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MONA OFFSHORE WIND PROJECT

Environmental Statement

Volume 2, Chapter 9: Marine Archaeology (F02)

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Image of an offshore wind farm

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Prepared by:

RPS

Prepared for:

Mona Offshore Wind Limited.

Errata

Document section	Description of errata
Table 9.16	The extents of the following AEZs were incorrectly given: • ID: Mona_0009 AEZ(m) was stated to have 50 extents – it should have instead been 100 extents • ID: Mona_0040 AEZ(m): was stated to have 25 extents – it should have instead been 50 extents • ID: Mona_0067 AEZ(m): was stated to have 50 extents – it should have instead been 25 extents • ID: Mona_0014 AEZ(m): was stated to have 25 extents – it should have instead been 50 extents • ID: Mona_0025 AEZ(m): was stated to have 50 extents – it should have instead been 25 extents • ID: Mona_0033 AEZ(m): was stated to have 25 extents – it should have instead been 50 extents • ID: Mona_0038 AEZ(m): was stated to have 50 extents – it should have instead been 25 extents • ID: Mona_0044 AEZ(m): was stated to have 25 extents – it should have instead been 50 extents • ID: Mona_0065 AEZ(m): was stated to have 50 extents – it should have instead been 25 extents

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Glossary

Term	Meaning
Gazetteer	A geographical index or dictionary.
Palaeochannel	A geological term describing a remnant of an inactive river or stream channel that has been filled or buried by younger sediment.
Palaeoenvironmental	An environment of a past geological age.

Acronyms

Acronym	Description
AD	Anno Domini
AEZ	Archaeological Exclusion Zone
AFS	Advanced Flying School
AHEF	Archaeology and Heritage Engagement Forum
AMAPs	Areas of Maritime Archaeological Potential
BC	Before Christ
BP	Before Present
BULSI	Burial, use, loss, survival and investigation
CEA	Cumulative effects assessment
DCO	Development Consent Order
EIA	Environmental Impact Assessment
EWG	Expert Working Group
HE	Historic England
HSC	Historic Seascape Character
JNAPC	Joint Nautical Archaeology Policy Committee
MBES	Multibeam Bathymetry
MDS	Maximum Design Scenario
MLWS	Mean Low Water Springs
MPS	Marine Policy Statement
NMRW	National Monuments Record Wales
NPS	National Policy Statement
NRHE	National Record of the Historic Environment
NSIP	Nationally Significant Infrastructure Project
OSP	Offshore Substation Platform
PAD	Protocol for Archaeological Discoveries
PEIR	Preliminary Environmental Information Report
RCAHMW	Royal Commission on the Ancient and Historical Monuments of Wales

Acronym	Description
SBP	Sub-bottom Profiler
SSS	Sidescan Sonar
TAEZ	Temporary Archaeological Exclusion Zone
WNMP	Welsh National Marine Plan
WSI	Written Scheme of Investigation

Units

Unit	Description
%	Percentage
km	Kilometres
km^2	Square kilometres
m	Metres
nm	Nautical miles (distance; 1 nm = 1.852 km)

9 Marine archaeology

9.1 Introduction

9.1.1 Overview

9.1.1.1 This chapter of the Environmental Statement presents the assessment of the potential impact of the Mona Offshore Wind Project on marine archaeology. Specifically, this chapter considers the potential impact of the Mona Offshore Wind Project seaward of Mean Low Water Springs (MLWS) during the construction, operations and maintenance, and decommissioning phases. Those impacts of the Mona Offshore Wind Project landward of MLWS are addressed in Volume 3, Chapter 5: Historic environment chapter of the Environmental Statement.

9.1.1.2 This chapter also draws upon information contained within Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.1.2 Purpose of chapter

9.1.2.1 The primary purpose of the Environmental Statement is outlined in Volume 1, Chapter 1: Introduction of the Environmental Statement. In summary, the primary purpose of an Environmental Statement is to support the Development Consent Order (DCO) application for the Mona Offshore Wind Project under the Planning Act 2008 (the 2008 Act). The Environmental Statement sets out the findings of the Environmental Impact Assessment (EIA) to date and will accompany the application to the Secretary of State for Development Consent.

9.1.2.2 In particular, this Environmental Statement chapter:

- Presents the existing environmental baseline established from desk studies, site-specific surveys and consultation
- Identifies any assumptions and limitations encountered in compiling the environmental information
- Presents the potential environmental effects on marine archaeology arising from the Mona Offshore Wind Project, based on the information gathered and the analysis and assessments undertaken
- Highlights any necessary monitoring and/or measures adopted as part of the Mona Offshore Wind Project which could prevent, minimise, reduce or offset the possible environmental effects of the Mona Offshore Wind Project on marine archaeology.

9.1.3 Study area

9.1.3.1 The Mona marine archaeology study area consists of the Mona Array Area and the Mona Offshore Cable Corridor up to MLWS with an additional 2 km buffer offshore. This is shown in . This study area was used as the search area for obtaining records from relevant archive databases. This Mona marine archaeology study area allows for a greater understanding of the wider archaeological baseline environment, with the dual purpose of enabling any archaeological trends within the region to be recognised and to allow any archaeological sites identified to be represented in a broader archaeological context. Physical processes modelling carried out for the Mona Offshore Wind Project (Volume 2, Chapter 1: Physical processes of the Environmental Statement) has shown that changes to the tidal regime are limited to the immediate

Mona Offshore Wind Project area. Therefore, changes in marine physical process beyond the 2 km Mona marine archaeology study area are so minimal as to be negligible and thus a 2 km buffer is considered adequate in which to assess potential impacts upon marine archaeology.

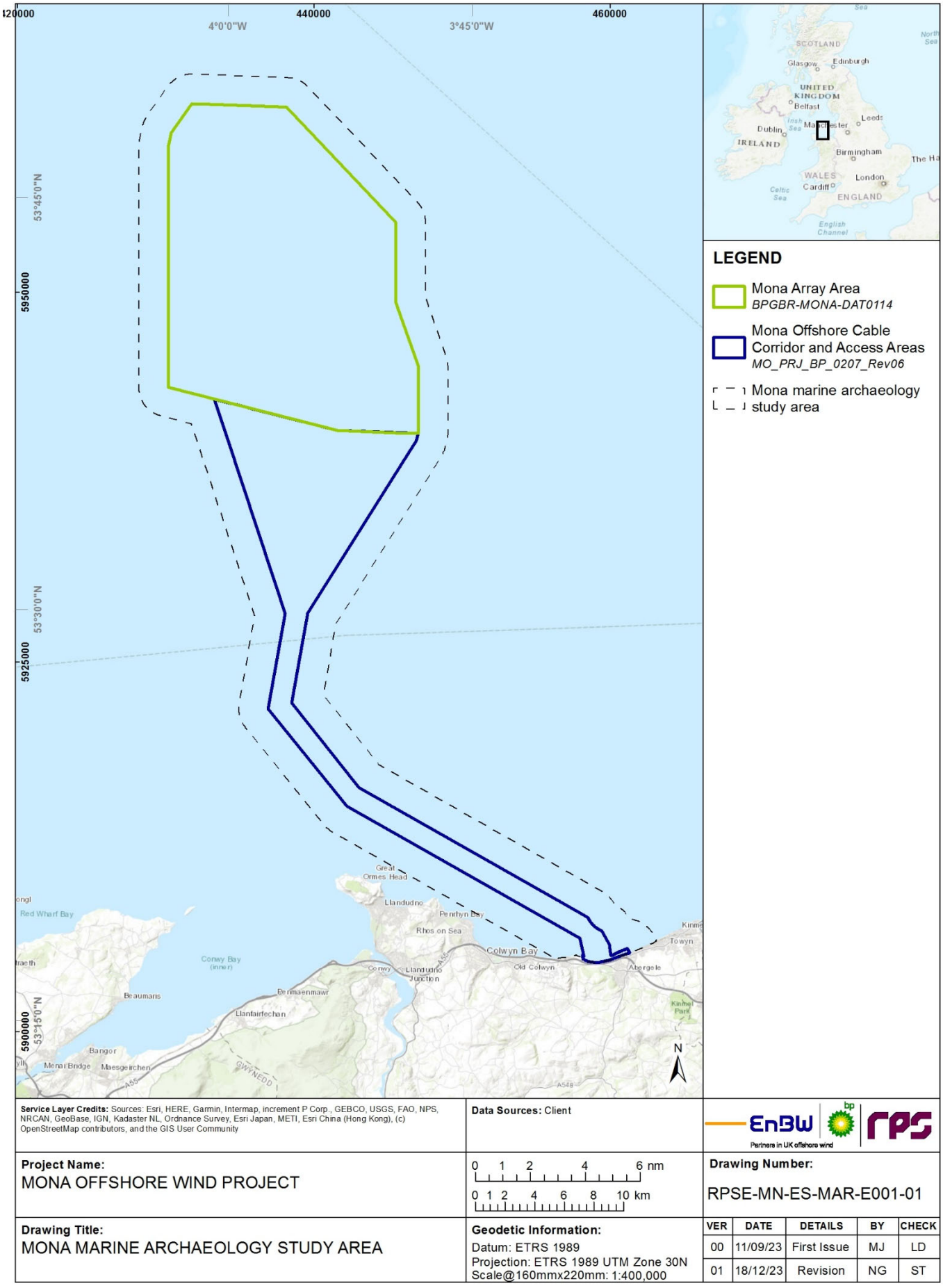

Figure 9.1: Mona marine archaeology study area.

9.2 Policy context

9.2.1 National Policy Statements

9.2.1.1 Planning policy on renewable energy infrastructure is presented in Volume 1, Chapter 2: Policy and legislation of the Environmental Statement. Planning policy on offshore renewable energy Nationally Significant Infrastructure Projects (NSIPs), specifically in relation to marine archaeology, is contained in the Overarching National Policy Statement (NPS) for Energy (EN-1) (Department for Energy Security & Net Zero, 2024a) and the NPS for Renewable Energy Infrastructure (EN-3) (Department for Energy Security & Net Zero, 2024b), the UK Marine Policy Statement (MPS) (HM Government, 2011) and the Welsh National Marine Plan (WNMP) (Welsh Government 2019).

9.2.1.2 NPS EN-1 and NPS EN-3 include guidance on what matters are to be considered in the assessment. These are summarised in Table 9.1 below. NPS EN-1 and NPS EN-3 also highlight a number of factors relating to the determination of an application and in relation to mitigation.

9.2.1.3 In addition to NPS EN-3, the MPS, in paragraph 2.6.6.3, states that heritage assets in the marine environment "should be conserved through marine planning in a manner appropriate and proportionate to their significance", adding that, "opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost".

9.2.1.4 With reference to non-designated heritage assets in the UK marine environment the MPS states, in paragraph 2.6.6.5, that the "Many heritage assets with archaeological interest in these areas are not currently designated as scheduled monuments or protected wreck sites but are demonstrably of equivalent significance. The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them subject to the same policy principles as designated heritage assets…based on information and advice from the relevant regulator and advisors".

9.2.1.5 When considering possible damage to or destruction of heritage assets by development proposals, the MPS states in paragraph 2.6.6.9 that "the marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost".

9.2.1.6 The WNMP (Table 9.3) includes Policy SOC_05 relating to Heritage Assets which recognises the importance of protecting the underwater historic environment and as such proposals should demonstrate appropriate consideration of the potential impacts of developments in order to prevent substantial loss or harm. It also highlights that development proposals should consider opportunities to better understand and promote the historic environment.

9.2.1.7 The WNMP Implementation Guidance (Welsh Government, 2020) highlights that the absence of designated historic assets should not suggest that non designated heritage assets are of less importance and points out that given the difficulties with investigating underwater heritage, the significance of many marine historic assets has not as yet been established and so all such assets should be considered by proposals.

9.2.1.8 The guidance advises that all proposals should demonstrate compliance with relevant national and regional legislation and guidance. The relevant regional Welsh archaeological trust should be consulted for the historic environment records and the

Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) for their extensive database of marine historic assets. Any assessment should also be undertaken in accordance with guidelines set out by the Chartered Institute for Archaeologists and best practise guidance notes for the marine historic environment.

9.2.1.9 The guidance highlights that proposals should demonstrate the potential impact on relevant historic assets and that there should be a general presumption in favour of preservation or enhancement of historic assets.

9.2.1.10 Further advice in relation specifically to the Mona Offshore Wind Project has been sought through consultation with the statutory authorities, from The Planning Inspectorate's Scoping Opinion (The Planning Inspectorate, 2022) (section 9.2.3 and Table 9.4) and through the Preliminary Environmental Impact Report (PEIR) (Mona Offshore Wind Ltd, 2023).

Table 9.1: Summary of the NPS EN-1 and NPS EN-3 provisions relevant to marine archaeology.

Summary of NPS EN-1 and EN-3 guidance	How and where considered in the Environmental Statement
Consultation with relevant bodies and stakeholders has been undertaken at an early stage. (paragraph 2.8.348 of NPS EN-3)	Consultation with relevant statutory and non-statutory stakeholders has been carried out from the early stages of the Mona Offshore Wind Project and through the Archaeology and Heritage Engagement Forum (AHEF). See section 9.2.3 and Table 9.4 for further details.
Where a site on which development is proposed includes, or has the potential to include heritage assets with archaeological interest, the applicant should submit an appropriate desk-based assessment. (paragraph 2.10.113 of NPS EN-3)	A marine archaeology desk-based assessment and technical report has been produced which informs the archaeological assessment (see Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement). The archaeological review of geophysical data is included in section 9.4 below and in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation. (paragraph 2.8.176 of NPS EN-3)	The EIA has considered the potential adverse and beneficial impacts on the historic environment during each phase of the Mona Offshore Wind Project (see section 9.7.3). The measures adopted as part of Mona Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. This is a beneficial outcome of the Mona Offshore Wind Project. This is discussed further in section 9.8 below.
Assessment of potential impacts upon the historic environment should be considered as part of the Environmental Impact Assessment process undertaken to inform any application for consent. (paragraph 2.8.169 of NPS EN-3)	The measures adopted as part of the Mona Offshore Wind Project have been designed sensitively. Mitigation is primarily by avoidance and the Mona Offshore Wind Project has been designed to avoid known sensitive receptors through provision of Archaeological Exclusion Zone's (AEZs) and Temporary Archaeological Exclusion Zones (TAEZs) (section 9.7). Any potential adverse effects have been assessed in this chapter in section 9.8.

Summary of NPS EN-1 and EN-3 guidance	How and where considered in the Environmental Statement
Whilst it should be possible for a development project to avoid designated heritage assets, the knowledge currently available about the historic environment in the inshore and offshore areas is limited, as much of the seafloor around our coast sand at sea has yet to be mapped or explored fully. (paragraph 2.8.172 of NPS EN-3)	Mona Offshore Wind Project will incorporate AEZs, where appropriate, as stated in the measures adopted as part of the Mona Offshore Wind Project (see section 9.7). AEZs are discussed further in the Outline Written Scheme of Investigation (WSI) and Protocol for Archaeological Discoveries (PAD) appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

Table 9.2: Summary of the MPS and WNMP.

