms of their historical associations with people or events and with their research value.

85. There is currently only one identified loss within the Bellrock WFDA, the *Karen* (3209), a motor fishing vessel which is reported to have sunk in 1978. Should any of the unidentified wrecks be confirmed to be the physical remains of the *Karen* then this would have limited 'heritage' significance as a modern vessel. However, should further information become available, it is possible that local or regional associations, which could include loss of life, could have wider significance for regional fishing communities, for example.

### 15.6.2.3 Importance of Heritage Assets

86. The importance of unidentified wrecks and debris, and potential wrecks (which are yet to be discovered) is currently unknown and these are, therefore, assessed as being of potentially high importance as a precautionary measure. However, for 'potential' sites each individual discovery would be considered independently and any requirements for further data gathering, or analysis will be considered on a case-by-case basis proportionate to the importance of the discovery.

87. For example, in terms of BR24_067, BR24_070, and BR24_142/UKHO 102075 each of these vessels have been identified as steel constructed vessels. As such, they are likely to be modern possibly representing fishing or cargo vessels which would therefore be of limited importance. However, there is a possibility that these vessels are military in origin and therefore could warrant national protection. Therefore, these vessels are assessed as being of high importance as a precautionary measure.

88. As a probable modern fishing vessel, having sunk in 1978 the *Karen* (UKHO 3209/CANMORE) is unlikely to represent an example of vessel that would be considered a heritage asset in its own right. Therefore, should any of the unidentified wrecks be positively confirmed as the *Karen* this would be of negligible importance.

89. Isolated finds of maritime or aviation origin within secondary contexts will have evidential value for patterns of activities offshore and are assessed as being of medium importance. The heritage importance of the potential heritage assets outlined above are presented in **Table 15.18**.

**Table 15.18: Heritage Importance (Maritime Archaeology)**

| Asset Type | Definition | Importance |
|---|---|---|
| Known maritime heritage assets | Unidentified wrecks and associated debris (BR24_067, BR24_070, BR24_101, and BR24_142) | High |
| Potential wrecks | Wrecks within the Bellrock WFDA that are yet to be discovered | High |
| Potential derived maritime finds | Isolated artefacts lost from a boat or ship or moved from a wreck site | Medium |

## 15.6.3 Aviation Archaeology

### 15.6.3.1 Description of Heritage Assets

90. No aviation remains have been identified within the Bellrock WFDA, however, if any military aircraft remains were identified these would be protected under the Protection of Military Remains Act 1986.

91. During World War II parts of the Scottish east coast were subject to numerous Luftwaffe bombing raids. For example, Peterhead was the second most bombed location in Britain, being bombed 28 times. This was because Peterhead was the first built-up area the Luftwaffe reach during bombing runs from Norway (Taylor, 2010). Similarly, Aberdeen was bombed 24 times, Edinburgh up to 15 times and Dundee and Clydebank also saw several attacks (Taylor, 2010). The Bellrock WFDA is likely to have lain within the Luftwaffe flight path during these raids, therefore there is potential for aviation remains relating to these bombing runs located within in the Bellrock WFDA.

92. Overall, therefore, it is concluded that there is moderate potential for previously unrecorded aviation archaeological remains to be present within the marine archaeology and cultural heritage study area.

### 15.6.3.2 Cultural Significance of Identified Assets

93. The cultural significance of potential aircraft, and isolated finds (which are yet to be discovered) is currently unknown. The archaeological interest (or otherwise) of these features will be further examined post-consent (e.g. investigation of individual anomalies (ground truthing) through ROV and/or diver survey).

94. Once the character, nature and extent of selected features are more fully understood, their cultural significance can be described, including any contribution setting makes to that significance, to inform any requirements for further work on a case-by-case basis.

95. The cultural significance of aircraft lies largely in their historic and archaeological interest, in terms of their historical associations with people or events and with their research value.

### 15.6.3.3 Importance of Identified Assets

96. The importance of potential aircraft crash sites (which are yet to be discovered) is currently unknown and these are, therefore, assessed as being of potentially high importance as a precautionary measure. Should any material from a crashed military aircraft be encountered located within the study area, these would automatically be protected under the Protection of Military Remains Act 1986. For 'potential' sites each individual discovery would be considered independently and any requirements for further data gathering, or analysis will be considered on a case-by-case basis proportionate to the importance of the discovery.

97. Isolated finds of aviation origin within secondary contexts will have evidential value for patterns of activities offshore and are assessed as being of medium importance. The heritage importance of the potential heritage assets outlined above are presented in **Table 15.19**.

**Table 15.19: Heritage Importance (Aviation Archaeology)**

| Heritage Asset | Definition | Importance |
|---|---|---|
| Potential aircraft | Aircraft within the study area that are yet to be discovered | High |
| Potential derived aviation finds | Isolated artefacts lost from an aircraft or moved from a crash site | Medium |

## 15.6.4 Predicted Future Baseline

98. If the Bellrock WFDA is not developed, an assessment of future conditions for marine archaeology and cultural heritage has been carried out and is described within this section.

99. The baseline environment for marine archaeology and cultural heritage has been shaped by a combination of factors, with the most prevalent being changes in global sea levels and associated climatic and environmental conditions which have affected the burial and preservation of prehistoric archaeology, and latterly that of maritime and aviation archaeology. HES (2020) recognise that '*Scotland's climate has always been dynamic, and many historic sites retain evidence of shifting environmental conditions*'. However, outlined in HES's (2019b) strategy for climate change 'A Guide to Climate Change Impacts' it also recognises the '*planet is undergoing a relatively rapid period of warming, which in turn is driving additional changes in our climate beyond what is naturally expected*.'

100. Historic and archaeological heritage is identified as a specific area of vulnerability and impact within the strategy for climate change (HES, 2019b) with damage to, or loss of heritage assets, recognised as a direct result of continued erosion. Conversely, it is also recognised that erosion may facilitate the discovery of previously hidden archaeological sites and finds.

101. Cycles of burial and exposure resulting from marine physical processes, including storm events which can result in the stripping of shallow sediment from the seabed and beach, have an ongoing effect upon the preservation of archaeological material. Exposed heritage assets are at greater risk from erosion and degradation due to the effects of marine physical processes than those which remain buried and are consequently provided with greater protection from continued sediment cover. These cycles of burial and exposure are anticipated to continue although the effect upon individual heritage assets is difficult to predict as this will depend upon site-specific conditions and the nature of any exposed archaeology.

102. As outlined in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**), the baseline conditions for marine geology, oceanography and physical processes will continue to be controlled by waves and tidal currents driving changes in sediment transport and then seabed morphology. However, over longer timescales, these drivers may be affected by climate change and sea-level rise. These broadscale environmental changes will occur regardless of the presence or absence of the Bellrock Wind Farm Infrastructure.

# 15.7 Potential Impacts

## 15.7.1 Scope

103. **Table 15.20** sets out the impacts that have been scoped in to and out of the Bellrock WFDA EIA Report, in line with the Scoping Opinion for the Bellrock WFDA (**Appendix 1.2: Bellrock WFDA Scoping Opinion (Volume IV)**).

104. The setting of a heritage asset is described as the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced (HES, 2016). This can often be integral to a heritage asset's cultural significance. A change to this setting would, therefore, have the potential to positively or negatively affect cultural significance.

105. Given the distance from the coast (120 km from Stonehaven and 116 km southeast from Peterhead), it was concluded at Scoping stage that there would be no change in the setting of onshore heritage assets from the Bellrock WFDA. Therefore, impacts to heritage assets from changes to their setting were scoped out of further assessment.

106. For offshore assets, for the most part, submerged archaeological sites are not readily appreciated or experienced in their setting, although some marine heritage assets do have a setting which directly relates to their cultural significance (i.e. a wreck sunk at the location of a historic naval battle). Reference to the setting of offshore heritage assets, therefore, can still be an important factor in describing their cultural significance and any changes to setting, which may have the potential to impact cultural significance, are articulated where relevant to the assessment of direct impacts to heritage assets in **Section 15.8**.