Summary of key points in MPS and WNMP relevant to marine archaeology	How and where considered in the Environmental Statement
Heritage assets in the marine environment "should be conserved through marine planning in a manner appropriate and proportionate to their significance" and "opportunities should be taken to contribute to our knowledge and understanding of our past by capturing evidence from the historic environment and making this publicly available, particularly if a heritage asset is to be lost" (paragraph 2.6.6.3 of MPS)	The Environmental Statement has considered the significance of all known and potential heritage assets within the Mona marine archaeology study area. This is discussed further in section 9.8 below. The measures adopted as part of the Mona Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. The results of these investigations will ultimately be made publicly available. This is discussed further in section 9.7 below.
The absence of designation…does not necessarily indicate lower significance and the marine plan authority should consider them [non designated heritage assets] subject to the same policy principles as designated heritage assets…based on information and advice from the relevant regulator and advisors (paragraph 2.6.6.5, of MPS)	The Environmental Statement has considered the significance of all known and potential heritage assets within the Mona marine archaeology study area. This is discussed further in section 9.8 below. Consultation to date with the relevant regulator and advisors is set out in Table 9.4 and will be ongoing.
The marine plan authority should identify and require suitable mitigating actions to record and advance understanding of the significance of the heritage asset before it is lost (paragraph 2.6.6.9 of MPS)	The measures adopted as part of the Mona Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. The results of these investigations will ultimately be made publicly available. This is discussed further in section 9.7 below. An outline WSI has also been prepared to support the EIA which will set out the high level mitigation strategy for approval by the regulator and advisors.

Summary of key points in MPS and WNMP relevant to marine archaeology	How and where considered in the Environmental Statement
WNMP SOC_05: Historic Assets Proposals should demonstrate how potential impacts on historic assets and their settings have been taken into consideration and should, in order of preference: a. avoid adverse impacts on historic assets and their settings; and/or b. minimise impacts where they cannot be avoided; and/or c. mitigate impacts where they cannot be minimised. If significant adverse impacts cannot be avoided, minimised or mitigated, proposals must present a clear and convincing case for proceeding. Opportunities to enhance historic assets are encouraged	The Environmental Statement has considered the significance of all known and potential heritage assets within the Mona marine archaeology study area. This is discussed further in section 9.8 below. The measures adopted as part of Mona Offshore Wind Project including any future geophysical and geotechnical surveys undertaken will produce new archaeological data and understandings of the historic marine environment of the area. The results of these investigations will be archived with NRW through RCAHMW. This is discussed further in section 9.7 below. An outline WSI has also been prepared to support the EIA which will sets out a high level mitigation strategy for approval by the regulator and advisors.
The absence of designated historic assets should not suggest that non designated heritage assets are of less importance and so all such assets should be considered by proposals (paragraph 95 of WNMP Implementation Guidance) Proposals should demonstrate compliance with relevant national and regional legislation and guidance. The relevant regional Welsh archaeological trust should be consulted for the historic environment records and the RCAHMW for their extensive database of marine historic assets. Any assessment should also be undertaken in accordance with guidelines set out by the Chartered Institute for Archaeologists and best practise guidance notes for the marine historic environment (paragraph 96 of WNMP Implementation Guidance) Proposals should demonstrate the potential impact on relevant historic assets and that there should be a general presumption in favour of preservation or enhancement of historic assets (paragraph 98 and 100)	The Environmental Statement has considered the significance of all known and potential heritage assets within the Mona marine archaeology study area. This is discussed further in section Table 9.8 below. Table 9.1, Table 9.2and Table 9.3 demonstrate how the Environmental Statement has complied with National and Regional Policy Statements. Section 9.4 confirms the baseline methodology and section 9.5.1 that the baseline assessment was undertaken in accordance with relevant professional and legal legislation and guidance.

9.2.2 Regional Policy Statements - North West Inshore and North West Offshore Coast Marine Plans

9.2.2.1 The assessment of potential changes to marine archaeology has also been made with consideration to the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (MMO, 2021). Key provisions are set out in Table 9.3 along with details as to how these have been addressed within the assessment.

Table 9.3 North West Inshore and North West Offshore Marine Plan policies relevant to marine archaeology.

Policy	Key provisions	How and where considered in the Environmental Statement
NW-HER-1	This policy aims to conserve and enhance marine and coastal heritage assets by considering the potential for harm to their significance. This consideration will not be limited to designated assets and extends to those non-designated assets that are, or have the potential to become, significant. The policy will ensure that assets are considered in the decision-making process and will make provisions for those assets that are discovered during developments.	The potential for harm to the significance of marine heritage assets by the Mona Offshore Wind Project has been assessed in section 9.8, which includes the assessment of non-designated marine heritage assets identified within the Mona marine archaeology study area. Measures have been adopted as part of the Mona Offshore Wind Project to protect the known archaeology assets and make provisions for those assets that are discovered during the Mona Offshore Wind Project in the form of the production of an Outline WSI and PAD appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.2.3 Legislation

9.2.3.1 This chapter of the Environmental Statement has considered the legislative framework as defined by:

- Protection of Wrecks Act 1973
- Ancient Monuments and Archaeological Areas Act 1979 (as amended)
- Protection of Military Remains Act 1986
- The Merchant Shipping Act 1995.

9.2.3.2 Full details of the legislation, policy and guidance considered in the development of this marine archaeology chapter are presented in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.2.4 Guidance

9.2.4.1 This chapter of the Environmental Statement has been developed in accordance with the following guidelines:

- Planning Policy Wales Technical Advice Note 24: The Historic Environment
- Managing the Marine Historic Environment of Wales Cadw/Welsh Government 2020
- Historic England's (HE) Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England), 2008)
- Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Cadw, 2011)
- Code of Conduct (Chartered Institute for Archaeologists, 2014)
- Standard and Guidance for Historic Environment Desk Based Assessment (Chartered Institute for Archaeologists, 2014 (updated 2020))

- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007a)
- Offshore Renewables protocol for Archaeological Discoveries (The Crown Estate, 2010)
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2010)
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate, 2021)
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021)
- Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition) (Historic England, 2011)
- Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (Historic England, 2013)
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008)
- Deposit Modelling and Archaeology – Guidance for Mapping Buried Deposits (Historic England, 2020).

9.3 Consultation

9.3.1.1 A summary of the key issues raised during consultation activities undertaken to date specific to marine archaeology is presented in Table 9.4 below, together with how these issues have been considered in the production of this chapter.

Table 9.4: Summary of key consultation issues raised during consultation activities undertaken for the Mona Offshore Wind Project relevant to marine archaeology.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
May 2022	Cadw. Scoping response.	Cadw has not identified any issues with the contents of this chapter but recommend that the Senior Investigator (Maritime) at the Royal Commission on the Ancient and Historic Monuments in Wales should be consulted on this chapter.	Noted. RCAHMW have been participants in the offshore AHEF.
May 2022	Historic England. Scoping response.	It is our advice that in consideration of the risk of encountering presently unknown cultural heritage (prehistoric environmental evidence or historic vessels and aircraft), that measures and procedures are established at an early stage of project planning. The benefit of adopting this approach is to ensure capacity is built in to inform design, so as to best deliver UK policy objectives for the protection of underwater cultural heritage.	Measures have been adopted as part of the Mona Offshore Wind Project and are detailed in section 9.7. These include further site investigation and the provision of an Outline WSI and PAD in order to account for the possibility of encountering presently unknown cultural heritage.
May 2022	Historic England. Scoping response.	It is important to factor-in seabed sedimentary conditions whereby wrecked vessels of considerable antiquity may have become entombed and therefore the state of preservation is very high. Furthermore, such heritage assets may be very difficult to identify with geophysical survey data which was gathered to generally characterise the area within which the development could occur for EIA purposes. The risk that a presently identified anomaly with minimal 'signature' may actual represent buried archaeological material of considerable importance should always be factored in.	Seabed sedimentary conditions have been assessed in the impact assessment in section 9.8 and the cumulative effects assessment in section 9.9. Measures have been adopted as part of the Mona Offshore Wind Project and are detailed in section 9.7. These include further site investigation and the provision of an Outline WSI and PAD in order to account for the possibility of encountering buried archaeological material.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
May 2022	Historic England. Scoping response.	We noted the statement about the identification of "…marine archaeology receptors of relevance to the Mona Offshore Wind Project" A crucial aspect of any such identification is the appreciation of risk that this project will discover presently unknown elements of the historic environment. We therefore appreciated the detail provided about accessing desk-top data and site-specific surveys (conducted in 2021).	Measures have been adopted as part of the Mona Offshore Wind Project and are detailed in section 9.7. These include the provision of an Outline WSI and PAD in order to account for the possibility of encountering presently unknown cultural heritage.
May 2022	Historic England. Scoping response.	We noted the attention given to the Evidence plan process and the establishment of Expert Working Groups (EWG). Unfortunately, it appears that marine archaeology has not been included and we must direct the Applicant to contact our colleagues in the Welsh national curatorial body to ensure such an EWG is convened without delay.	An AHEF was established to cover both onshore and offshore heritage matters in relation to Mona. The Marine Management Organisation, Historic England, RCAHMW and Cadw are participants.
July 2022	Historic England. Scoping response on Morgan Generation Assets.	We also noted that the EIA Scoping Report did not specifically include consideration of Historic Seascape Character and the methodological approach produced by Historic England as a means to support the UK's implementation of Council of Europe European Landscape Convention 2000 (https://www.coe.int/en/web/landscape), we therefore provide the following links for further information: • https://historicengland.org.uk/research/methods/characterisation/historic- seascapes/ • https://archaeologydataservice.ac.uk/archives/view/hscirish_eh_2011/.	These documents and data sources have been reviewed and applied in the development of the approach to assessment of effects to HSC as presented in section 9.8.6.
June 2022	The Planning Inspectorate. Scoping response.	Where possible, the Applicant should seek to agree the magnitude of impact or sensitivity of receptors with relevant consultees through the PEIR and pre-application process. Where differences in opinion remain, these should be identified within the Environmental Statement with justification given for the Applicant's choice.	The magnitude of each impact and sensitivity of each receptor or each receptor group is detailed in section 9.8 of this chapter. The approach to EIA including magnitude and sensitivity was discussed and agreed in the AHEF through the PEIR and pre-application process.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
June 2022	The Planning Inspectorate. Scoping response.	The Environmental Statement should define what a 'reasonable timescale' or 'short time period' would be within which recovery could occur so that an impact would be reversible/not permanent.	Reversibility of impact is not considered within marine archaeology, as impacts upon marine archaeological receptors are not reversible. EIA methodology is presented in section 9.5. Measures have been adopted as part of the Mona Offshore Wind Project in order to avoid direct impact on known marine archaeology receptors, details of which are in section 9.7. These include establishing AEZs around identified marine archaeological receptors.
June 2022	The Planning Inspectorate. Scoping response.	A number of mitigation plans have been referred to in aspect chapters. Where plans are relied upon to avoid significant environmental effects, outline or in-principle plans should be submitted as part of the DCO application.	Please see the Outline WSI and PAD appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
June 2022	The Planning Inspectorate. Scoping response.	Alteration of sediment transport regimes – construction and decommissioning. This matter is proposed to be scoped out. In the absence of a justification in relation to impacts on marine archaeology, the Inspectorate does not agree that this matter should be scoped out. The Environmental Statement should assess any impacts on marine archaeological assets, where significant effects are likely to occur.	Alteration to sediment transport regimes during the construction and decommissioning phases has not been assessed because during the construction phase there will be gradual changes to sediment transport and sediment transport pathways as infrastructure is introduced into the environment. With changes and therefore potential impacts ranging from the baseline environment (no presence of infrastructure) to the operations and maintenance phase. Similarly, the decommissioning phase will see any alteration of sediment transport regimes returned to baseline and the MDS is for the operations and maintenance phase and is assessed in section 9.8.
June 2022	The Planning Inspectorate. Scoping response.	Some of the potential impacts to be assessed result from changes to marine physical processes. The study area to be used for the marine archaeological assessment is different to that proposed for the assessments of physical processes. The Environmental Statement should provide a justification for the extent of the study area used in the marine archaeological assessment, in light of the potential for impacts from physical processes over a wider extent.	Justification for the Mona marine archaeology study area is detailed in section 9.1.3.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
April 2023	RCAHMW. Section 42 response.	In terms of the offshore work, my main questions at this stage are really about the long-term monitoring of the Archaeological Exclusion Zones established in order to protect the identified historic assets on the seabed. Section 13.13 implies a discussion of monitoring in its title. But the related tables all list monitoring of the historic assets within the scheme as N/A. There will almost certainly be a condition of the marine license that there needs to be some form of repeat surveys to monitor the condition/state/status of the historic assets within the AEZs, over the lifetime of the project and post-decommissioning.	Measures adopted as part of the project (section 9.7) include for the ongoing monitoring of all proposed AEZs, TAEZs and of the archaeological assets within them through the acquisition of survey data throughout the lifetime of the Mona Offshore Wind Project. Further details are also included within the Outline WSI and PAD.
April 2023	RCAHMW. Section 42 response.	Related to this, we (RCAHMW and Cadw) are keen to ensure that it is possible to monitor historic asses contained within schemes such as Mona across the full life of the scheme and into its decommissioning phase. The only effective way to do this is to ensure that relevant spatial survey data relating to the historic assets within the scheme is archived with the National Monuments Record of Wales via the RCAHMW at the outset of the project, and as it is collected across its life. This will mean that if the responsibility for monitoring passes to another company, then access to the baseline data will be assured. This also relates to Policy Soc5 of the WNMP regarding opportunities to enhance our knowledge of historic assets. Essentially, what I am asking is that the spatial survey data within the AEZs is archived with the RCAHMW. I realise that the survey data itself can be commercially sensitive, so we are certainly not asking for the entire survey dataset, only those small portions that are directly related to the archaeological material.	Measures adopted as part of the project (section 9.7) include for the ongoing monitoring of all proposed AEZs, TAEZs and of the archaeological assets within them through the acquisition of survey data throughout the lifetime of the Mona Offshore Wind Project. Data acquired will be archived with NRW through RCAHMW. Further details are also included within the Outline WSI and PAD.

Date	Consultee and type of response	Issues raised	Response to issue raised and/or where considered in this chapter
May 2023	Historic England. Section 42 response.	For the proposed Mona Offshore Windfarm project, we appreciate the lead provided by RCAHMW and Cadw through the AHEF. We will therefore offer any advice as requested of us through the AHEF should any heritage assets be located within any area subject to English marine planning. For example, we note in Figure 13.2 (Geophysical Anomalies within the Mona marine archaeology study area) that a couple of anomalies of “low potential” (Mona_0052 and Mona_0063) appear to be in the English marine planning area. Therefore, in reference to Table 13.13 (Maximum Design Scenario), we request that further clarification is provided to us if these anomalies require further investigation and whether any mitigation strategy is appropriate.	Due to refinement of project boundaries, these two low potential geophysical anomalies are no longer within the Mona Array Area. Consideration of low potential anomalies are included in Volume 1, Chapter 3: Project description of the Environmental Statement and the Outline WSI and PAD appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement. Full details of these are also in Volume 6, Annex 9.1: Marine Archaeology Technical Report of the Environmental Statement.
May 2023	MMO. Section 42 response.	The Isle of Man offshore wind farm (being developed by Orsted) should be included in the Cumulative Impact Assessment as a Tier 3 development. Currently, a scoping report has not yet been submitted/reviewed for this project and is not in the public domain, however the Isle of Man offshore wind farm has been identified in other plans and programs.	The Isle of Man offshore wind farm will be located 34.50 km from the Mona Array Area and 59.90 km from the Mona Offshore Cable Corridor. This is beyond the 2 km Cumulative Effects Assessment (CEA) study area for marine archaeology and therefore there is no impact receptor pathway for cumulative effects and this is the reason why it has been screened out of assessment.
May 2023	Isle of Man Government. Section 42 response.	The Isle of Man has acquired some shipwreck data and is being integrated into Manx National Heritage (MNH) data system. MNH expects the Environmental Impact Assessment (EIA) to exercise due diligence in this respect.	Data from the MNH Shipwreck Index was reviewed and they hold no records within the Mona marine archaeology study area.
May 2023	Cadw. Section 42 response.	The measures outlined to investigate and provisionally protect the maritime archaeological resource are appropriate at the stage of the design process.	Response noted.
Nov 2023	Manx National Heritage. PEIR Response.	In relation to the PEIR we have no other comments to raise from a cultural heritage perspective.	Response noted.

9.4 Baseline environment

9.4.1 Methodology to inform baseline

9.4.1.1 Data used to compile this report consists of primary geophysical survey data (Table 9.6) and secondary information derived from a variety of sources (Table 9.5).

9.4.2 Desktop study

9.4.2.1 Information on marine archaeology within the Mona marine archaeology study area was collected through a detailed desktop review of existing studies and datasets. These are summarised at Table 9.5 below.

9.4.2.2 The principal archaeological archives relating to the Mona marine archaeology study area are the National Monuments Record Wales (NMRW) as held by RCAHMS. And the National Record of the Historic Environment (NRHE) as held by Historic England (HE). Data from the United Kingdom Hydrographic Office (UKHO) is a further resource, of which RPS holds in house and is utilised to corroborate positional information of known wrecks and obstructions on the seabed. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts.

Table 9.5: Summary of key desktop data.

Title	Source	Year	Author
Submerged Landscapes Data	EMODnet Geology	2023	British Geological Survey
UKHO Wreck and Obstructions Data	UKHO	2023	UKHO
Historic Environment Record Data	NRHE	2021	Historic England
Historic Environment Record Data	NMRW	2021	Royal Commission on the Ancient and Historical Monuments of Wales
Historic Seascape Characterisation: The Irish Sea (English Sector)	Archaeology Data Service	2011	Historic England

9.4.3 Site-specific surveys

9.4.3.1 In order to inform the Environmental Statement, site-specific surveys were undertaken. A summary of the surveys undertaken to inform the marine archaeology impact assessment is outlined in Table 9.6 below.

9.4.3.2 A comprehensive marine geophysical survey was carried out for the Mona Array Area and Mona Offshore Cable Corridor. The surveys were undertaken to inform a detailed understanding of the topography and underlying geological formations of the seabed. An archaeological review of the geophysical data has been carried out and is presented in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.4.3.3 Geotechnical site investigations were conducted in 2021 and 2022 by Fugro Marine Limited and Gardline within the Mona Array Area and Mona Offshore Cable Corridor. This was in the form of vibrocore and borehole sampling.

Table 9.6: Summary of site-specific survey data.

Title	Extent of survey	Overview of survey	Date	Reference to further information
Sidescan Sonar (SSS)	Mona Array Area and Mona Offshore Cable Corridor	Geophysical survey to characterise the marine archaeology of the Mona Offshore Wind Project	July 2021 to September 2021 and April to September 2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Multibeam Bathymetry (MBES)	Mona Array Area and Mona Offshore Cable Corridor	Geophysical survey to characterise the marine archaeology of the Mona Offshore Wind Project	June 2021 to March 2022 and April to September 2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Sub-bottom Profiler (SBP)	Mona Array Area and Mona Offshore Cable Corridor	Geophysical survey to characterise the marine archaeology of the Mona Offshore Wind Project	July 2021 to September 2021 and April to September 2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Magnetometry	Mona Offshore Cable Corridor	Geophysical survey to characterise the marine archaeology of the Mona Offshore Cable Corridor	April to September 2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Boreholes	Mona Array Area	Geotechnical survey to characterise the marine archaeology of the Mona Array Area	2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.
Vibrocores	Mona Offshore Cable Corridor	Geotechnical survey to characterise the marine archaeology of the Mona Offshore Cable Corridor	2021 and 2022	Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.4.4 Baseline environment

9.4.4.1 Marine archaeology is considered within the following categories:

- Submerged prehistoric archaeology: This includes paleochannels and other inundated terrestrial landforms that may preserve sequences of sediment of paleoenvironmental interest, Palaeolithic and Mesolithic sites and artefacts
- Maritime archaeology: relates generally to craft or vessels and any of their associated structures and/or cargo
- Aviation archaeology: this comprises all military and civilian aircraft crash sites and related wreckage
- Historic Seascape Character (HSC): characterisation of the historic and present physical, environmental and human made changes and activities that have formed the seascape as it is today.

9.4.4.2 Archaeology is considered in terms of periods that represent timeframes which are defined and categorised by the culture of the people of the time. Notable changes in culture and activities are indicated by changes in chronological periods. Dates are referred to as BC (Before Christ), or AD (anno domini). The chronological periods and their corresponding date ranges that are considered within the report are provided in Table 9.7.

Table 9.7: Overview of British archaeological chronology.

Period	Date Range
Palaeolithic	c. 900,000 to 12,000 BC
Mesolithic	12,000 to 4000 BC
Neolithic	4000 to 2500 BC
Bronze Age	2500 to 800 BC
Iron Age	800 BC to AD 43
Romano-British	AD 43 to 410
Early Medieval	AD 410 to 1066
Medieval	AD 1066 to 1500
Post-medieval	AD 1500 to 1800
19th century	AD 1800 to 1899
Modern	AD 1900 to present day

Submerged prehistoric archaeology

9.4.4.3 The prehistoric archaeological record of the British Isles covers the period from the earliest hominin occupation more than 780,000 Before Present (BP) to the Roman invasion of Britain in 43 AD. During this long span of time, sea level fluctuations caused by three major glaciations (the Anglian, Wolstonian and the Devensian) have shaped the submerged prehistoric landscape within the Mona marine archaeology study area. The changes in sea level have at times exposed the seabed floor creating a terrestrial and potentially habitable environment, suitable for hominin occupation and exploitation. The submerged prehistoric archaeological potential of the Mona marine

archaeology study area is summarised below and further information is presented in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.4.4.4 Geological periods referred to in this section are defined by the date ranges presented in Table 9.8.

Table 9.8: Geological periods.

Period	Date Range	Notes
Holocene	10,000 BP to Present Day	Mesolithic, Neolithic, Bronze Age, Iron Age, Roman, Medieval, Post Medieval and Modern periods. The Holocene is the current time period within the larger geological time scale known as the Quaternary Period.
Devensian from Post Late Glacial Maximum to Late Glacial Interstadial	18,000 to 10,000 BP	Coincides with the Late Upper Palaeolithic and the early Mesolithic.
Devensian up to Late Glacial Maximum	c. 73,000 to 18,000 BP	Arrival in the UK of Late Middle Palaeolithic Neanderthals, who were followed approximately 31,000 BP by Early Upper Palaeolithic, anatomically modern humans (Homo sapiens).
Ipswichian (interglacial)	c. 130,000 to c. 115,000 BP	Last interglacial period in the UK. Overlaps with the Late Middle Palaeolithic.
Wolstonian	c. 374,000 to c. 130,000 BP	Predominantly Pleistocene glaciation. Incorporates the earliest period of the Late Middle Palaeolithic.

Late Middle Palaeolithic (186,000- 45,000 BP, 184,000–43,000 BC)

9.4.4.5 Evidence in the form of the presence of deposits representing the Wolstonian Glaciation indicate that the marine archaeology study area would have been subglacial during the Late Middle Palaeolithic. The analysis of seismic data from within the Mona Array Area, stage one geotechnical analysis and evidence from the wider area suggests that deposits representing environments favourable for human occupation dating to this period are not likely to be present within the Mona marine archaeology study area (COARS, 2023; Jackson et al., 1995; Mellett et al., 2015; Wood, 2022).

Upper Palaeolithic (45,000-10,000 BP, 43,000 – 8,000 BC)

9.4.4.6 The site-specific geophysical and geotechnical surveys conducted for the Mona Offshore Wind Project have revealed the presence of a glacial lake. This evidence therefore supports academic theories (Brooks et al., 2011; COARS, 2023; Jackson et al., 1995; Mellett et al., 2015; Fitch et al., 2011) that the areas within the Mona Array Area and Mona Offshore Cable Corridor would have been a partially terrestrial or intertidal environment during the Upper Palaeolithic, with final submergence of much of the area occurring c.13,000 BP. The site-specific surveys supported by desktop sources indicate that final submergence of the Mona Offshore Cable Corridor would have occurred c.6000 BP.

9.4.4.7 Despite the partially terrestrial environment within the Mona marine archaeology study area, it may not have been a favourable environment for human exploitation.

Permafrost would have been present in the area, limiting the growth of vegetation and therefore the availability of resources for human exploitation. Therefore, the potential for the presence of submerged prehistoric archaeological material within the marine archaeology study area is low.

Mesolithic (10,000 – 6000 BP, 12,000 – 4000 BC)

9.4.4.8 Evidence from the site-specific geophysical and geotechnical surveys conducted within the Mona Array Area and Mona Offshore Cable Corridor and modelling conducted as part of the West Coast Palaeolandscape Study (COARS, 2023; Fitch et al. 2011) indicate that the southeast part of the Mona Array Area and along the Mona Offshore Cable Corridor was intertidal during the Mesolithic. The intertidal zone represents an environment that is rich in available resources for human exploitation, access to the sea would provide humans a food source in the form of fish and shellfish. The intertidal zone is also an environment which encourages the growth of vegetation that could be utilised for food and resources. Therefore, there is potential for the survival of archaeological material dating to this period within the Mona marine archaeology study area. However, the results of the stage one geotechnical analysis of vibrocores taken within the Mona Offshore Cable Corridor have not identified any archaeological potential (COARS, 2023).

Maritime and aviation archaeology

Maritime archaeology potential

Early Prehistoric (Palaeolithic and Mesolithic)

9.4.4.9 There is currently no evidence in the UK for maritime archaeological remains pre-dating the start of the Holocene.

9.4.4.10 Watercraft may have been used in the rivers and estuaries during the Mesolithic for coastal journeys, fishing expeditions, and possibly longer journeys in favourable weather. However due to the paucity of evidence within the archaeological record and the extent of fluvial activity across the Mona marine archaeology study area, the potential for the survival of any archaeology associated with the maritime environment from the Palaeolithic and Mesolithic periods is considered low.

Neolithic and Bronze Age

9.4.4.11 The potential for evidence of watercraft of vessels dating to the Neolithic period within the Mona marine archaeology study area is considered to be low.

9.4.4.12 Evidence of Bronze Age maritime activity has been recorded throughout England with the discovery of a number of inland watercraft and sea faring vessels. No such examples have been recorded within or close to the Mona marine archaeology study area, however it is possible that similar crafts may have been utilised to traverse the area. Generally, based on the available evidence the potential for the discovery of maritime archaeology dating to the Bronze Age is considered to be low.

Iron Age and Romano-British

9.4.4.13 Evidence of Iron Age maritime activity has been discovered in Britain in the form of Romano-Celtic boats which are examples of a new form of ship construction that was emerging in north western Europe at the time. No evidence has been found within the Mona marine archaeology study area and based on the available evidence the archaeological potential is considered to be low. The Roman occupation of Britain was

by necessity a maritime endeavour, which would have required continuous transportation of resources and people to the military and civilian sites established by the Romans. Sites such as these can be found along Liverpool Bay and therefore it is likely that there would have been substantial Roman maritime traffic in this area. No evidence has been found within the Mona marine archaeology study area and based on the available evidence the archaeological potential is considered to be low to moderate.

Early Medieval and Medieval

9.4.4.14 The Early Medieval period marked a change in ship construction techniques coinciding with the end of the Roman occupation of Britain in the 5th century AD and an increasing Anglo-Saxon presence in the form of Norse and Danish Vikings. Several examples have been recorded in Britain.

9.4.4.15 With the Medieval period came a boom in maritime trade across Europe and trade expanded across the Irish Sea at this time also, with Dublin becoming an increasingly important commercial port, contributing to the maritime transportation of goods through the Irish Sea. The rapid technological advances in ship construction during the medieval period can also be attributed to increased military campaigns.

9.4.4.16 Due to the large increase of maritime traffic that would have occurred in the Irish Sea during the early medieval and medieval period, the potential for the discovery of archaeological remains dating from this period is considered to be moderate.

Post-Medieval and Modern

9.4.4.17 Records of known wreck sites and losses in UK waters are biased towards the Post-Medieval and Modern periods and therefore the precise locations of most wrecks pre-dating these periods in UK waters are not known. The majority of known and recorded wreck sites lie relatively close to the coast.

9.4.4.18 A total of 101 recorded losses have been identified within the desktop data (NRHE and NMRW) that are attributed to coordinates within the Mona marine archaeology study area. The high volume of recorded losses in the area is consistent with the increase of trade to and from Liverpool from the 16th century and the increase of military activity from the 18th century. From the 18th century onwards there was also rapid developments in shipbuilding technology including the advent of the steam engine and the use of iron hulls. These advances in shipbuilding mean that the incorporation of metal into ship design made shipwrecks more likely to survive on the seafloor and be identifiable in geophysical surveys.

9.4.4.19 Further advances in technology occurred during both World Wars and the east Irish Sea saw extensive activity associated with these periods, therefore the potential for the presence of modern military remains within the Mona marine archaeology study area is high.

9.4.4.20 The overwhelming majority of recorded losses are Post Medieval and predominantly lost to weather. Of the vessels that were lost during the periods of both World Wars, only one, Stanleigh (NRHE ID 271180) was certainly sunk as a result of enemy action. Of the 101 recorded losses, only HMS Thistle (NRHE ID 271584) was in active military service at the time of sinking and would thus constitute a Protected Place under the auspices of the Protection of Military Remains Act 1986 should any remains be positively identified as associated with this vessel.