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**Table 15.20: Potential Impacts Scoped In and Out of the EIA for Marine Archaeology and Cultural Heritage as Agreed in the Bellrock WFDA Scoping Opinion**

| Potential Impact | Construction | Operation and Maintenance | Decommissioning |
|---|---|---|---|
| | Advised within the Bellrock WFDA Scoping Opinion | | |
| Direct physical impacts to known heritage assets | ✓ | ✓ | ✓ |
| Direct physical impacts to potential heritage assets | ✓ | ✓ | ✓ |
| Indirect impacts to heritage assets associated with changes to marine physical processes | ✓ | ✓ | ✓ |
| Change to the setting of heritage assets | x | x | x |
| Direct transboundary impacts | ✓ | ✓ | ✓ |
| Indirect transboundary impacts | x | x | x |
| Transboundary impacts | x | x | x |

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## 15.7.2 Realistic Worst-case Scenario

107. The final design of the Bellrock Wind Farm Infrastructure will be confirmed during detailed engineering studies post-consent. To undertake a robust and precautionary impact assessment, the realistic worst-case design scenario has been defined. Realistic worst-case scenario (i.e. those that have potential to cause the greatest impact) are derived from the project design envelope to ensure that all other design scenarios would have equal or less impact. Please see **Chapter 5: EIA Methodology** (**Volume II**) for further details on the design envelope approach.

108. The realistic worst-case scenario for the marine archaeology and cultural heritage assessment are summarised in **Table 15.21** below. These are based on the project design as described in **Chapter 4: Project Description** (**Volume II**).

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**Table 15.21: Realistic Worst-case Scenario for Impacts on Marine Archaeology and Cultural Heritage**

| Impact | Realistic Worst-case Scenario | Rationale |
|---|---|---|
| **Construction** | | |
| Direct impacts to known and potential heritage assets as a result of construction activities (including site preparation works[1]). | Floating Offshore Units (FOUs)<br>▪ Number of FOUs: 132;<br>▪ Number of mooring lines and anchors per FOU: 9;<br>▪ Worst-case area: Maximum seabed footprint area for all DEAs (including drag distance of 60 m per DEA) = 855,360 $m^2$. (720 $m^2$ per DEA (anchor width 12m x drag distance 60 m), per FOU 6,480 $m^2$ (720 $m^2$ x 9)), for 132 FOUs (6,480 x 132)); and<br>▪ Maximum anchor embedded depth = 8.75 m.<br>Mooring Lines<br>▪ Maximum footprint area due to the pre-lay of mooring lines (including clump weights) on the seabed = 532,224 $m^2$. | The worst-case scenario is represented by the maximum disturbance of seabed sediments with the potential to contain archaeological material (present either on the seafloor or buried within seabed deposits).<br>Each value provided represents the worst-case/maximum possible value for that parameter.<br>Direct impacts to known heritage assets will not occur due to the application of embedded mitigation comprising AEZs around high and medium potential anomalies. |
| | IACs<br>▪ Installation method with the largest seabed footprint area = ploughing;<br>▪ Target burial depth = 0.5 to 2.5 m; and<br>▪ Maximum seabed footprint area of disturbance from ploughing = 1,447,500 $m^2$. | |
| | Subsea Cable Hubs<br>Maximum seabed footprint for 18 subsea cable hubs = 3,042 $m^2$ (per subsea cable hub = 13 x 13m = 169 $m^2$). | |
| | **Cable Protection:**<br>**IACs**<br>▪ Maximum amount of IAC requiring external cable protection = 26.2 km (including of the total 75 km of unburied IACs (5%); and 22.5 km allowance for buried IACs (10%))<br>▪ Maximum area of cable protection for IACs at 4.8 m width = 125,760 $m^2$ (26,200 m * 4.8 m). | |

| Impact | Realistic Worst-case Scenario | Rationale |
|---|---|---|
| | **IAC Crossings**<br>▪ Maximum seabed footprint for three cable crossings = 981 $m^2$ (327 $m^2$ per crossing).<br>**Scour Protection for:**<br>**Anchors**<br>▪ Maximum seabed footprint for anchor scour protection (all anchors) = 2,418,768 $m^2$ (2,036 $m^2$ (excluding the anchor) per anchor). | |
| | **Seabed Preparation = 797,032 $m^2$**<br>▪ Maximum footprint area due to boulder clearance = 4,000 $m^2$;<br>▪ Maximum footprint area due to sand wave levelling = 420,000 $m^2$; and<br>▪ Maximum footprint area due to slope levelling for GBAs only = 373,032 $m^2$. | |
| | <u>Metocean Buoys:</u><br>▪ Maximum number of metocean buoys = 2;<br>▪ Maximum seabed footprint per buoy = 15 $m^2$; and<br>▪ Maximum footprint for all Metocean buoys = 30 $m^2$.<br><u>Installation of Mooring Buoys:</u><br>▪ Number of mooring buoys = 2;<br>▪ Maximum number of anchors = 6 (2 buoys * 3 anchors per buoy);<br>▪ Max footprint per anchor = 98 $m^2$; and<br>Total mooring buoy footprint: 588 $m^2$. | |
| | <u>Construction Activities:</u><br>Number of round trips[2] during construction (including site preparation) for all vessels: 1,615. | |

| Impact | Realistic Worst-case Scenario | Rationale |
|---|---|---|
| Indirect impacts to heritage assets associated with changes to marine physical processes due to the presence of construction vessels and Wind Farm Infrastructure | The worst-case scenario for marine physical processes are set out in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**) (**Table 6-16**). The following impacts are relevant to the worst-case for Marine Archaeology and Cultural Heritage offshore archaeology and cultural heritage:<br>▪ Impact C1 Changes in SSCs and Seabed Levels; and<br>▪ Impact C2 Changes to bedload sediment transport regime and seabed morphology. | The worst-case scenario represents the greatest potential for increased scour and sediment stripping across an area due to changes to physical processes which could result in the exposure and degradation of heritage assets which are currently buried and protected from marine processes.<br>Conversely, the worst-case scenario for potential positive effects are associated with changes to physical processes which result in increased sediment cover and the burial (and protection) of heritage assets which may previously have been exposed. |
| **Operation and Maintenance** | | |
| Direct impacts to known and potential heritage assets as a result of routine and non-routine maintenance activities which disturb the seabed (e.g. seabed contact by legs of jack-up vessels and/or anchors). | **Worst-case O&M disturbance footprint for the Bellrock WFDA (total over the lifetime of the Project) = 4.75 km$^2$**<br>**Moorings:**<br>▪ Maximum catenary drag seabed footprint (swept area) of all mooring lines = 46,200,000 m$^2$ (350,000m$^2$ per FOU).<br>**IACs:**<br>▪ IAC repair due to failure: Maximum seabed disturbance footprint (per year) = 27,720 m$^2$ (970,200m$^2$ over lifetime (35 yrs)); and<br>▪ Remedial IAC burial due to exposure: Maximum seabed disturbance footprint (per year) = 2,700m$^2$ per year (94,500 m$^2$ overtime lifetime (35 yrs)).<br>**Jack-up Vessels:**<br>▪ Maximum jack-up vessel seabed footprint (per jack-up vessel) = 1,440 m$^2$; | The worst-case scenario is represented by the maximum disturbance of seabed sediments with the potential to contain archaeological material (present either on the seafloor or buried within seabed deposits).<br>Direct impacts to known heritage assets will not occur due to the ongoing application of AEZs during the projects lifetime. |