Aviation archaeology

9.4.4.21 Since World War II, despite the volume of both military and civilian air traffic, there have been few aviation losses off the west coast of England and north Wales, in the vicinity of the Mona Offshore Wind Project. The potential for post-war aircraft remains to be discovered within the Mona marine archaeology study area for the transmission assets is therefore considered to be low. Civilian aircraft wrecks are not subject to protection under the terms of the Protection of Military Remains Act 1986.

9.4.4.22 No aviation remains can be positively identified within the UKHO, NMRW or NRHE datasets for the Mona marine archaeology study area during the desktop study or were identified from the assessment of geophysical data.

9.4.4.23 There are eight recorded losses of aircraft attributed to coordinates within the Mona marine archaeology study area. As with maritime recorded losses, no specific location can be associated with these records.

9.4.4.24 No recorded losses of aircraft are associated with enemy action but instead appear to represent equipment failures. All eight recorded losses were military aircraft, but only one, the De Havilland Vampire (NRHE ID 515680), occurred outside of the timeframe of World War II. It was assigned to 202 AFS (Advanced Flying School) and crashed in the sea in 1953.

Results of the desktop study

9.4.4.25 No designated sites have been identified within the datasets for the Mona marine archaeology study area.

9.4.4.26 The desktop study has identified 37 entries within the datasets that may indicate the presence of material of anthropogenic origin within the Mona marine archaeology study area. Of these, there are three positively identified non designated wreck sites that are listed as ‘live’ by the UKHO, four possibly identified ‘live’ non designated wreck sites and six unknown sites believed to be of anthropogenic origin that are also considered ‘live’.

9.4.4.27 There are 23 other entries within the NMRW and NRHE datasets that do not correspond with UKHO records and have little to no known information associated with them and are either recorded as unknown, unnamed wrecks or seabed anomalies. These notably include the possible position of the wrecks Glory and Hecla and a record of a porthole find. These are included in the desktop gazetteer presented in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement for completeness as they may represent archaeological material.

9.4.4.28 The Ardlough (UKHO 8239) was a cargo ship built in Germany in 1968 which sank in 1988 after taking on water in the Irish Sea. In addition to the UKHO record, the Ardlough is recorded as NMRW number 544553. The Ardlough is recorded as being located on the south boundary of the Mona Array Area and has been confirmed through the site-specific geophysical survey (Mona_0009). The Tijl Uilenspiegle was a Belgian fishing trawler built in 1972 and sank in 1987 under mysterious circumstances. The location of the Tijl Uilenspiegle has been confirmed through the site-specific geophysical survey (Mona_0076).

9.4.4.29 The Susie Mo II (UKHO 91489) was a fishing vessel that sank in 2015. The location corresponding with the Susie Mo II has been identified through the site-specific geophysical survey (Mona_0068), though it appears that wreck material may no longer be at that location.

9.4.4.30 The Sea Gull was a British steam ship that was torpedoed by submarine U-103 enroute from Le Havre to Liverpool and sank on 16 March 1918. The potential wreck of the Sea Gull was identified within the geophysical data (Mona_0045).

9.4.4.31 The possible remains of the Vine (UKHO 8238), a British transport barge lost in 1877, are recorded as 'live' by the UKHO and listed as located within the Mona Offshore Cable Corridor. The position of this wreck has not been verified through the geophysical survey, but there remains a possibility for archaeological material to survive at the location shown in Figure 9.3.

9.4.4.32 The Albanian (UKHO 8124) was an iron-hulled steam ship built in Liverpool in 1870 used for Mediterranean trade during the 1870s until it collided with the Nydia (UKHO 8140) whilst on route from Liverpool to Genoa on the 18 November 1877. The collision off of Great Orme resulted in the loss of both vessels and the Nydia, built 1863 in Quebec, is also listed as 'live' within the Mona marine archaeology study area. The Nydia is described as being almost entirely buried by sand and it is believed that some damage has been caused though trawling. The Albanian was the subject of salvage operations in 1992 and is now reported to lie in three parts and to be very broken up. Although both of these are listed as 'live' within the Mona Offshore Cable Corridor, they have not been verified through the geophysical survey although it is possible that remains survive at the locations but have been buried. The recorded positions are shown in Figure 9.3.

9.4.4.33 Within the UKHO records of unknown origin is UKHO 93502, located within the southern section of the Mona Offshore Cable Corridor and relates to a 'degraded wreck possibly partially covered in sediment,' first identified in 2019. The dimensions of the wreck are recorded as 33.7 m x 3.8 m, with a height of 0.5 m. The record contains no further diagnostic information. No evidence of the wreck was identified within the geophysical data, the position does however lie alongside a sandbank and in an area where there is a slight curvature, although this less than 20 m. It is not possible to ascertain whether the identification is that of the side of the sandbank, or whether the wreck may now be buried. Due to the description of the wreck and it's recent identification, it is considered likely that this wreck may be at its recorded location.

9.4.4.34 Four of the unknown UKHO records have also been corroborated by the geophysical survey. The UKHO data also records a large number of 'dead' entries, ranging from recordings of fisherman's fasteners to possible wrecks, however the fact that they are recorded as dead indicates that no remains of these are currently visible on the seabed. The geophysical survey has confirmed that no material exists on the seabed at these locations, however they may represent archaeological material that is buried, fragmented or no longer at their recorded positions.

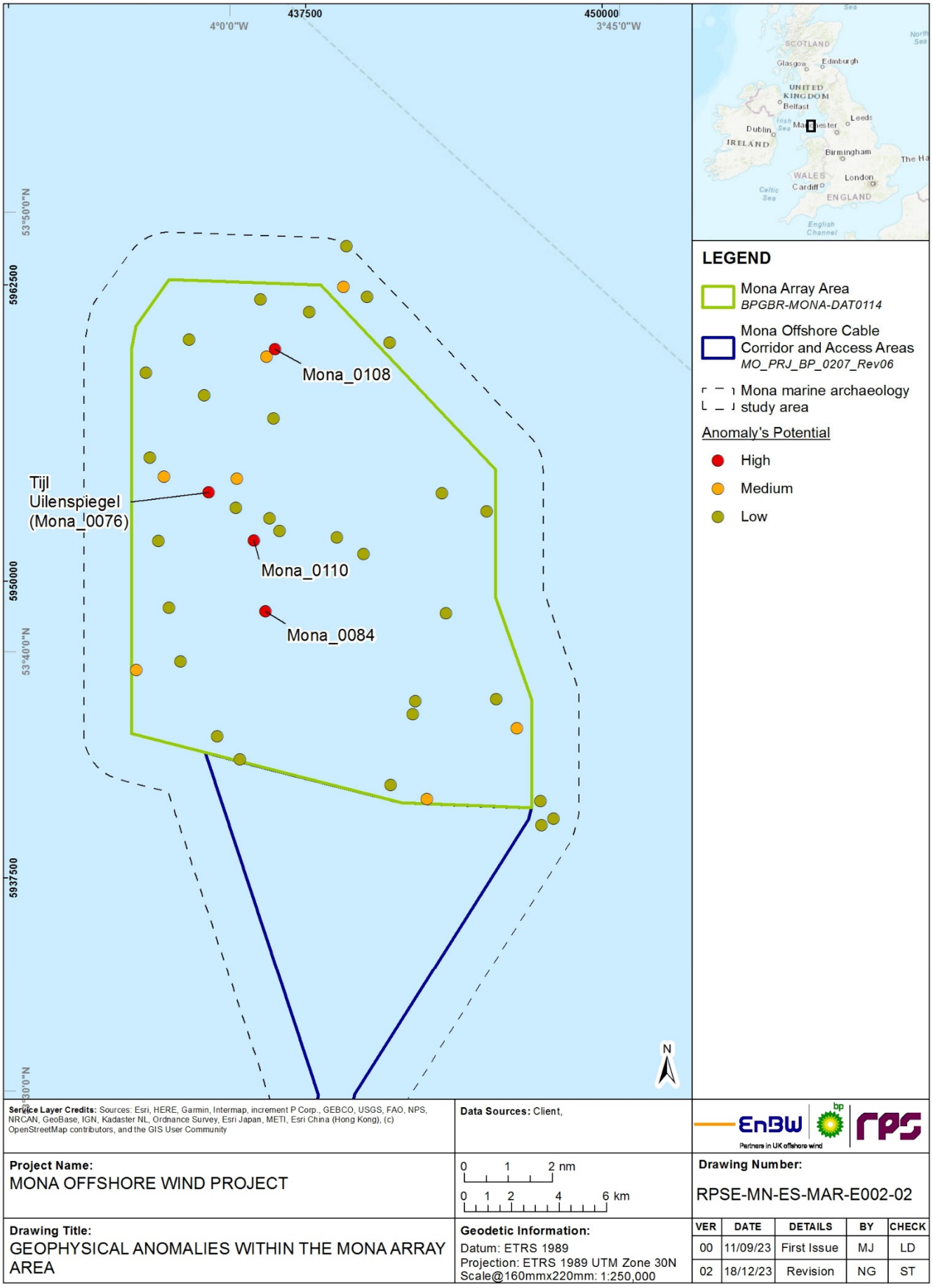

Figure 9.2: Marine archaeology identified through the desktop data within the Mona Array Area.

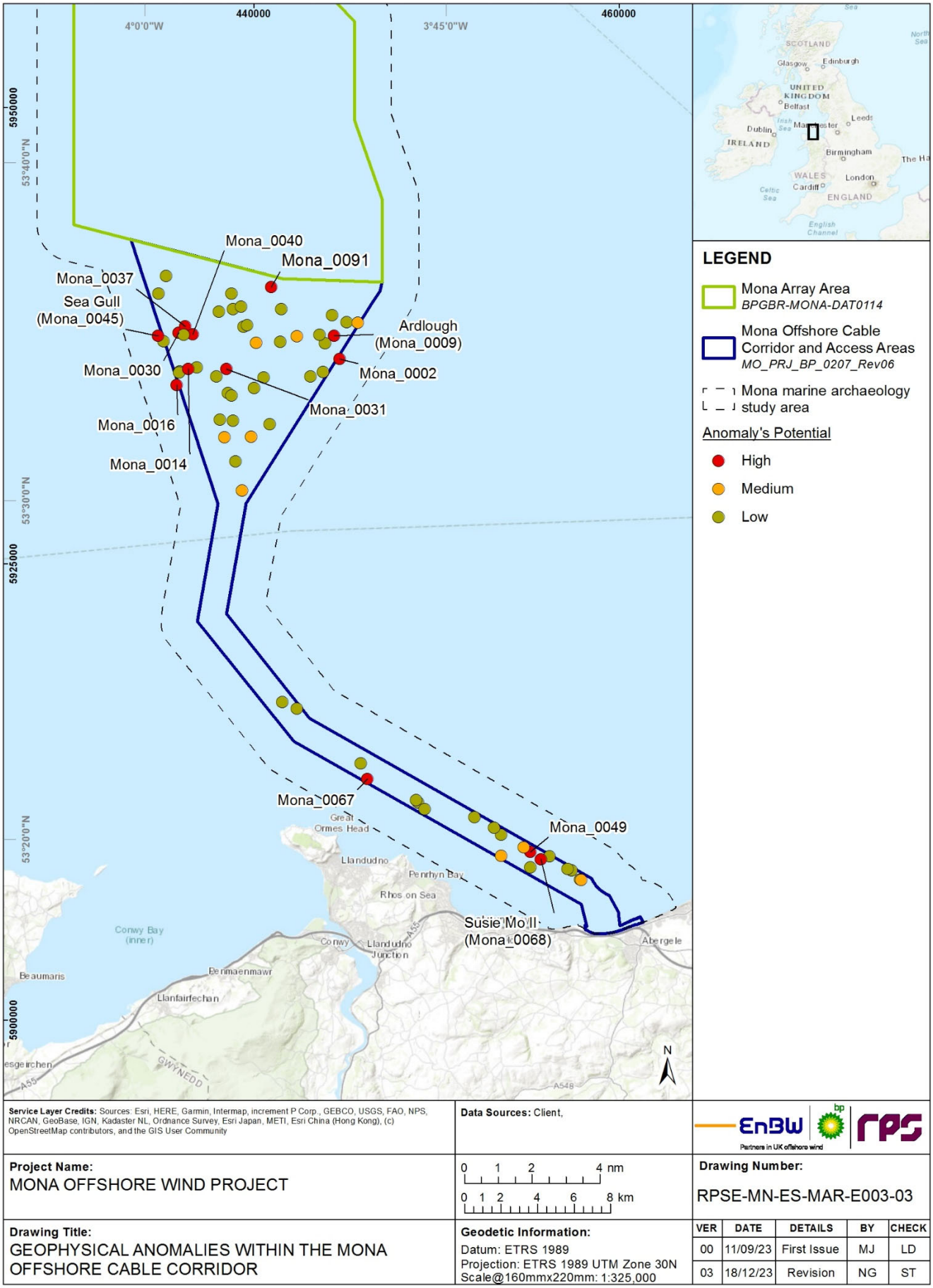

Figure 9.3: Marine archaeology identified through the desktop data within the Mona Offshore Cable Corridor.

Results of the geophysical seabed features assessment

9.4.4.35 Geophysical data was collected across and beyond the Mona Array Area and Mona Offshore Cable Corridor. A total of 107 anomalies of potential archaeological interest were identified through the geophysical surveys. Of these, 17 are considered to be high potential anomalies, 16 are of medium potential and 74 have been classed as low potential anomalies. These are presented in Figure 9.4 and Figure 9.5.

9.4.4.36 The 74 low potential anomalies have been assessed against all available evidence and consequently are considered unlikely to have any archaeological significance and so will not be discussed further in this report. Should material of potential archaeological significance be identified during the course of Mona Offshore Wind Project they will be reported through the PAD as described in Outline WSI and PAD. The locations of all low potential anomalies are presented in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement and Outline WSI and PAD.

9.4.4.37 The 18 medium potential anomalies could represent marine archaeology sites from potential debris to wreck. These are shown in Figure 9.4 and presented in Table 9.9. Full details of the medium potential anomalies and potential wrecks identified within the desktop data can be found in Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

Table 9.9: Medium potential anomalies.

ID	Category
Mona_0057	Anchor
Mona_0080	Unidentified debris
Mona_0081	Potential debris
Mona_0092	Potential wreck
Mona_0102	Potential debris
Mona_0109	Mound
Mona_0112	Mound
Mona_0018	Potential debris
Mona_0025	Mound
Mona_0033	Mound
Mona_0038	Debris
Mona_0044	Potential debris
Mona_0048	Potential debris
Mona_0065	Potential debris
Mona_0066	Potential debris
Mona_0069	Potential wreck

9.4.4.38 Of the 17 high potential anomalies identified, five are located within the Mona Array Area (Figure 9.4) and nine are located within the Mona Offshore Cable Corridor (Figure 9.5) , eight of which have also been recorded within the UKHO data.