| Impact | Realistic Worst-case Scenario | Rationale |
|---|---|---|
| | ▪ Maximum number of jack-up positions over the operational phase = 132; and<br>▪ Maximum jack-up vessel seabed footprint (for all jack-up positions) = 190,080 $m^2$ (1,440 $m^2$ x 132). | |
| Indirect impacts to heritage assets associated with changes to marine physical processes due to the presence of the installed Wind Farm Infrastructure. | The worst-case scenario for marine physical processes are set out in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**) (**Table 16-6**). The following impacts are relevant to the worst-case for Marine Archaeology and Cultural Heritage offshore archaeology and cultural heritage:<br>▪ Impact O1 Changes to SSC and seabed levels; and<br>▪ Impact O2 Changes to sediment transport regime and seabed morphology. | The worst-case scenario represents the greatest potential for increased scour and sediment stripping across an area due to changes to physical processes which could result in the exposure and degradation of heritage assets which are currently buried and protected from marine processes.<br>Conversely, the worst-case scenario for potential positive effects are associated with changes to physical processes which result in increased sediment cover and the burial (and protection) of heritage assets which may previously have been exposed. |
| **Decommissioning** | | |
| It is expected that the Bellrock Wind Farm Infrastructure will be fully removed at the end of its operational life. Exceptions to this would be where removal would create unacceptable risks to personnel or to the marine environment, be technically unfeasible or involve extreme costs (Scottish Government, 2022).<br>The sequence of decommissioning is likely to be the reverse of the construction sequence, taking around seven years, with similar types and numbers of vessels and equipment expected to be involved.<br>The removal and dismantling of the FOUs will largely be a reversal of the installation process. Generally, the FOUs will be towed from the Bellrock WFDA to a suitable port for decommissioning.<br>Mooring lines and anchors will be recovered and removed from the WFDA. For FOU driven pile anchors, these are expected to be either fully removed or cut off below seabed level with a proportion remaining in-situ (due to anticipated excessive cost in their complete removal) following good practice and consideration of environmental conditions and sensitivities. | | |

| Impact | Realistic Worst-case Scenario | Rationale |
|---|---|---|
| Subsea cable hubs are expected to be fully removed from the seabed.<br><br>The dynamic sections of the IACs within the water column will be cut at the connector with the static IAC and fully removed. The approach for decommissioning the static IACs on the seabed is yet to be determined, however, this will be reviewed throughout the lifetime of the Bellrock WFDA and good practice guidance at time of decommissioning will be followed.<br><br>Subject to the material used and environmental sensitivities, it may be preferable to leave scour protection in-situ to preserve the marine habitat that may have developed over the life of the Bellrock WFDA. The approach for decommissioning cable protection will be similar to scour protection. Relevant stakeholders and regulators will be consulted to establish the best approach. Good practice guidance at time of decommissioning will be followed. | | |
| Notes:<br><br>[1] Site preparation works will commence up to one year before commencement of construction (year 0), at which point they may continue albeit as construction works (rather than site preparation works) these activities have been considered in the assessments of this Chapter, for completeness.<br><br>[2] One round trip comprises two movements (i.e. one to and one from the Bellrock WFDA). | | |

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### 15.7.3 Embedded Mitigation Measures

109. This section outlines the embedded (primary and tertiary) mitigation relevant to the marine archaeology and cultural heritage assessment (as shown in **Table 15.22** below). Where additional (secondary) mitigation measures are proposed, these are detailed in the impact assessment (**Section 15.8**).

110. The Applicant has made several commitments to avoid, prevent, reduce or, if possible, offset potential adverse environmental effects through mitigation measures embedded into the evolution of the Bellrock WFDA's design envelope. These embedded mitigation measures include actions that will be undertaken to meet other existing legislative requirements and those considered to be standard or best practice to manage commonly occurring environmental effects.

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**Table 15.22: Embedded Mitigation Measures Relevant to Marine Archaeology and Cultural Heritage**

| Measure ID | Embedded Mitigation Measure(s) | Mitigation Type | Means of Implementation |
|---|---|---|---|
| WFDA-14 | Development of and adherence to an Inter-array Cable Plan (IA-CaP). The IA-CaP will set out detailed IAC installation methods and techniques (based on final project design). The IA-CaP will confirm planned IAC routing, burial (if any), and any additional protection if required, and will set out methods for post-installation IAC monitoring. | Tertiary | Secured in the s.36 Consent and Marine Licence, via a condition requiring an IA-CaP to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |
| WFDA-20 | During the construction and O&M of the Wind Farm Infrastructure, periodic geophysical surveys would be required to ensure the IACs remain buried and if they do become exposed, remedial works will be undertaken. | Primary | Secured in the s.36 Consent and Marine Licence, via a condition requiring an IA-CaP to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |
| WFDA-21 | An EMP will be prepared and implemented to set out the procedures to avoid, reduce, and manage potential environmental effects arising across the construction and O&M of the Bellrock Wind Farm Infrastructure, in accordance with relevant international and national legislation and guidance. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring an EMP to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>An **Outline EMP** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-28 | Development of UXO Threat and Risk Assessment. All UXO detonations will be subject to a risk assessment undertaken in accordance with relevant guidance such as publication C754 Assessment and Management of UXO Risk in the Marine Environment (Construction Industry Research and Information Association, 2015). | Tertiary | A UXO Threat and Risk Assessment has been developed to support an indicative assessment of UXO clearance in the Bellrock WFDA EIA Report and will inform separate Marine Licence application(s) for UXO clearance. |
| WFDA-34 | Adherence to the following international and national regulations and guidance, namely:<br>▪ International Convention for the Prevention of Pollution from Ships (MARPOL), which sets out requirements, including appropriate vessel maintenance;<br>▪ The International Convention for the Control and Management of Ships' Ballast Water and Sediments, which provides an international framework for the control of transfer of potentially invasive species from ballast water; and | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a Vessel Management and Navigational Safety Plan (VMNSP) to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>An **Outline VMNSP** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |

| Measure ID | Embedded Mitigation Measure(s) | Mitigation Type | Means of Implementation |
|---|---|---|---|
| | ▪ Consideration of guidance from the International Maritime Organisation (IMO, 2023) on the control and management of ships' biofouling to minimise the transfer of invasive aquatic species. | | |
| WFDA-47 | Development of, and adherence to, a Decommissioning Programme (DP).<br>The DP will set out the framework for the safe, orderly, and environmentally acceptable decommissioning and removal of the Bellrock Wind Farm Infrastructure, in the interests of safety and environmental protection.<br>Climate change risk measures will be included in the DP to be developed prior to the commencement of construction and will include a review of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to ensure risk assessments, H&S protocols and guidelines on safe working practices are suitable for future climate conditions at the time of decommissioning works. The DP will be refreshed prior to decommissioning activities commencing.<br>The DP will mitigate the risk of climate change impacts on decommissioning site personnel, plant and equipment and other assets and the risk of delays to the decommissioning programme due to extreme weather events, which are becoming more frequent and intense due to climate change. | Tertiary | Secured in the s.36 Consent and Marine Licence, via a condition requiring a DP to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |
| WFDA-53 | Commitment to preparation and agreement on an Offshore WSI and PAD. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a WSI to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>A **WSI and PAD** (**Volume V**) is submitted alongside the s.36 Consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-54 | The implementation of AEZs around sites identified as having a known important archaeological potential to mitigate the potential impacts from offshore infrastructure. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a WSI to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |

| Measure ID | Embedded Mitigation Measure(s) | Mitigation Type | Means of Implementation |
|---|---|---|---|
| | | | A **WSI and PAD** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-55 | Archaeological input into specifications for and analysis of future geophysical surveys and/or geotechnical surveys within the Bellrock WFDA, including a provision for sampling, analysis and reporting of recovered cores, if appropriate.<br>The results of all geoarchaeological investigations to be compiled in a final report which includes a sediment deposit model. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a WSI to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>A **WSI and PAD** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-56 | Archaeologists to be consulted in the preparation of any Remotely Operated Vehicle or diver surveys and in monitoring/checking of data, if appropriate based upon the findings of the archaeological assessment of geophysical survey data. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a WSI to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>A **WSI and PAD** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-57 | All anomalies of possible archaeological potential will be reviewed against the final layout and design. If they are likely to be impacted, these anomalies would undergo further archaeological investigation. Should these anomalies prove to be of archaeological importance then future AEZs may be implemented following consultation with heritage stakeholders. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a WSI to be developed and submitted to the Scottish Ministers for approval before commencement of construction.<br>A **WSI and PAD** (**Volume V**) is submitted alongside the s.36 consent application and Marine Licence application for the Bellrock Wind Farm Infrastructure. |
| WFDA-58 | Micro-siting of station keeping stations, IACs and subsea cable hub(s) to avoid known heritage assets (AEZs) where practicable. | Primary | Secured in the s.36 Consent and Marine Licence via a condition requiring a Construction Method Statement (CMS) and Development Specification and Layout Plan (DSLP) to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |

| Measure ID | Embedded Mitigation Measure(s) | Mitigation Type | Means of Implementation |
|---|---|---|---|
| WFDA-60 | Development of, and adherence to, a CMS.<br><br>The CMS will describe the methods for construction for all consented Wind Farm Infrastructure and set out the measures to be implemented to avoid or reduce adverse effects on the environment and legitimate users of the sea during the construction phase. This will include a clear definition of roles and responsibilities and reference to relevant H&S protocols.<br><br>In relation to climate change, the CMS will incorporate measures to ensure construction activities are resilient to current and projected extreme weather and metocean conditions. This will include, as appropriate:<br><br>▪ Monitoring of site-specific weather and metocean conditions, including use of recognised forecasting and severe weather alert services;<br><br>▪ Programming and phasing of construction activities with regard to seasonality and short- to medium-term forecasts;<br><br>▪ Definition of safe working limits for vessel, lifting, and installation operations and procedures for suspension of works where thresholds are exceeded;<br><br>▪ Measures to secure plant, equipment, and materials during adverse weather; and<br><br>▪ Risk assessments and safety procedures that account for site-specific extreme weather risks.<br><br>Through these measures, the CMS will mitigate risks to construction personnel, plant, and equipment, and reduce the potential for programme disruptions arising from extreme weather events. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring a CMS to be developed and submitted to the Scottish Ministers for approval before commencement of construction. |
| WFDA-61 | Regular and periodic inspections and maintenance of all components of the Wind Farm Infrastructure will be undertaken over their operational lifetime to identify and remediate any damage and deterioration and maintain good working conditions. These will be included in the Operation and Maintenance Plan (OMP).<br><br>Monitoring of site-specific weather and metocean conditions, recent extreme weather events and up-to-date climate change projection data will be undertaken to provide a dynamic risk assessment of climate change impacts and inform operation and maintenance planning. | Tertiary | Secured in the s.36 Consent and Marine Licence via a condition requiring an OMP to be developed and submitted to the Scottish Ministers for approval prior to the commissioning of the first WTG. |

| Measure ID | Embedded Mitigation Measure(s) | Mitigation Type | Means of Implementation |
|---|---|---|---|
| | The OMP will mitigate the risks of climate change impacts on the conditions and performance of the Wind Farm Infrastructure and ensures that it is adaptable to future climate conditions and remains resilient over its operational life. The O&M strategy will be adaptive, with the frequency of maintenance, repair and replacement activities being adjusted based on need (i.e. increasing planned O&M visits for components with higher deterioration rates than anticipated). | | |

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# 15.8 Assessment of Effects

111. The potential effects to marine archaeology and cultural heritage that may occur during construction, O&M, and decommissioning of the Bellrock Wind Farm Infrastructure are assessed in the following sections. The assessment follows the methodology set out in **Section 15.4.1** and is based on the realistic worst-case scenario defined in **Section 15.7.2**, with consideration of embedded mitigation measures identified in **Section 15.7.3.**

## 15.8.1 Potential Impacts During Construction

### 15.8.1.1 Impact C1: Direct Impacts to Heritage Assets

112. Direct impacts encompass direct effects from the physical siting of the Wind Farm Infrastructure within the Bellrock WFDA. Direct impacts to heritage assets, either present on the seafloor or buried within seabed deposits, may result in damage to, or total destruction of, archaeological material or the relationships between that material and the wider environment (stratigraphic context or setting). These relationships are crucial to developing a full understanding of an asset. Such impacts may occur if heritage assets are present within the footprint of elements of the Wind Farm Infrastructure (i.e. SKSs and associated scour protection or IACs and associated cable protection) or within the footprint of site preparation and construction activities.

113. There is potential for direct impact to these features during the following activities:

- Site preparation works (for the purpose of this assessment, site preparation activities include surveys, seabed preparation, unexploded ordnance (UXO) clearance, debris clearance, and out of service cable/pipeline removal);
- During construction:
  - Installation of FOUs and associated SKSs, including associated scour protection; and
  - Installation of IACs, subsea cable hub(s) and associated cable protection.

#### *15.8.1.1.1 Heritage Importance (Sensitivity)*

##### *15.8.1.1.1.1 Known Heritage Assets*

114. The heritage importance (sensitivity) of known heritage assets is described in **Sections 15.6.1.3**, **15.6.2.3** and **15.6.3.3** and summarised in **Table 15.23**.

**Table 15.23: Importance of Known Heritage Assets**

| Heritage Asset | Definition | Importance |
|---|---|---|
| Known Wrecks | Unidentified wrecks and associated debris (BR24_067, BR24_070, BR24_101, and BR24_142) | High |

#### 15.8.1.1.1.2 Potential Heritage Assets

115. The heritage importance (sensitivity) of potential heritage assets is described in **Sections 15.6.1.3**, **15.6.2.3** and **15.6.3.3** and summarised in **Table 15.24**.

**Table 15.24: Importance of Potential Heritage Assets**

| Heritage Asset | Definition | Importance |
|---|---|---|
| Potential derived prehistoric finds | Isolated discoveries of prehistoric archaeological material discovered within secondary contexts. | Medium |
| Potential palaeoenvironmental evidence | Palaeoenvironmental material beyond the context of a site or palaeolandscape feature with archaeological potential. | Low |
| Potential wrecks | Wrecks within the study area that are yet to be discovered | High |
| Potential derived maritime finds | Isolated artefacts lost from a boat or ship or moved from a wreck site | Medium |
| Potential aircraft | Aircraft within the study area that are yet to be discovered | High |
| Potential derived aviation finds | Isolated artefacts lost from an aircraft or moved from an aviation crash site | Medium |

### *15.8.1.1.2 Magnitude of Impact*

#### 15.8.1.1.2.1 Known Heritage Assets

116. Within the extent of the design envelope, and worst-case assessment, until the final design and layouts are confirmed, there will remain uncertainty in the precise nature and extent of any direct impacts. However, with the application of the embedded mitigation (see **Section 15.7.3**), it is anticipated that all direct impacts to known heritage assets as a result of the installation of the Wind Farm Infrastructure would be avoided. As discussed in **Section 15.7.3** the primary means of mitigation is avoidance through the application of archaeological exclusion zone (AEZs).

117. Four high potential anomalies, and ten medium potential anomalies, have been identified within the geophysical survey data extents, of which three high potential and eight medium potential anomalies lie within the Bellrock WFDA. AEZs have been recommended for all high and medium anomalies within the Bellrock WFDA. Dependant on the form of anomalies, AEZs will either be recommended as a radius from the centre point of the anomaly or as a distance from the extents.

118. The size of the recommended buffer is based on the size of the anomaly, the extents of any debris, the potential significance of the anomaly, the potential impact of the development and the seabed dynamics within the area. The location and size of AEZs are presented in **Table 15.25** and illustrated in **Figure 15.5** (**Volume III**).

**Table 15.25: Location of AEZs in the Bellrock WFDA**

| Anomaly ID | Description | Potential | WGS84 Z30N | | AEZ Distance (from Boundary of Heritage Asset) (m) |
|---|---|---|---|---|---|
| | | | X | Y | |
| BR24_067 (incorporating medium potential BR24_068) | Wreck | High | 675109.7 | 6300567.3 | 50 |
| BR24_070 | Wreck | High | 675182.3 | 6304895.3 | 50 |
| BR24_142 (incorporating medium potential BR24_143) | Wreck | High | 687344.0 | 6301679.0 | 100 |
| BR24_069 | Potential debris | Medium | 675054.6 | 6301818.6 | 25 |
| BR24_071 | Wreck debris | Medium | 675330.2 | 6304868.2 | 25 (radius around centre point) |
| BR24_073 | Potential debris | Medium | 675268.6 | 6304437.7 | 25 |
| BR24_094 | Seabed disturbance | Medium | 678064.1 | 6303011.4 | 25 |
| BR24_103 | Seabed disturbance | Medium | 678948.9 | 6308574.5 | 25 |
| BR24_117 | Mound | Medium | 681989.3 | 6299052.9 | 25 |

119. The archaeological assessment of pre-construction survey data, including high resolution geophysical data undertaken for the purposes of UXO identification, will further clarify the nature and extent of any additional anomalies of possible archaeological interest and the project design will be modified (micro-sited) to avoid heritage assets where possible.