9.4.4.39 Mona_0076 (Figure 9.4) has been interpreted as a wreck and coincides with the recorded location of UKHO record 7452, the Tijl Uilenspiegel, a late 20th century Belgian fishing trawler that was lost in 1989 and subsequently identified in 2000. The Tijl Uilenspiegel now lies on its port side with some associated debris, namely the vessel's trawl gear.

9.4.4.40 Mona_0084 (Figure 9.4) has been interpreted as a wreck that coincides with UKHO record 8162, NMRW record 518452 and NRHE record 909485. Diver investigations in 1991 recorded the wreck as the remains of a small lightship with a double ended hull. The survey data appears to show evidence of collapse of one end of the lightship. It is likely that this wreck dates from the post medieval or modern period.

9.4.4.41 Mona_0091 (Figure 9.4) has been interpreted as a wreck corresponding to the UKHO record 7969, NMRW record 240670 and NRHE record 909482 of an unidentified steam ship. The wreck measures 37.1 m x 5.1 m and has a height of 5.8 m and shows evidence of degradation. The wreck site was dived in 2000 and reported to be intact. A small bell and pottery dating to 1906 were recovered, indicating that the date of loss must be post 1906 and potentially associated with World War I.

9.4.4.42 Mona_0108 (Figure 9.4) has been interpreted as an area of anthropogenic debris. No UKHO, NRHE, or NMRW records are associated with its position. The area of debris may represent a wreck site and consists of three distinct features. There is a high potential for Mona_0108 to be of archaeological interest due to the size, form and distribution of the material.

9.4.4.43 Mona_0110 (Figure 9.4) has been interpreted as an area of anthropogenic debris. No UKHO, NRHE, or NMRW records are associated with its position, however NRHE records 102663 and 1027034 are located <300 m south of this position and are recorded as seabed obstructions. Mona_0110 may represent a wreck site as the overall form, and distribution of features is consistent with that of a wrecked vessel.

9.4.4.44 Mona_0009 (Figure 9.5) was identified as the wreck of the Ardlough and lies in the northeast portion of the fan section of the Mona Offshore Cable Corridor. The anomaly directly corresponds with UKHO record 8239 (45 m southeast of NRHE 1004768), an Antiguan and Barbudan carrier which sank on 26th September 1998 while enroute from Garston to Belfast. The wreck lies apparently upright and mostly coherent, except for notable collapse along the port side.

9.4.4.45 Mona_0016 (Figure 9.5) does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies outside of and approximately 120 m west of the Mona Offshore Cable Corridor. While the origin is not clear the form of the anomaly is indicative of anthropogenic debris; the size and distribution potentially represent the remains of a collapsed wreck vessel.

9.4.4.46 Mona_0030 (Figure 9.5) is located in the north-west of the fan section of the Mona Offshore Cable Corridor and does not directly correspond with any UKHO, NRHE, or RCAHMW records. The size, and form, of the mound, and the associated large magnetic anomaly indicate buried material of anthropogenic origin, and potentially the remains of a wrecked vessel.

9.4.4.47 Mona_0031 (Figure 9.5) is located within the fan section of the Mona Offshore Cable Corridor and does not directly correspond with any UKHO, NRHE, or RCAHMW records. The anomaly is visible as an elongated mound, the south east end of the mound there is an accumulation of seabed, potentially indicating an extension of the main feature. There is little in the way of features to indicate the presence of a wreck, however mounds have the potential to represent buried material. The size, and form,

of the mound, and the associated large magnetic anomaly indicate buried material of anthropogenic origin, and potentially the remains of a wrecked vessel.

9.4.4.48 Mona_0037 (Figure 9.5) does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the northwest portion of the fan section of the Mona Offshore Cable Corridor. The anomaly appears as an irregular mound but at least three linear features are visible in the SSS data on the top of the mound. The form of the mound and association with linear features is indicative of anthropogenic material. The size of the mound may indicate the remains of a wrecked vessel.

9.4.4.49 Mona _0040 (Figure 9.5) does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the northwest portion of the fan section of the Mona Offshore Cable Corridor. The size and form of the mound and its association with a magnetic anomaly indicate buried material of anthropogenic origin, possibly the remains of a wrecked vessel.

9.4.4.50 Mona_0049 (Figure 9.5) does not directly correspond with any UKHO, NRHE or NMRW records. The anomaly lies in the south area of the Mona Offshore Cable Corridor. While the form of the anomaly is not dissimilar to a large geological feature, the size and uniqueness in the vicinity may indicate an anthropogenic origin. The survey contractor, Gardline, identified the anomaly as a potential wreck during their assessment of the data. However, the form and lack of an associated magnetic anomaly does not make this identification firm.

9.4.4.51 Mona_0067 (Figure 9.5) lies midway along the Mona Offshore Cable Corridor and corresponds with UKHO record 8144 and NMRW record 505956. The UKHO record the position of the feature as a small wreck, or piece of wreckage, originally located in 1986. The prominence of the anomaly in the area of seabed and its recording by the UKHO and NMRW indicate a potential anthropogenic origin.

9.4.4.52 Mona_0014 (Figure 9.5) does not directly correspond to any UKHO, NRHE or NMRW records. The anomaly measures 15.8 m x 14.9 m with a measurable height of 0.5 m, lies in the northwest of the fan section of the Mona Offshore Cable Corridor. In form the anomaly appears as an irregular mound in the MBES data, not dissimilar from other seabed features in the area. However, the high magnitude of its associated magnetic anomaly (9,734 nT) suggests anthropogenic material of archaeological interest.

9.4.4.53 Mona_0068 (Figure 9.5) is located in the northwest fan section of the Mona Offshore Cable Corridor which corresponds to the UKHO record 91489, the Susie Mo II, which sank in 2015. The UKHO record states that in 2019, the location was the site of a wreck measuring 7.8 m x 4.9 m, with a measurable height of 3.3 m. What is unusual about the record is that the intact wreck identified in the UKHO record in 2019 is no longer visible and there is no record of it having been lifted. It is not possible to determine, with certainty, that the wreck from UKHO 91489 was that of a small fishing vessel, or whether it relates to an older structure that has since collapsed. A high-potential rating has been assigned until full-coverage SSS data can be reviewed.

9.4.4.54 Mona_0045 (Figure 9.5) lies outside of and approximately 250 m northwest of the Mona Offshore Cable Corridor Mona Offshore Cable Corridor and directly corresponds with UKHO record 7946, NRHE record 909480 and NMRW record 272253, the Sea Gull (possibly). Sea Gull is a British steam ship that was torpedoed by Submarine U-103 and sank on 17 March 1918 while enroute from Le Havre to Liverpool. The full built dimensions of Sea Gull were 68.6 m x 10.1 m, so it is possible that should the anomaly be that of Sea Gull then another section of wreck lies outside the extents of the survey data.

9.4.4.55 Mona_0002 (Figure 9.5) lies outside of and approximately 130 m east of the Mona Offshore Cable Corridor and has been interpreted as a potential wreck corresponding with UKHO record 99231. The UKHO record is that of a degraded and buried wreck, of similar dimensions to those observed in the SSS data. No further details are given.

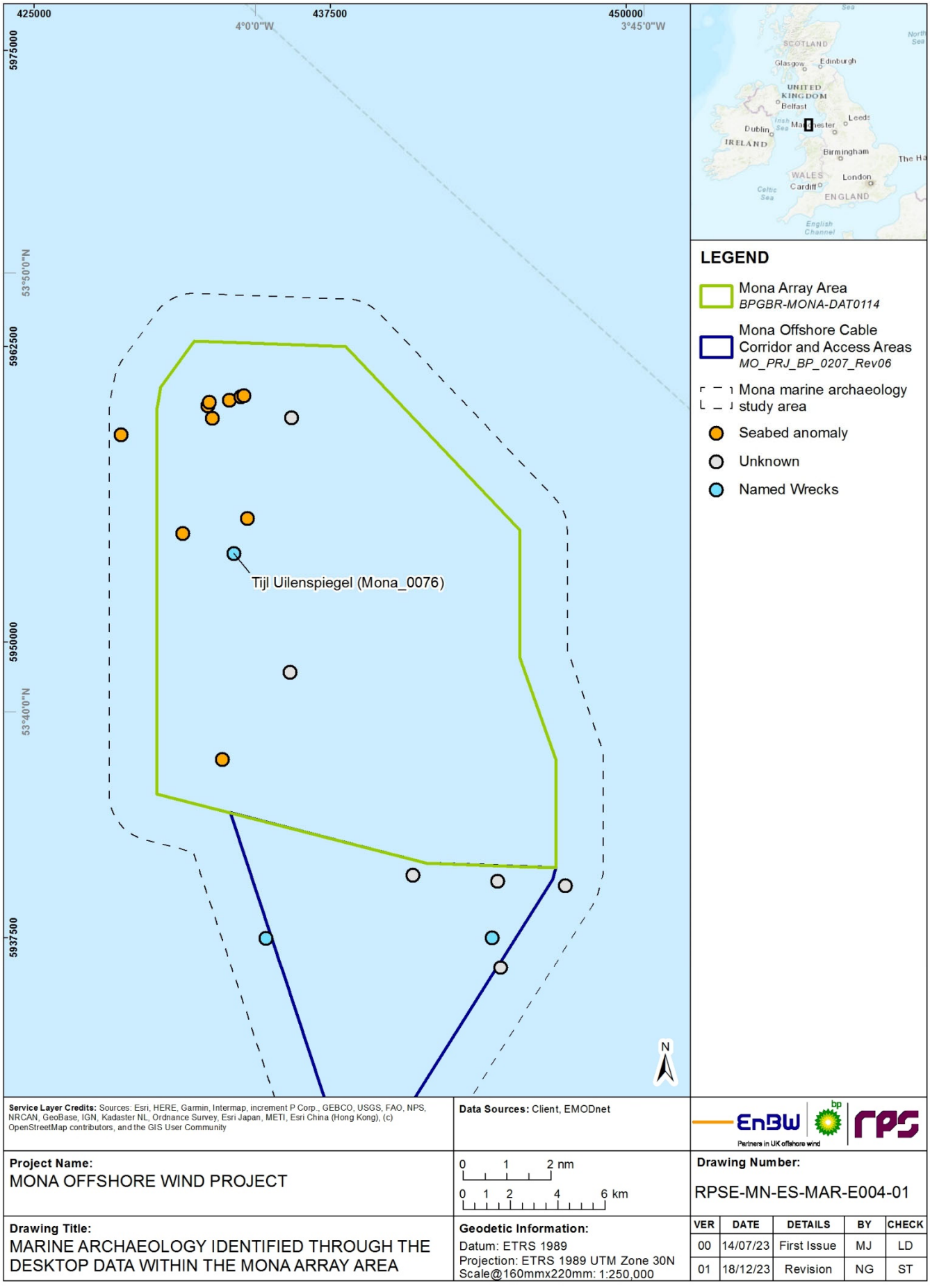

Figure 9.4: Geophysical anomalies within the Mona Array Area.

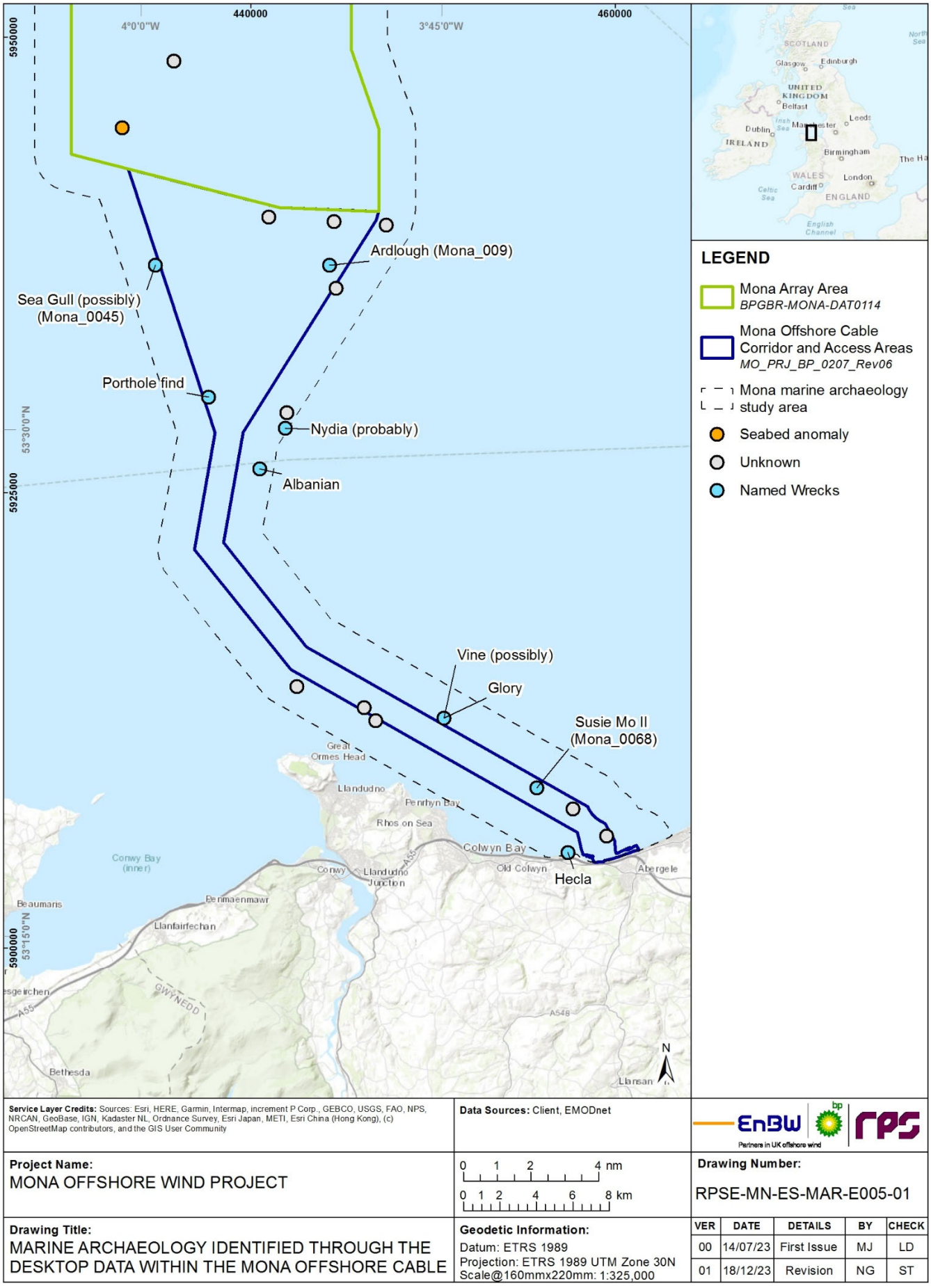

Figure 9.5: Geophysical anomalies within the Mona Offshore Cable Corridor.

Historic Seascape Character

9.4.4.56 The HSC method characterises historic trends and process that have shaped the marine archaeological environment to provide information for the sustainable management of English marine and coastal environments. The marine environment is considered in four 'levels': the sea surface, the water column, the sea floor and the sub-sea floor. The results are available in Geographical Information System compatible downloads from the Archaeology Data Service which allows key characteristics within the Mona marine archaeology study area to be identified. These are presented in Table 9.10.

Table 9.10: HSC within the Mona marine archaeology study area

Character area	Character type within the Mona marine archaeology study area	Date
Conflated	Wreck hazard	Unknown
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Coarse sediment plains	Unknown
Sea Surface	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Water Column	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Sea Floor	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown
Sub-Sea Floor	Submarine telecommunications cable	Modern (AD1900 to Present)
	Submarine telecommunications cable	Modern (AD1900 to Present)
	Shellfish dredging	Modern (AD1900 to Present)
	Fine sediment plains	Unknown

Character area	Character type within the Mona marine archaeology study area	Date
	Coarse sediment plains	Unknown
	Wreck hazard	Unknown

9.4.4.57 Historical cultural processes which have shaped the character of the Mona marine archaeology study area are predominantly related to fishing and navigation activity. Infrastructure for the modern energy industry dominates the current seascape character.

9.4.5 Future baseline scenario

9.4.5.1 The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require that "an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge" is included within the Environmental Statement. In the event that Mona Offshore Wind Project does not come forward, an assessment of the future baseline conditions has been carried out and is described within this section.

9.4.5.2 It is unlikely that significant change will occur to the marine archaeology of the Mona marine archaeology study area over the next few decades. It is likely that sediment mobility will continue, and this natural process retains the potential to expose and re-bury marine archaeology, leading to their deterioration over time. It is also possible that new marine archaeology sites and wrecks will be exposed.

9.4.6 Data limitations

9.4.6.1 The records held by the UKHO, NRHE and NMRW and the other sources used in this assessment are not a record of all surviving cultural heritage assets, rather 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. In particular, this relates to buried archaeological features.

9.4.6.2 The interpretation of geophysical and hydrographic data is by its very nature, subjective. However, by using an experienced specialist who can analyse the form, size and characteristics of an anomaly, a reasonable degree of certainty can be achieved. Measurements can be taken in most data processing software, and whilst largely accurate, discrepancies can occur. Where there is uncertainty as to the potential of an anomaly or its origin, a precautionary approach is always taken to ensure the most appropriate mitigation for the historic environment is recommended. There may be instances where a contact may exist on the seabed but not be visible in the geophysical data. This may be due to the anomaly being covered by sediment or being obscured from the line of sight of the sonar, or due to poor quality data. The desk-based sources and the site-specific survey data examined represent a comprehensive and robust sequence of datasets and observations that allow for a detailed assessment of the archaeological constraints associated with the Mona Offshore Wind Project.

9.5 Impact assessment methodology

9.5.1 Overview

9.5.1.1 The marine archaeology impact assessment has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement.

9.5.1.2 This assessment has been undertaken in accordance with Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Cadw 2011) and Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021).

9.5.2 Impact assessment criteria

9.5.2.1 The significance of an effect is determined based on the sensitivity of a receptor and the magnitude of an impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and magnitude of potential impacts. The terms used to define magnitude and sensitivity are based on and have been adapted from those used in the Design Manual for Roads and Bridges methodology (Highways England et al., 2020).

9.5.2.2 The criteria for determining the significance of effects is a two-stage process that involves defining the magnitude of the impacts and the sensitivity of the receptors. This section describes the criteria applied in this chapter to assign values to the magnitude of potential impacts and the sensitivity of the receptors. The terms used to define magnitude and sensitivity are based on those which are described in further detail in Volume 1, Chapter 5: EIA methodology of the Environmental Statement.

Magnitude of impact

9.5.2.3 The criteria for defining magnitude in this chapter are outlined in Table 9.11 below.

Table 9.11: Definition of terms relating to the magnitude of an impact.

Magnitude of impact		Definition
High	Adverse	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, composition or attributes
	Beneficial	Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality
Medium	Adverse	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, composition or attributes
	Beneficial	Benefit to, or addition of, key characteristics, composition or attributes improvement of attribute quality
Low	Adverse	Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, composition or attributes
	Beneficial	Minor benefit to, or addition of, one (maybe more) key characteristics, composition or attributes some beneficial impact on attribute or a reduced risk of negative impact occurring

Magnitude of impact		Definition
Negligible	Adverse	Very minor loss or detrimental alteration to one or more characteristics, composition or attributes
	Beneficial	Very minor benefit to, or positive addition of one or more characteristics, composition or attributes

Receptor sensitivity/value

9.5.2.4 The capability of a receptor to accommodate change and its ability to recover if affected is a function of its sensitivity. Receptor sensitivity is typically assessed via the following factors:

- Adaptability - the degree to which a receptor can avoid or adapt to an effect
- Tolerance - the ability of a receptor to accommodate temporary or permanent change without significant adverse impact
- Recoverability - the temporal scale over and extent to which a receptor will recover following an effect
- Value - a measure of the receptor's importance, rarity and worth.

9.5.2.5 Marine archaeology receptors cannot adapt, tolerate or recover from impacts resulting in damage or loss caused by development. As a result, the sensitivity of a receptor can only be determined through its value.

9.5.2.6 Based on HE's Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage, 2008) and Conservation Principles for the Sustainable Management of the Historic Environment in Wales (Cadw 2011) the significance of a historic asset 'embraces all the diverse cultural and natural heritage values that people associate with it, or which prompt them to respond to it'. Significance is determined by the following value criteria:

- Evidential value - deriving from the potential of a place to yield evidence about past human activity
- Historical value - deriving from the ways in which past people, events and aspects of life can be connected through a place to the present. It tends to be illustrative or associative
- Aesthetic value - deriving from the ways in which people draw sensory and intellectual stimulation from a place
- Communal value - deriving from the meanings of a place for the people who relate to it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical (particularly associative) and aesthetic values but tend to have additional and specific aspects.

9.5.2.7 Ships and Boats: Prehistory to Present - Selection Guide (Historic England, 2017) sets a criteria of value to shipwrecks specifically that is defined as:

- Period
- Rarity
- Documentation

- Group value
- Survival/condition
- Potential.

9.5.2.8 The criteria for defining value, and therefore sensitivity, in this chapter are outlined in Table 9.12 below.

Table 9.12: Definition of terms relating to the value (and therefore sensitivity) of the receptor.

Value	Definition
Very High	Singular or excellent example and/ or high potential to contribute to knowledge and understanding. Receptors with a demonstrable international or national dimension to their importance are likely to fall within this category. Wrecked ships and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 with an international dimension or their importance as well as as-yet undesignated sites that are demonstrably of very high archaeological value. Known submerged prehistoric sites and landscapes with a confirmed presence of largely in situ artefactual material or palaeogeographic features with demonstrable potential to include artefactual and/or palaeoenvironmental material, possibly as part of a prehistoric site or landscape.
High	Good example and/or high potential to contribute to knowledge and understanding. Includes shipwrecks and aircraft that are protected under the Protection of Wrecks Act 1973, Ancient Monuments and Archaeological Areas Act 1979 or Protection of Military Remains Act 1986 as well as as-yet undesignated sites that do not have statutory protection or equivalent significance, but have high potential based on an assessment of their importance in terms of build, use, loss, survival and investigation (BULSI). Prehistoric deposits with high potential to contribute to an understanding of the palaeoenvironment.
Medium	Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.
Low	Below average example and/or low potential to contribute to knowledge and understanding and/or outreach. Includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on an assessment of their importance in terms of BULSI. Prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.
Negligible	Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach. Assets with little or no surviving archaeological interest.

Significance of effect

9.5.2.9 The significance of the effect upon marine archaeology is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The particular method employed for this assessment is presented in Table 9.13. Where a range of significance of effect is presented the final assessment for each effect is based upon expert judgement.

9.5.2.10 For the purposes of this assessment, any effects with a significance level of minor or less have been concluded to be not significant in terms of the EIA Regulations.

Table 9.13: Matrix used for the assessment of the significance of the effect.

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

9.5.2.11 The definitions for significance of effect levels are described as follows:

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

9.5.2.12 In all cases, the evaluation of receptor value (and therefore sensitivity) and impact magnitude has been informed by professional judgement and is underpinned by narrative to explain the conclusions reached. Where a range of significance levels is presented, the final assessment for each effect is based upon expert judgement.

9.5.3 Approach to assessment of HSC

9.5.3.1 The assessment of effects on HSC has been undertaken in accordance with An Approach to Seascape Character Assessment (Natural England, 2012) and the methodology developed through consultation with HE at the AHEF meeting held on 13 July 2023.

9.5.3.2 HSC as not something that can be physically impacted but something that can be changed, therefore the assessment has defined the characteristics of the historic seascape and will assess whether or not these characteristics have the ability to accommodate change. A key element of HSC is that it can't be equated to sensitivity and therefore assessed as a receptor, therefore the HSC assessment will consider the magnitude of impact only.

9.6 Key parameters for assessment

9.6.1 Maximum design scenario

9.6.1.1 The maximum design scenarios (MDSs) identified in Table 9.15 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. These scenarios have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the Environmental Statement. Effects of greater adverse significance are not predicted to arise should any other design scenario, based on details within the Project Design Envelope (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

9.6.1.2 In assessing the effects of the Mona Offshore Wind Project on marine archaeology the assessment has been undertaken on the basis of i) the greatest area of near-surface sediments disturbed and ii) the greatest penetration depth of foundations. These two assessments are undertaken as they have very different effects on the marine historic environment.

9.6.1.3 Impacts on the settings of terrestrial heritage assets (landward of MLWS) are considered in Volume 3, Chapter 5: Historic environment of the Environmental Statement.

Table 9.14: MDS considered for assessment of potential impacts on marine archaeology.

*C=construction, Operations and maintenance, D=decommissioning

Potential Impact	Phase			Maximum Design Scenario	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors (the exposure or burial of receptors).	✓	✓	✓	**Construction phase** Site preparation: Sandwave clearance: • Sandwave clearance activities undertaken over an approximate 12 month duration within the wider four year construction programme • Wind turbines and Offshore Substation Platform (OSP) foundations: sandwave clearance has been calculated on the basis of wind turbine generator foundations and an assumption of clearance at up to 50% of locations. Spoil volume per location has been calculated on the basis of 34 locations supporting the largest suction bucket four legged jacket foundation with an associated base diameter of 205 m to an average depth of 7.5 m. This equates to a total spoil volume of 8,416,621 m^3 and a volume of 247,548 m^3 per location • Inter-array cables: sandwave clearance along 163 km of cable length with a width of 80 m, to an average depth of 3.0 m. Total spoil volume of 4,188,876 m^3 • Interconnector cables: sandwave clearance along 30 km of cable length, with a width of 80 m, to an average depth of 5.1 m. Total spoil volume of 432,000 m^3 • Offshore export cables: sandwave clearance along 72 km of export cable, with a width of 40 m, to an average depth of 5.1 m. Total spoil volume of 1,504,000 m^3 • Removal of up to 46 km of disused cables. Foundation installation: • Undertaken over an approximate 12 month duration • Wind turbines: installation of 45 three legged jacket piles of 5.5 m diameter, drilled to a depth of 75 m at a rate of up to 1.78 m/h. Spoil volume of 1,782 m^3 per pile • Wind turbines: installation of 23 conical gravity base foundations with a caisson diameter of 37 m and a sea surface diameter 15 m. Installation requires dredging of a maximum area of 32,761 m^2 to a maximum depth of 10 m. • OSPs: installation of one OSP with six legs with three piles per leg, each 5.5 m drilled to a depth of 75 m at a rate of up to 1.78 m/h. Spoil volume of 1,782 m^3 per pile • Two drilled piles installed concurrently at adjacent sites.	**Construction phase** Site preparation: • The volume of material to be cleared from individual sandwaves will vary according to the local dimensions of the sandwave (height, length, and shape) and the level to which the sandwave must be reduced. These details are not fully known at this stage, however based on the available data, it is anticipated that the sandwaves requiring clearance in the array area are likely to be in the range up to 15 m in height. In all cases the material cleared from the sandwave will be sidecast (i.e. placed in close proximity to the breach) in order that the sediment is readily available for supply for sandwave recovery • Site clearance activities may be undertaken using a range of techniques, the suction hopper dredger will result in the greatest increase in suspended sediment and largest plume extent as material is released near the water surface during the relocation of material. In reality plough dredging may be implemented however the volume of material brought into suspension would be reduced as material is ploughed along the bed • Boulder clearance activities will result in minimal increases in suspended sediment concentrations and have

Potential Impact	Phase	Maximum Design Scenario	Justification
		Cable installation: • Inter-array cables: Installation via trenching of up to 325 km of cable, with a trench width of up to 3 m and a depth of up to 6 m. Total maximum spoil volume of 2,925,000 m^3. Installed over a period of approximately 12 months • Interconnector cables: installation via trenching of up to 50 km of cable, with a trench width of up to 3 m and a depth of up to 3 m. Total spoil volume of 225,000 m^3. Installed over a period of approximately four months • Offshore export cables: installation via trenching of up to 360 km of cable, with a trench width of up to 3 m and a depth of up to 3 m. Total spoil volume of 1,620,000 m^3. Installed over a period of 15 months **Operational and maintenance phase** Project lifetime of 35 years • Inter-array cables: repair of up 10 km of cable in one event every three years. Reburial of up to 20 km of cable in one event every five years • Interconnector cables: repair of up to 16 km of cable in each of three events every 10 years. Reburial of up to 2 km of cable in one event every five years • Offshore export cables: repair of up to 32 km of cable in eight events every five years. Reburial of up to 15 km of cable in one event every five years **Decommissioning phase** • Scour and cable protection will remain *in situ*. If suction caissons are removed using the overpressure to release them then suspended sediment concentration will be temporarily increased • Inter-array and interconnector cables will be removed and disposed of onshore. • Offshore export cables will be removed and disposed of onshore.	therefore not been considered in the assessment. Foundation installation: • The dredging and site preparation associated with conical gravity base foundations may involve the use of up to 7,000 m^3 of this material as ballast within the structure. The remaining material will be sidecast in close proximity to be available within the sediment cell for transport and sandwave regeneration. • Installation of foundations via augured (drilled) operations results in the release of the largest volume of sediment unrestrained through the water column. The greatest volume of sediment disturbance by drilling at individual locations is associated with the largest diameter pile for wind turbines. The selected OSP scenario represents the greatest volume of sediment to be released for a drilling event • The selected OSP scenario represents the greatest volume of sediment to be released for a drilling event • The greatest drilling rate associated with the largest pile diameter represents the maximum level of increase in suspended sediment concentration • The MDS assumes that piles may require drilling to the full depth however it is noted that driven piling is more likely for, at least, part of the required depth. Cable installation: • Cable routes inevitably include a variety of seabed material and in some areas 3 m depth may not be achieved or may be

Potential Impact	Phase			Maximum Design Scenario	Justification
					of a coarser nature which settles in the vicinity of the cable route. The maximum burial depth of 6 m for inter-array cables would only be required at locations where significant seabed/sandwave mobility is identified. The assessment therefore considers the upper bound in terms of suspended sediment and dispersion potential • Cables may be buried by ploughing, trenching or jetting with trenching or jetting mobilising the greatest volume of material to increase suspended sediment concentrations **Operation and maintenance phase** • The greatest foreseeable number of cable reburial and repair events is considered to the MDS for sediment dispersion. **Decommissioning phase** The removal of cables may be undertaken using similar techniques to those employed during installation, therefore the potential increases in SSC and deposition would be in-line with the construction phase.
Direct damage to marine archaeology receptors ((e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)	✓	✓	✓	**Construction phase** Up to 60,512,833 m^2 of seabed impact in total across the Mona Array Area and Mona Offshore Cable Corridor. Maximum duration of the offshore construction phase is up to four years. <u>Mona Array Area</u> Up to 48,784,483 m^2 of seabed impact in the Mona Array Area comprising: • Jack-up events: up to 816,000 m^2 of disturbance from the use of jack-up vessels during foundation installation, with up to four jack-up events at each of 96 wind	<u>Construction phase:</u> Maximum footprint which would be affected during the construction, operations and maintenance and decommissioning phases. The MDS assumes 100% of all cables are buried. The MDS assumes that the width of disturbance for sandwave and pre-lay preparation (boulder and debris clearance) also includes subsequent burial.