120. If features cannot be avoided, then additional work may be required (to be undertaken post-consent) to establish the archaeological interest of the feature (e.g. investigation of individual anomalies (ground-truthing) through ROV and/or diver survey). Once the character, nature and extent of selected features are more fully understood, appropriate mitigation measures (proportionate to the significance of the asset) to reduce or offset impacts can be determined on a case by case basis.

121. For example, if an anomaly is found not to be of archaeological interest, then the AEZ could be removed in agreement with HES. Alternatively, an AEZ may be reduced in size if an anomaly is found to be constrained to a smaller area, allowing the buffer to be reduced. Conversely, if further investigation demonstrates the presence of a greater than expected potential for buried remains or an associated debris field then the buffer may need to be increased, resulting in a larger overall AEZ.

122. Unless modified by agreement, it is important that AEZs are retained throughout the lifetime of Bellrock Wind Farm Infrastructure and monitoring of AEZs may be required by the regulator and HES to ensure adherence during construction.

123. With the application of embedded mitigation, the magnitude of impact is considered to be **no impact**.

#### *15.8.1.1.2.2* Potential Heritage Assets

124. Unlike known heritage assets, it is not possible to avoid heritage assets that have not yet been discovered (potential heritage assets). Therefore, unavoidable direct impacts may occur if archaeological material is present within the footprint. However, with the application of the embedded mitigation (see **Section 15.7.3**), further archaeological assessment of high-resolution geophysical data and geoarchaeological assessment of geotechnical data will be undertaken pre-construction in order to reduce, as far as practicable, the probability of an impact occurring during construction.

125. With respect to submerged prehistory, the assessment undertaken to date (**Section 15.6.1**) indicates a very low archaeological potential for most identified units suggesting that the probability of impacts occurring is also very low. Units D1 and D3 have been attributed a moderate, and low to moderate, potential for palaeoenvironmental remains, respectively. As such, these units may benefit from further investigation.

126. However, impacts to Unit D1 will not occur due to its depth at < 81.4 metres below seafloor. Furthermore, the examination of these potential prehistoric deposits through the assessment of preconstruction geotechnical data will further contribute to the body of scientific data available for the study of seabed prehistory within the region. There will be archaeological input into any future sampling programmes and all available geotechnical data (e.g. samples/geotechnical logs acquired as part of engineering-led ground investigation works) will be subject to geoarchaeological assessment during the post-application/post-consent stages of the Bellrock Wind Farm Infrastructure.

127. With this embedded mitigation, the magnitude of impact is therefore considered to be **low beneficial**.

128. With respect to the potential for maritime and aviation archaeology, as described in **Sections 15.6.2** and **15.6.3** above, low potential anomalies, and small magnetic anomalies, have been identified as potentially anthropogenic in origin but unlikely to be of archaeological significance and AEZs have not been recommended. Overall, **Sections 15.6.2** and **15.6.3** identify a moderate potential for further finds of maritime and aviation archaeological material. The archaeological assessment of high-resolution geophysical data to be acquired pre-construction, together with ground-truthing of identified anomalies of potential archaeological significance, where required, will help to confirm and clarify further this potential. This will reduce further the potential for unexpected discoveries during construction.

129. Should any new features be identified during pre-construction survey and assessment, where features cannot be avoided, then additional work would be required (to be undertaken post-consent) to establish the archaeological interest of the feature (e.g. investigation of individual anomalies (ground-truthing) through ROV and/or diver survey). Once the character, nature and

extent of selected features are more fully understood, appropriate mitigation measures (proportionate to the significance of the asset) to avoid, reduce or off-set impacts can be determined on a case by case basis. For example, if features of archaeological interest are confirmed during these further investigations, which are considered to be of sufficient significance to warrant preservation in situ, then they will be subject to the same mitigation as described for known heritage assets (AEZs) described above.

130. Should impacts occur, the magnitude of the impact cannot be fully understood until after the potential heritage asset has been encountered and the impact has occurred. The extent of any impact will depend on the presence, nature and depth of any such remains, in association with the depth, location and nature of construction related groundworks and contact with the seabed. However, whilst the risk of encountering unexpected discoveries cannot be entirely removed, with the application of the embedded mitigation the probability of such impacts occurring will be significantly reduced. Furthermore, based on the assessment of potential, and the provision for further investigation, unexpected discoveries during construction are anticipated to be limited to isolated finds, rather than in situ sites.

131. Isolated or derived artefacts, within reworked deposits may be considered less sensitive to change than in situ material, as their relationship with their context or physical setting is less relevant to understanding their significance. Therefore, in accordance with the definitions set out in **Table 15.4**, there is potential for direct impacts of low adverse magnitude upon potential isolated finds. Should such finds be encountered during construction activities, although removal from the marine context will still result in the destruction of that contextual relationship, albeit a secondary context (i.e. not in situ), isolated artefacts have capacity to accommodate physical changes, therefore resulting in only a slight loss of heritage significance.

132. In the event of an unexpected discovery, this will be reported through a formal PAD. For the Bellrock WFDA, this will be based upon the established Protocol for Archaeological Discoveries: Offshore Renewables Projects (The Crown Estate, 2014). This will establish whether the recovered objects are of archaeological interest and allow for the application of appropriate mitigation measures, where necessary. For any new discoveries, any further mitigation which may be required would be considered on a case by case basis, proportionate to the significance of the discovery.

133. The magnitude of impact is therefore considered to be **low adverse**.

#### *15.8.1.1.3 Significance of Effect*

##### *15.8.1.1.3.1* Known Heritage Assets

134. Considering the embedded mitigation identified in **Table 15.22** there will be **no effect** on known heritage assets during construction, which is **not significant** in EIA terms.

##### *15.8.1.1.3.2* Potential Heritage Assets

135. With respect to the potential for archaeological and palaeoenvironmental remains to be present within the Bellrock WFDA, impacts are not expected to occur. However, with the application of embedded mitigation, there is potential for geoarchaeological assessments undertaken from the Bellrock WFDA to contribute to the body of scientific data available for the study of seabed prehistory within the region. Overall, it is predicted that the importance of any palaeoenvironmental

material Units D1 and D3 is **low** and the magnitude of impact is **low beneficial**. The effect is therefore of **minor beneficial** significance, which is **not significant** in EIA terms. Nonetheless, a commitment to the delivery of this beneficial effect, including the completion of studies to professional archaeological standards and to making the results of such work publicly available, is set out in the **WSI and PAD** (**Volume V**).

136. With respect to the potential for encountering isolated finds of maritime or aviation, with the application of the PAD, overall, it is predicted that importance of isolated finds is **medium,** and the magnitude of impact is **low adverse**. The effect is therefore of **minor adverse** significance, which is **not significant** in EIA terms.

#### *15.8.1.1.3.3* Secondary Mitigation

137. Secondary mitigation would only be required in the event of a discovery of significant archaeological material reported through the PAD, which is not predicted to occur.

138. The nature of any secondary mitigation will depend on the cultural significance and importance of the heritage asset and would be considered on a case-by-case basis in consultation with HES. Measures could include the implementation of a Temporary Exclusion Zone (TEZ) followed by further investigation (marine geophysical, ROV or diver survey) to confirm the significance of the discovery. This could lead to the formalisation of the TEZ as an AEZ (preservation in situ), or, if it's not possible to avoid the heritage asset, to full excavation (preservation by record). As set out in the **WSI and PAD** (**Volume V**), any secondary mitigation, will require detailed methodologies to be set out in a Method Statement, to be agreed with HES. Discussions would need to include the Receiver of Wreck and if military aircraft, the Ministry of Defence.