Potential Impact	Phase	Maximum Design Scenario	Justification
		turbines (two jack-up events for wind turbines and two jack-up events for the foundations) and two jack-up events at each of four OSPs • Sandwave clearance for foundations: up to 923,839 m^2 of seabed impact associated with sandwave clearance comprising: – 826,440 m^2 of sandwave clearance associated with seabed preparation for wind turbine foundations – 97,399 m^2 of sandwave clearance associated with seabed preparation for OSP foundations. • Cable installation (including sandwave clearance and pre-lay preparation): up to 19,050,000 m^2 of disturbance comprising: – Inter-array cables: up to 16,250,000 m^2 impact from installation of up to 325 km of inter-array cables (assumes 50% requires boulder clearance with a 20 m width of disturbance and 50% requires sandwave clearance with an 80 m width of disturbance) – Interconnector cables: up to 2,800,000 m^2 impact from installation of up to 50 km of interconnector cables (assumes 40% requires boulder clearance with a 20 m width of disturbance and 60% requires sandwave clearance with an 80 m width of disturbance). • Sandwave clearance material deposition: Up to 26,074,994m^2 of seabed impact associated with the deposition of sandwave clearance material comprising: – 16,833,242 m^2 from deposition of 8,416,621 m^3 of sandwave clearance material associated with seabed preparation for wind turbine and OSP foundations – 8,377,752 m^2 from deposition of 4,188,876 m^3 of sandwave clearance material associated with seabed preparation for inter-array cables – 864,000 m^2 from deposition of 432,000 m^3 of sandwave clearance material associated with seabed preparation for OSP foundations • Anchor placements: up to 1,000,000 m^2 of seabed impact from two 100 m^2 anchor set placements (five anchors per set) every 500 m per inter-array cable link during installation (500 km) • Cable removal: Up to 920,000 m^2 from the removal of 46,000 m of disused cables • UXO removal: clearance of up to 22 UXOs within the Mona Array Area or Mona Offshore Cable Corridor ranging from 25 kg up to 907 kg with 130 kg the most likely (common) maximum. <u>Mona Offshore Cable Corridor</u>	For the purposes of the MDS, and to avoid double counting of the total footprint with sandwave clearance activities, the MDS assumes up to 50% of inter-array, 40% of interconnector, and 80% of export cables will be subject to pre-lay preparation only. The MDS assumes that the remainder of the cables will be subject to sandwave clearance. The area of seabed affected by the placement of sandwave clearance material has been calculated based on the maximum volume of sediment to be placed on the seabed, assuming all this sediment is coarse material (i.e. is not dispersed through tidal currents; see "Increased SSC" impact assessment below). The total footprint of seabed affected has been calculated, for the purposes of the MDS, assuming a mound of uniform thickness of 0.5 m height. The disturbance width is driven by the need to survey for UXO over the cable route. The actual disturbance width for cable installation is likely to be considerably less. Maximum number and maximum size of UXOs encountered in the Mona Array Area and Mona Offshore Cable Corridor. Due to uncertainties in size of UXOs the assessment presents a range, highlighting the most likely size (common) to be encountered. <u>Operations and maintenance phase:</u> The MDS for seabed impact associated with export cable maintenance includes repairs/reburial of subtidal cables. <u>Decommissioning phase:</u>

Potential Impact	Phase	Maximum Design Scenario	Justification
		Up to 11,728,000 m^2 of seabed impact in the Mona Offshore Cable Corridor comprising: • Export cable installation (including sandwave clearance and pre-lay preparation): up to 8,640,000 m^2 of impact resulting from installation of up to 360 km of export cables (assumes 80% requires boulder clearance with a 20 m width of impact and 20% requires sandwave clearance with a 40 m width of disturbance) • Sandwave clearance material deposition: up to 3,008,000 m^2 of seabed impact from deposition of 1,504,000 m^3 of sandwave clearance material associated with sandwave clearance for export cables • Anchor placements: up to 80,000 m^2 of seabed impact from a 100 m^2 anchor placement event every 500 m during offshore export cable installation within the nearshore area (10 km for each of the four export cables) • UXO removal: clearance of up to 22 UXOs within the Mona Array Area or Mona Offshore Cable Corridor ranging from 25 kg up to 907 kg with 130 kg the most likely (common) maximum. **Operations and maintenance phase** Up to 17,402,800 m^2 of seabed impact in total across the Mona Array Area and Mona Offshore Cable Corridor. Operational phase up to 35 years. <u>Mona Array Area</u> Up to 10,822,800 m^2 of seabed impact in the Mona Array Area comprising: • Up to 1,822,800 m^2 of seabed impact due to jack-ups at wind turbines and OSPs over the lifetime of the Mona Offshore Wind Project for the following: – Up to 840 major component replacements (one every four years for each location) for wind turbines – 12 major component replacements (three over the lifetime per OSP) for OSPs – Four access ladder replacements and four modifications to/replacement of J-tubes for wind turbines – Four access ladder replacements and four modifications to/replacement of J-tubes for OSPs • Up to 5,200,000 m^2 of seabed impact due to inter-array cable maintenance associated with: – 2,800,000 m^2 from seven reburial events (one every five years) affecting up to 20,000 m per reburial event	Parameters for decommissioning will be significantly lower than for the construction phase as sandwave clearance and pre-lay preparation will not be required in advance of cable removal and cable protection and scour protection may be left *in situ*. The MDS assumes the complete removal of all wind turbine and OSP foundations and cables.

Potential Impact	Phase			Maximum Design Scenario	Justification
				– 2,400,000 m^2 from 12 repair events (one every three years) affecting up to 10,000 m per cable repair events – Assuming 20 m width seabed disturbance for repair and remedial burial • Up to 3,800,000 m^2 of seabed impact due to interconnector cable maintenance: – 280,000 m^2 from seven reburial events (one every five years) affecting up to 2,000 m per reburial event – 3,520,000 m^2 from 11 repair events (three every 10 years) affecting up to 16,000 m of cable per repair event – Assuming 20 m width seabed disturbance for repair and remedial burial. <u>Mona Offshore Cable Corridor</u> Up to 6,580,000 m^2 of seabed impact in the Mona Offshore Cable Corridor comprising: • Subtidal export cable maintenance: – 4,480,000 m^2 from 14 repair events (two repairs every five years) for each of the four export cables (i.e. 56 repair events in total) affecting up to 4 km per cable per repair event (i.e. 16 km for all four cables) – 2,100,000 m^2 from seven reburial events (one event every five years) s affecting up to 15 km of cable per reburial event – Assuming 20 m width seabed disturbance for repair and remedial burial. Decommissioning phase Seabed impact due to: • Cable removal: disturbance from the removal of 325 km of inter-array cables, 50 km of interconnector cables and 360 km of offshore export cables • Anchor placements: seabed impact from anchor placements during cable removal • Jack-up events: impact from the use of jack-up vessels during foundation removal.	
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors)	✓	×	×	**Construction phase** As above for “Direct damage to archaeological receptors”. Foundation installation: 57 jacket foundations reaching pile penetration depth of 75 m and seabed disturbance footprint of 243,726 m^2.	Maximum depth of seabed disturbance of foundation installation represents the maximum impact to submerged prehistoric archaeological receptors.

Potential Impact	Phase			Maximum Design Scenario	Justification
Alteration of sediment transport regimes.	×	✓	×	**Operations and maintenance phase** • Wind turbines: 68 installations with four-legged suction bucket foundations, each jacket leg with a diameter of 5 m, spaced 48 m apart, and each bucket with a diameter of 16 m. Scour protection to a height of 2.5 m. Total footprint of 10,816 m^2 per wind turbine • OSPs: one installation with a rectangular gravity base foundation, with an 80 m by 60 m dimension at the surface, a slab base dimension of 100 m by 80 m and with scour protection to a height of 2.6 m. Total footprint of 19,500 m^2 • Inter-array cables: cable protection along 32.5 km of the cable. Up to 67 cable crossings, each crossing has a height of up to 4 m, a width of up to 36 m and a length of up to 80 m • Interconnector cables: cable protection along 10 km of the cable, with a height of up to 3 m and up to 10 m width. Up to ten cable crossings, each crossing has a height of up to 3 m, a width of up to 20 m and a length of up to 50 m • Export cables: cable protection along 72 km of the cable, with a height of up to 3 m and up to 10 m width. Up to 14 cable crossings, each crossing has a height of up to 3 m, a width of up to 30 m and a length of up to 50 m.	The presence of infrastructure (I.e, wind turbines) provides the largest obstruction to flow in the water column. See also Volume 2, Chapter 1: Physical processes of the Environmental Statement.

9.6.2 Impacts scoped out of the assessment

9.6.2.1 On the basis of the baseline environment and the description of development outlined in Volume 1, Chapter 3: Project description of the Environmental Statement, no impacts are proposed to be scoped out of the assessment for marine archaeology.

9.7 Measures adopted as part of the Mona Offshore Wind Project

9.7.1 Overview

9.7.1.1 For the purposes of the EIA process, the term 'measures adopted as part of the project' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the project design. These include modifications to the location or design envelope of the Mona Offshore Wind Project which are integrated into the application for consent. These measures are secured through the consent itself through the description of the development and the parameters secured in the DCO and/or marine licences (referred to as primary mitigation in IEMA, 2016)
- Measures required to meet legislative requirements, or actions that are standard practice used to manage commonly occurring environmental effects and are secured through the DCO requirements and/or the conditions of the marine licences (referred to as tertiary mitigation in IEMA, 2016).

9.7.1.2 A number of measures (primary and tertiary) have been adopted as part of the Mona Offshore Wind Project to reduce the potential for impacts on marine archaeology. These are outlined in Table 9.15 below. As there is a secured commitment in the marine license(s) to implementing these measures for the Mona Offshore Wind Project, they have been considered in the assessment presented in section 9.8 below (i.e. the determination of magnitude and therefore significance assumes implementation of these measures). The measures adopted as part of the Mona Offshore Wind Project are captured in the Outline WSI and PAD appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

Table 9.15: Measures adopted as part of the Mona Offshore Wind Project.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Primary measures: Measures included as part of the project design		
The identification and implementation of AEZs around those sites identified as having high and medium archaeological potential (Table 9.17). Further details of which are provided in the Outline WSI and PAD. Final wind turbine locations to avoid any known archaeological constraints identified in pre-construction site investigation surveys through micrositing.	To avoid any potential direct impacts on sites of identified archaeological significance.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
The identification and implementation of TAEZs based on all available information including the stated positional accuracy, the recorded size of the target and the potential archaeological significance around those records for wrecks and obstructions outside of the survey data coverage but within the Mona Offshore Wind Project. Further details of which are provided in the Outline WSI and PAD, appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.	To avoid any potential impacts on sites of archaeological importance.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Archaeological input into specifications for, and archaeological analysis of, any further site investigation. Further details of which are provided in the Outline WSI and PAD which are provided in the Outline WSI and PAD, appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body. To offset any potential impacts of the Mona Offshore Wind Project through preservation by record on sediments of geoarchaeological/palaeoenvironmental importance and enhance knowledge of the offshore marine archaeological resource.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Mona Offshore Wind Project archaeologists to be consulted in the preparation of any pre-construction Remotely Operated Vehicle/diver surveys and, if appropriate, in monitoring/checking of data. Further details of which are provided in the Outline WSI and PAD.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.

Measures adopted as part of the Mona Offshore Wind Project	Justification	How the measure will be secured
Operational awareness of the location of those archaeological anomalies identified as having a low potential. Reporting through the agreed protocol (PAD) will be undertaken should material of potential archaeological interest be encountered. Further details of which are provided in the Outline WSI and PAD.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the Statutory Historic Body.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Archaeologists to be consulted in the preparation of pre-construction clearance operation and, if appropriate, to carry out archaeological monitoring of such work. Further details of which are provided in the Outline WSI and PAD.	To record archaeological remains that may be affected by pre-construction clearance operation.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Mitigation of unavoidable direct impacts on known sites of archaeological significance through options which include i) preservation by record; ii) stabilisation; iii) detailed analysis and safeguarding of otherwise comparable sites elsewhere. Further details are provided in the Outline WSI and PAD.	To offset the effects of disturbance/destruction of irreplaceable archaeological remains.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Commitment to the ongoing monitoring of known archaeological receptors through the acquisition of relevant spatial survey data. This monitoring will include the appropriateness of, and adjustments that need to be made to, AEZs through the lifetime of the Mona Offshore Wind Project.	Changes to marine archaeology receptors during the lifetime of offshore wind projects are not well known. Industry guidance (Wessex Archaeology, 2007a) suggests that monitoring methods, set out in the WSI, may include periodic reporting on adherence to exclusion zones and the results of watching briefs. Periodic reporting will provide a potential beneficial effect through regional mapping of accessible data and provision of publicly accessible data post-consent (described but currently not quantifiable).	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.
Tertiary measures: Measures required to meet legislative requirements, or adopted standard industry practice		
Commitment to preparation, agreement and implementation of an Offshore WSI prior to any post-consent works within the Mona Offshore Wind Project.	The Outline WSI will be submitted alongside the application and will contain a method statement for pre-construction surveys and details of monitoring requirements. The PAD will ensure the protection and, if necessary, recording of previously unknown sites/objects of archaeological significance affected by the development.	Secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.