### 15.8.1.2 Impact C2: Indirect Impacts to Heritage Assets

139. Indirect impacts to heritage assets may occur if buried heritage assets become exposed to marine processes as a result of construction activities associated with the Bellrock Wind Farm Infrastructure, due to increased wave/tidal action for example, as these will deteriorate faster than those protected by sediment cover. This enhanced deterioration has the potential to lead to the loss of key elements which contribute to the cultural significance of a heritage asset, or as a worst-case, lead to total loss. Conversely, if increased sedimentation results in an exposed site becoming buried this may be considered a beneficial effect if the preservation conditions result in the survival of a heritage asset (or elements of that heritage assets) that would otherwise have been lost.

140. As described in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**), during the construction phase there is potential for changes to seabed level as sediment, released into the water column during the following activities, settles out of suspension:

- Anchor installation (with drilling);
- Seabed preparation prior to anchor installation (slope levelling prior to GBA installation);
- Seabed preparation prior to cable installation (sand wave levelling), and;
- IAC installation.

141. During anchor installation the degree of change in seabed levels is defined as being **negligible** at the point of disturbance. Changes at the Bellrock WFDA-scale will be <1mm, are undetectable and difficult to distinguish from natural variation resulting in a definition of **no change** at the Bellrock WFDA-scale and regional scale. Similarly, changes associated with seabed preparation are predicted to be extremely small (<5mm) and will be highly localised. The degree of change is therefore defined as **negligible** at the point of disturbance and **no change** at the Bellrock WFDA scale and regional scale.

142. The degree of change associated with IAC installation is defined as being **low** at the point of disturbance. Changes at the Bellrock WFDA-scale will be <10mm and are therefore defined as **negligible** and **no change** will occur at the regional scale.

143. It is also important to note that re-suspension of the re-deposited sediment will be redistributed by the prevailing tidal regime meaning the changes in bed-level will likely be short lived.

144. During construction, changes to sediment transport and seabed morphology may occur due to site preparation works including sand wave clearance. These activities would directly alter the seabed morphology within the footprint of the infrastructure/preparation area, but once installed, the prevailing bedload transport regime will resume, and the sand waves will repair with time. Impacts to heritage assets within the footprint of the infrastructure/preparation area are addressed under as Impact C1 above. The degree of change is defined as **negligible** at the Bellrock WFDA scale and **no change** is predicted at the regional scale.

145. These changes will be insufficient to result in an indirect effect on heritage assets. There is no pathway for indirect impacts on heritage assets from changes to marine physical processes and, therefore, **no effect**.

## 15.8.2 Potential Impacts During Operation and Maintenance

### 15.8.2.1 Impact O1: Direct Impacts to Heritage Assets

146. As for construction (**Section 15.8.1.1**), direct impacts during the O&M phase encompass direct effects from the physical siting of the Wind Farm Infrastructure in the Bellrock WFDA.

147. During O&M, there is potential for direct impact to heritage assets during the following activities:

- Seabed contact by legs of jack-up vessels and/or vessel anchors; and
- Repairs or reburial of IACs.

#### 15.8.2.1.1 Sensitivity

148. The heritage importance (sensitivity) of known heritage assets is described in **Sections 15.6.1.3**, **15.6.2.3** and **15.6.3.3**.

149. The heritage importance (sensitivity) of potential heritage assets is described in **Sections 15.6.1.3**, **15.6.2.3** and **15.6.3.3**.

#### 15.8.2.1.2 Magnitude of Impact

##### 15.8.2.1.2.1 Known Heritage Assets

150. As all known heritage assets will be avoided through the retention of AEZs throughout the operational life of the Bellrock Wind Farm Infrastructure, there is no pathway for impact during routine or unscheduled O&M activities. The review of AEZs, through the archaeological assessment of post-construction monitoring data, will confirm their ongoing suitability, or allow for any necessary amendments, to ensure the avoidance and preservation in situ of all known heritage assets throughout the O&M phase.

151. The magnitude of impact is therefore considered to be **no impact**.

##### 15.8.2.1.2.2 Potential Heritage Assets

152. Direct impacts to potential heritage assets are unlikely to occur as a result of intrusive maintenance as any impacts would already have occurred during installation of the Bellrock Wind Farm Infrastructure during the construction phase and been subject to appropriate and proportionate additional mitigation measures, as and where necessary. The archaeological assessment of post-construction monitoring data will further reduce, as far as practicable, the potential for unintended impacts during O&M. If further features of archaeological interest are identified during post-construction monitoring, these would be subject to the same mitigation as known heritage assets and avoided, with the application of further AEZs if required.

153. There is potential for impacts to occur if archaeological material is present within the footprint of jack-ups or vessel anchors deployed during planned or unscheduled maintenance activities, if these are located in areas which were not previously subject to disturbance. However, as for construction, based on the assessment of potential, and the application of embedded mitigation, unexpected discoveries during O&M are anticipated to be limited to isolated finds, rather than in situ sites.

154. In the event of an unexpected discovery, the ongoing implementation of a formal PAD, throughout the O&M phase, will allow for such discoveries to be efficiently reported, for advice to be provided and for any further mitigation to be considered on a case-by-case basis, proportionate to the significance of the discovery.

155. As such, the magnitude of impact is considered to be **low adverse**.

#### 15.8.2.1.3 Significance of Effect

156. Considering the embedded mitigation identified in **Table 15.22** there will be **no effect** on known heritage assets during O&M, which is **not significant** in EIA terms.

157. With respect to the potential for encountering isolated finds of maritime or aviation origin, with the application of the PAD, overall, it is predicted that importance of isolated finds is **medium,** and the magnitude of impact is **low adverse**. The effect is therefore of **minor adverse** significance, which is **not significant** in EIA terms.

### 15.8.2.2 Impact O2: Indirect Impacts to Heritage Assets

158. Indirect impacts to heritage assets during O&M may occur if buried heritage assets become exposed to marine processes, or if increased sedimentation results in an exposed site becoming buried, as a result of activities associated with the Bellrock WFDA.

159. As described in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**), during the O&M phase, there is potential for the following activities to disturb seabed and/or sub-surface sediments, releasing them into the water column which would change suspended sediment concentration:

- Cable repair; and
- Disturbance from within the swept area of the catenary mooring lines.

160. However, the volume of sediment disturbed during the O&M period will be much lower than during construction and there is, therefore, no pathway for indirect impact to heritage assets from changes in seabed level (**no effect**).

161. The degree of changes in tidal and wave regimes, due to the physical blockage effect of structures in the water column, will be **low** at a localised individual structure-scale and **negligible** at the Bellrock WFDA-scale. No changes will occur at the regional scale.

162. Considering water depths across the Bellrock WFDA, centimetre-scale changes in wave height are unlikely to have an effect on the sediment transport regime and changes to tidal regime. Changes to tidal regime have the greatest potential to change sediment transport regime. However, sediment transport rates are expected to be very low within the Bellrock WFDA and, given the dominant grain size within the WFDA is fine sand, changes in tidal current speeds are unlikely to significantly alter the sediment transport regime.

163. The degree of change will therefore be no greater than **low** at structure scale and **no change** at the Bellrock WFDA scale and regional scale.

164. These changes will be insufficient to result in an indirect effect on heritage assets. There is no pathway for indirect impacts on heritage assets from changes to marine physical processes and, therefore, **no effect**.

## 15.8.3 Potential Impacts During Decommissioning

### 15.8.3.1 Impact D1: Direct Impacts to Heritage Assets

165. During decommissioning, direct impacts to heritage assets may occur through the following activities:

- Removal of the FOUs and SKSs; and
- Removal of the dynamic sections of IACs and subsea cable hubs.

166. The approach for decommissioning of the cable protection and static portion of the IACs on the seabed is yet to be determined.

167. The heritage importance (sensitivity) of known heritage assets is as for construction, and described in Sections **15.6.1.3**, **15.6.2.3** and **15.6.3.3**.

168. As all known heritage assets will be avoided through the retention of AEZs throughout the operational life of the Bellrock Wind Farm Infrastructure, there is no pathway for impact during decommissioning activities. The magnitude of impact is therefore considered to be **no impact**.

169. Direct impacts to potential heritage assets are unlikely to occur as a result of decommissioning activities as any impacts would already have occurred during installation of the Bellrock Wind Farm Infrastructure during the construction phase and been subject to appropriate and proportionate additional mitigation measures, as and where necessary.

170. There is potential for impacts to occur if archaeological material is present within the footprint of mooring buoys anchors deployed during decommissioning activities, if these are located in areas which were not previously subject to disturbance. However, as for construction and O&M, based on the assessment of potential, and the application of embedded mitigation, unexpected discoveries during decommissioning are anticipated to be limited to isolated finds, rather than in situ sites.

171. In the event of an unexpected discovery, the ongoing implementation of a formal PAD, throughout the decommissioning phase, will allow for such discoveries to be efficiently reported, for advice to be provided and for any further mitigation to be considered on a case-by-case basis, proportionate to the significance of the discovery. As such, the magnitude of impact is considered to be **low adverse**.

172. The significance of effect for direct heritage impacts to heritage impacts is as follows for:

- Known heritage assets: **no change** (**not significant** in EIA terms); and
- Unknown heritage assets: **minor adverse** (**not significant** in EIA terms).

#### 15.8.3.2 Impact D2: Indirect Impacts to Heritage Assets

173. Indirect impacts to heritage assets during decommissioning may occur if buried heritage assets become exposed to marine processes, or if increased sedimentation results in an exposed site becoming buried, as a result of activities associated with the Bellrock WFDA.

174. As described in **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**), during the decommissioning phase it is anticipated that the degree of change associated with decommissioning will be equal to, or potentially less than, those experienced during the construction phase.

175. As such, changes will be insufficient to result in an indirect effect on heritage assets. There is no pathway for indirect impacts on heritage assets from changes to marine physical processes and, therefore, **no effect**.

## 15.9 Cumulative Effects Assessment

### 15.9.1 Screening of Potential Cumulative Impacts

176. Potential impacts from the Bellrock WFDA alone assessment are brought forward into the CEA. Some potential impacts considered for the Bellrock WFDA alone assessment may be specific to a particular phase of development (e.g. construction, O&M, or decommissioning). The potential for cumulative effects with other plans or projects requires spatial and/or temporal overlap with the Bellrock Wind Farm Infrastructure during the relevant phases of development. Therefore, impacts associated with a certain phase may be screened out from further consideration where no projects or plans have been identified that have the potential for cumulative effects during the same temporal period and/or across the same spatial extent. All impacts considered in the Bellrock WFDA alone assessment (**Section 15.8**) were initially brought forward for CEA impact pathway screening (**Table 15.26**). Impact screening considered the Zone of Influence of the impacts and the plans and projects identified in **Table 15.27**. Impacts with no rationale for cumulative effects i.e. those assessed as no change or where impacts were highly spatially and/or temporally constrained, and therefore would not contribute to a cumulative effect, were screened out.

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**Table 15.26: Potential Cumulative Impacts as Part of the Marine Archaeology and Cultural Heritage Impact Screening**

| Potential Impact | Bellrock WFDA-alone Residual Effect | Potential for Cumulative Effects | Rationale |
|---|---|---|---|
| **Construction Phase** | | | |
| Impact C1: Direct Impacts to Heritage Assets | Minor Adverse | Yes | There is potential for multiple unavoidable impacts associated with construction activities across both the Bellrock WFDA and Bellrock OfTDA.<br>However, direct impacts will not occur to heritage assets to which an AEZ has been applied |
| Impact C2: Indirect Impacts to Heritage Assets | No Effect | No | **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**) concludes that cumulative effects will not be greater than the Bellrock WFDA in isolation. |
| **O&M Phase** | | | |
| Impact O1: Direct Impacts to Heritage Assets | Minor Adverse | Yes | There is potential for multiple unavoidable impacts associated with operations and maintenance activities (e.g. cable repairs, jack up legs) during the operational phase of the Bellrock WFDA and Bellrock OfTDA'. However, direct impacts will not occur to heritage assets to which an AEZ has been applied. |
| Impact O2: Indirect Impacts to Heritage Assets | No Effect | No | **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**) concludes that cumulative effects will not be greater than the Bellrock WFDA in isolation. |
| **Decommissioning Phase** | | | |
| Impact D1: Direct Impacts to Heritage Assets | Minor Adverse | Yes | There is potential for multiple unavoidable impacts associated with decommissioning activities (e.g. removal of subsea cables, cable hubs and SKSs). However, direct impacts will not occur to heritage assets to which an AEZ has been applied. |
| Impact D2: Indirect Impacts to Heritage Assets | No Effect | No | **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**) concludes that cumulative effects will not be greater than the Bellrock WFDA in isolation. |

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## 15.9.2 Screening of Other Plans, Projects and Activities

177. Potential cumulative plans and projects were identified and screened in **Appendix 5.3: Cumulative Effect Assessment Long List of Projects** (**Volume IV**). For this CEA, a 6 km distance is used to identify possible projects as this distance encompasses the Zone of Influence for all relevant Bellrock Wind Farm Infrastructure impacts as well as incremental changes over the wider relevant area. The plans and projects which have been subsequently scoped into the CEA for marine archaeology and cultural heritage are outlined in **Table 15.26**. Given that there is no potential pathway for impact to marine archaeology and cultural heritage from the Bellrock Onshore Transmission Infrastructure (located within the Bellrock OnTDA), this has not been considered further within the CEA. The Bellrock OfTDA, however; remains as part of the Tier 1 assessment, due to a potential receptor impact pathway.

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**Table 15.27: Short List of Plans/Projects Screened in for the Marine Archaeology and Cultural Heritage Cumulative Effects Assessment**

| Project/Plan | Type of Development | Status at the Time of Assessment (i.e. Application Consented, etc) | Closest Distance from Bellrock WFDA (km) | Date of Construction (if Applicable) | Date of Operation (if Applicable) | Data Confidence (High, Medium, Low) | Rationale |
|---|---|---|---|---|---|---|---|
| Bellrock OfTDA - offshore export cables; interconnector cables; offshore substations | Offshore wind projects and associated cables | In planning | 0.00 km | Expected between 2031 to 2036 | Expected from 2036 | Low | ▪ The Bellrock OfTDA will spatially overlap the whole of the Bellrock WFDA; and<br>▪ The Bellrock OfTDA is expected to temporally overlap the construction and O&M phases of the Bellrock WFDA. |

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### 15.9.3 Assessment of Cumulative Effects

178. Cumulative direct effects on known heritage assets will not occur due to the application of embedded mitigation, which includes the implementation of AEZs around known heritage assets to ensure avoidance during all phases (construction, O&M and decommissioning) of both the Bellrock Wind Farm Infrastructure and Bellrock Offshore Transmission Infrastructure.

179. Cumulative direct effects on potential heritage assets may occur if multiple unavoidable impacts and unexpected discoveries occur during all phases (construction, O&M and decommissioning) of both the Bellrock Wind Farm Infrastructure and Bellrock Offshore Transmission Infrastructure. Until the final design and layouts are confirmed, there will remain uncertainty in the precise nature and extent of any direct impacts. However, the commitment to embedded mitigation, and secondary mitigation (which may be required in the event of an unexpected discovery), will be the same for the Bellrock OfTDA as for the Bellrock WFDA.

180. With respect to the potential for archaeological and palaeoenvironmental remains to be present within the Bellrock WFDA and the Bellrock OfTDA, there is potential for geoarchaeological assessments to contribute to the body of scientific data available for the study of seabed prehistory within the region. This effect is expected to be similar to that for Bellrock WFDA alone (i.e. of **minor beneficial** significance, which is **not significant** in EIA terms).

181. With respect to the potential for encountering isolated finds of maritime or aviation origin, with the application of the PAD for both the Bellrock WFDA and the Bellrock OfTDA, it is predicted that the effect will be similar to that for Bellrock WFDA alone (i.e. of **minor adverse** significance, which is **not significant** in EIA terms).

182. A commitment to the delivery of the embedded, and secondary, mitigation for the Bellrock Wind Farm Infrastructure is set out in the **WSI** and **PAD** (**Volume V**). A WSI and PAD will similarly be prepared of the Bellrock OfTDA and submitted with the application.

## 15.10 Transboundary Effects

183. Transboundary impacts to individual heritage assets will not occur due to the localised nature of disturbance which do not cross territorial borders.

184. Significant transboundary effects from the Bellrock Wind Farm Infrastructure on marine archaeology and cultural heritage receptors are unlikely to occur, as the Bellrock WFDA lies within the UK exclusive economic zone and no receptors of other EEA member states or other interests of EEA member states have been identified.

# 15.11 Inter-related and Interacting Impacts

## 15.11.1 Inter-relationships

185. **Table 15.28** below provides a summary of the key inter-relationships between marine archaeology and cultural heritage and other technical chapters and indicates where those impacts have been addressed in the relevant chapters.

**Table 15.28: Marine Archaeology and Cultural Heritage Inter-relationships**

| Topic and Description | Related Chapter(s) (Volume II) | Where Addressed in this Chapter | Rationale |
|---|---|---|---|
| **Construction** | | | |
| Indirect impact to heritage assets from changes to physical processes | **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**). | **Section 15.8.1** | Significant changes to physical processes may impact the preservation/survival of buried/exposed heritage assets. |
| **Operation and Maintenance** | | | |
| Indirect impact to heritage assets from changes to physical processes | **Chapter 6: Marine Geology, Oceanography and Physical Processes** (**Volume II**). | **Section 15.8.2** | Significant changes to physical processes may impact the preservation/survival of buried/exposed heritage assets. |
| **Decommissioning** | | | |
| Indirect impact to heritage assets from changes to physical processes | **Chapter 6: Marine Geology, Oceanography and Physical Processes.** | **Section 15.8.3** | Significant changes to physical processes may impact the preservation/survival of buried/exposed heritage assets. |

## 15.11.2 Interactions

186. The impacts identified and assessed in this Chapter (i.e. Impact 1: Direct impacts to heritage asset and Impact 2: Indirect impact to heritage assets from changes to physical processes) have the potential to interact with each other during each development phase (i.e. construction, O&M, or decommissioning). As such, the same heritage assets may be impacted directly or indirectly which could increase the magnitude of impact upon that receptor.

187. A lifetime assessment which considers the impact interactions across all development phases is included in **Table 15.29**.

**Table 15.29: Potential Interactions Between Impacts - Phase and Lifetime Assessment**

| Highest Significance of Effect Level | | | | | |
|---|---|---|---|---|---|
| **Receptor** | **Construction** | **O&M** | **Decommissioning** | **Phase Assessment** | **Lifetime Assessment** |
| Potential heritage assets | Minor adverse | Minor adverse | Minor adverse | No greater than individually assessed impact.<br>While direct impacts to known heritage assets can be avoided, potential heritage assets (anticipated to be limited to isolated finds) may also be subject to direct impact. However, through the application of mitigation (such as additional recording, AEZs, micro-siting or relocation) the magnitude of each, spatially discrete impact (should an impact occur), would be no greater across all phases than each phase in isolation.<br>Indirect impact from changes to physical processes are not expected to occur during any phase. | No greater than individually assessed impact<br>As for the phase assessment, the application of mitigation means that that the magnitude of each, spatially discrete impact (should an impact occur), would be no greater across the lifetime of the Bellrock WFDA. |

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# 15.12 Summary

188. **Table 15.30** presents a summary of the assessment of potential effects on marine archaeology and cultural heritage during the construction, O&M, and decommissioning phases of the Bellrock Wind Farm Infrastructure.

189. With the application of embedded mitigation (**Table 15.22**) there will be **no effect** on known heritage assets.

190. With respect to the potential for archaeological and palaeoenvironmental remains to be present within the Bellrock WFDA, impacts are not expected to occur. However, with the application of embedded mitigation, there is potential for geoarchaeological assessments undertaken from the Bellrock WFDA to contribute to the body of scientific data available for the study of seabed prehistory within the region. Overall, it is predicted that the importance of any palaeoenvironmental material Units D1 and D3 is **low** and the magnitude of impact is **low beneficial**.

191. The effect is therefore of **minor beneficial** significance, which is **not significant** in EIA terms. Nonetheless, a commitment to the delivery of this beneficial effect, including the completion of studies to professional archaeological standards and to making the results of such work publicly available, is set out in the **WSI and PAD** (**Volume V**).

192. With respect to the potential for encountering isolated finds, with the application of the PAD, overall, it is predicted that importance of isolated finds is **medium,** and the magnitude of impact is **low adverse**. The effect is therefore of **minor adverse** significance, which is **not significant** in EIA terms.

193. Secondary mitigation would only be required in the event of a discovery of significant archaeological material reported through the PAD, which is not predicted to occur.

194. Indirect impact from changes to physical processes are not expected to occur.

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**Table 15.30: Summary of Potential Effects for Marine Archaeology and Cultural Heritage**

| Potential Impact | Receptor(s) | Sensitivity | Magnitude of Impact | Significance of Effect | Secondary Mitigation | Residual Significance of Effect | Cumulative Residual Significance of Effect |
|---|---|---|---|---|---|---|---|
| **Construction** | | | | | | | |
| C1: Direct impacts to heritage asset | Known heritage assets | Medium/high | No impact | No significance of effect | None | No significance of effect | N/A |
| | Potential heritage assets (seabed prehistory - archaeological and palaeoenvironmental remains) | Low/medium | No impact | No significance of effect | None | No significance of effect | N/A |
| | Potential heritage assets (seabed prehistory – buried channels and paleoenvironmental deposits) | Low | Low beneficial | Minor beneficial | None | Minor beneficial (not significant) | Minor beneficial (not significant) |
| | Potential heritage assets (maritime and aviation – isolated finds) | Medium | Low adverse | Minor adverse | In the event of an unexpected discovery reported through the PAD, secondary mitigation measures could include the implementation of a TEZ followed by further investigation to confirm the significance of the discovery as a first step. | Minor adverse (not significant) | Minor adverse (not significant) |

| Potential Impact | Receptor(s) | Sensitivity | Magnitude of Impact | Significance of Effect | Secondary Mitigation | Residual Significance of Effect | Cumulative Residual Significance of Effect |
|---|---|---|---|---|---|---|---|
| **Impact 2: Indirect impact to heritage assets from changes to physical processes** | Known and potential heritage assets | Low/medium/high | No Impact | No significance of effect | None | No significance of effect | |
| **Operation and Maintenance** | | | | | | | |
| O1: Direct impacts to heritage asset | Known heritage assets | Medium/high | No Impact | No significance of effect | N/A | No significance of effect | N/A |
| | Potential heritage assets (isolated finds) | Medium | Low adverse | Minor adverse | In the event of an unexpected discovery reported through the PAD, secondary mitigation measures could include the implementation of a TEZ followed by further investigation to confirm the significance of the discovery as a first step. | Minor adverse (not significant) | Minor adverse (not significant) |
| | Known and potential heritage assets | Low/medium/high | No impact | No significance of effect | None | No significance of effect | N/A |
| **Decommissioning** | | | | | | | |
| D1: Direct impacts to heritage asset | Known Heritage Assets | Medium/high | No impact | No significance of effect | None | | N/A |
| | Potential heritage assets (isolated finds) | Medium | Low adverse | Minor adverse | In the event of an unexpected discovery reported through the PAD, secondary mitigation | Minor adverse (not significant) | Minor adverse (not significant) |

| Potential Impact | Receptor(s) | Sensitivity | Magnitude of Impact | Significance of Effect | Secondary Mitigation | Residual Significance of Effect | Cumulative Residual Significance of Effect |
|---|---|---|---|---|---|---|---|
| | | | | | measures could include the implementation of a TEZ followed by further investigation to confirm the significance of the discovery as a first step. | | |
| D2: Indirect impact to heritage assets from changes to physical processes | Known and potential heritage assets | Low/medium/high | No impact | No significance of effect | None | No significance of effect | N/A |

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