9.7.2 Archaeological Exclusion Zones (AEZs)

9.7.2.1 Best practice favours the preservation in situ of archaeological remains, therefore the ideal preferred mitigation for archaeological remains is avoidance (Wessex Archaeology for the Crown Estate, 2021). For the Mona Offshore Wind Project, AEZs have been proposed that prohibit development-related activities within their extents, which vary depending upon the nature of the site. The final Mona Offshore Wind Project design will take into account these preliminary zones, which may evolve or be removed (with the agreement of the NRW, Cadw and RCAHMW) as the Mona Offshore Wind Project progresses, subject to the project design and additional subsequent surveys that may be required.

9.7.2.2 The appropriateness and effectiveness of the AEZs and condition of the archaeological assets will be monitored through the acquisition of survey data during the lifetime of the Mona Offshore Wind Project. Data relating to the marine archaeology assets will be archived with NRW through RCAHMW at the outset of the Mona Offshore Wind project and as it is collected through its lifetime.

9.7.2.3 All AEZs agreed with Cadw and RCAHMW, through the Offshore WSI, will be marked on the Offshore Historic Environment Plan. If impacts cannot be avoided, measures to reduce, remedy or offset disturbance will be agreed with NRW in consultation with Cadw and RCAHMW.

9.7.2.4 In view of their potential archaeological significance, AEZs (either in the form of individual AEZs or clusters) will be placed around the 14 anomalies classified as being of high archaeological potential and the 16 anomalies classed as being of medium potential that are located within the Mona Offshore Wind Project. These anomalies have been recommended AEZs 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 three high potential anomalies that were identified within the Mona marine archaeology study area but out with the Mona Offshore Wind Project have not been assigned AEZ's as they are all located more than 100 m from the Mona Array Area and therefore there is no pathway for direct impact. One TAEZ has been recommended within the Mona Offshore Cable Corridor for UKHO record 93502.

9.7.2.5 Dependant of the form of the anomaly, AEZs have either been recommended as a radius' from the centre point of the anomaly or as a distance from the extents. Particularly in the case of shipwrecks, which tend to be longer in length than width, the use of a circle provides unequal protection around the extents. This not only impacts the protection afforded but does not present proportional mitigation.

9.7.2.6 The proposed AEZs are listed in Table 9.16 and shown in Figure 9.6 and Figure 9.7. Scope is allowed for their amendment in light of further evidence and with the involvement of NRW, Cadw and RCAHMW. Further details of AEZs and archaeological monitoring will be provided in the Outline WSI and PAD. AEZs can be different sizes depending on the size of the archaeological anomaly and the extent to which there is associated debris present on the seabed.

9.7.2.7 The AEZs identified for the Mona marine archaeology study area have been compiled from the results of the archaeological assessments of geophysical and hydrographic data for Mona Offshore Wind Project. These have been reviewed against desk based and site-specific data, and as a result of this review AEZ's have been identified of varying sizes according to the size and spread of the individual archaeological receptor.

9.7.2.8 AEZs are presented as either extents or a radius. Extents indicate the distance proposed from the furthest extents of the archaeological anomaly whilst a radius AEZ is one that is measured as a circumference from the central point of the anomaly.

9.7.2.9 Further TAEZs and AEZs may be assigned during the course of the project as anomalies that have been identified in the data do not necessarily represent all of the marine archaeological material that is on the seafloor. For example, wooden wrecks can be buried under the seabed and may not appear in the data. If previously unidentified material of cultural significance is identified, it would require an AEZ.

9.7.2.10 Low potential anomalies are not provided AEZs or TAEZs but will be considered in the final Project Design through micrositing via the acquisition of high-resolution geophysical data, to be acquired post-consent and as part of the mitigation strategy, as outlined in Table 9.15. Full details are presented in the Outline WSI and PAD (Document Reference J18).

Table 9.16: Proposed AEZs within the Mona marine archaeology study area.

ID	Description	Potential	Eastings	|Northings	AEZ (m)
Mona_0076	Wreck	High	433419.2	5953767.8	50 extents
Mona_0084	Wreck	High	435824.4	5948735.6	50 extents
Mona_0091	Wreck	High	440973.4	5940170.0	50 extents
Mona_0108	Potential wreck	High	436254.1	5959800.1	50 extents
Mona_0110	Potential wreck	High	435333.1	5951723.8	50 extents
Mona_0080	Unidentified debris	Medium	431545.5	5954410.7	15 radius
Mona_0081	Potential debris	Medium	446410.7	5943791.7	15 radius
Mona_0092	Potential wreck	Medium	430376.0	5946260.9	25 radius
Mona_0102	Potential debris	Medium	435869.6	5959476.0	15 radius
Mona_0109	Mound	Medium	434606.8	5954333.8	30 radius
Mona_0112	Mound	Medium	442619.1	5940823.2	15 radius
Mona_0009	Wreck	High	444396.3	5937516.9	50 extents
Mona_0030	Potential wreck	High	435890.5	5937670.3	50 extents
Mona_0031	Potential wreck	High	438516.7	5935692.4	50 extents
Mona_0037	Potential wreck	High	436239.1	5938033.9	50 extents
Mona_0040	Potential wreck	High	436676.6	5937578.9	25 extents
Mona_0049	Potential wreck	High	455141.6	5909212.6	25 extents
Mona_0067	Potential wreck	High	446219.6	5913202.3	50 extents
Mona_0014	Potential wreck	High	436407.3	5935691.7	25 extents
Mona_0068	Potential wreck	High	455717.1	5908796.2	25 extents
Mona_0018	Potential debris	Medium	439865.8	5931973.2	25 extents
Mona_0025	Potential debris	Medium	442354.5	5937489.0	50 extents
Mona_0033	Mound	Medium	438392.3	5931929.6	25 extents
Mona_0038	Potential debris	Medium	439386.8	5929010.4	50 extents
Mona_0044	Debris	Medium	445694.8	5938210.5	25 extents

ID	Description	Potential	Eastings	|Northings	AEZ (m)
Mona_0048	Potential debris	Medium	440139.3	5937112.4	25 extents
Mona_0066	Potential debris	Medium	454791.8	5909474.8	25 extents
Mona_0065	Seabed disturbance	Medium	453545.1	5908994.0	50 extents
Mona_0069	Mound	Medium	457913.3	5907677.7	50 extents
UKHO 93502	Degraded wreck possibly partially covered in sediment. Record from 2021.	N/A	449229.7	5911740.7	100 m radius

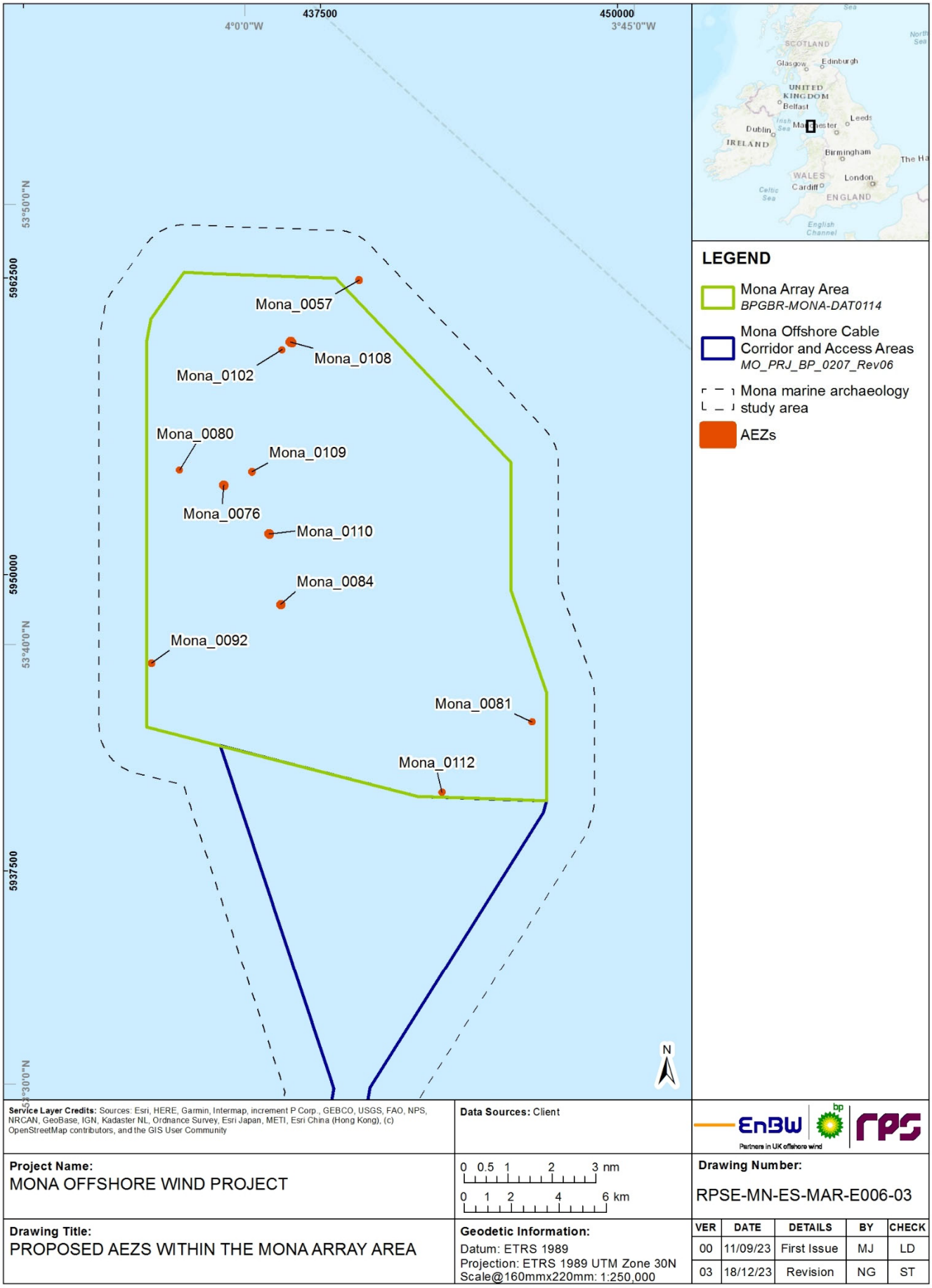

Figure 9.6: Proposed AEZs within the Mona Array Area.

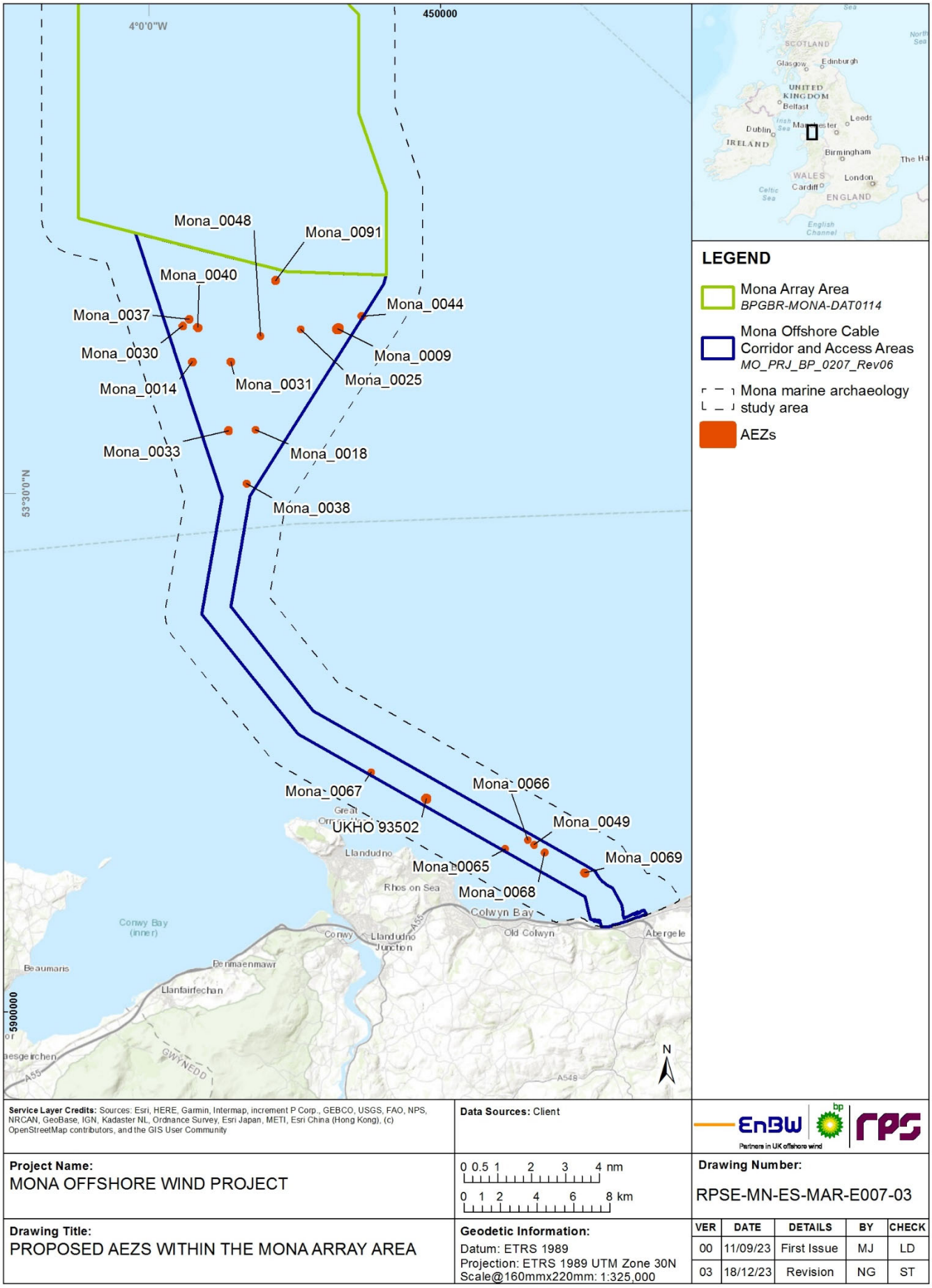

Figure 9.7: Proposed AEZs within the Mona Offshore Cable Corridor.

9.7.3 Preservation by record

9.7.3.1 Where preservation in situ is not practicable, disturbance of archaeological sites or material will be offset by appropriate and satisfactory measures, also known as 'preservation by record'. In these circumstances, the effects of the Mona Offshore Wind Project will be offset by carrying out excavation and recording prior to the impact occurring (Wessex Archaeology for The Crown Estate, 2021). Approaches to additional archaeological mitigation measures is set out in the Outline WSI and PAD appended to Volume 6, Annex 9.1: Marine archaeology technical report of the Environmental Statement.

9.7.3.2 The Offshore Renewables Protocol for Archaeological Discoveries (The Crown Estate, 2014) will be followed, which will involve the reporting of archaeological discoveries made during the lifetime of the Mona Offshore Wind Project. This protocol covers the reporting and investigating of unexpected archaeological discoveries encountered during construction, operations and maintenance and decommissioning activities, informed by the guidance of a marine archaeologist specialised in working with PADs for offshore wind farm projects. This protocol further makes provision for the implementation of TAEZs around areas of possible archaeological interest, for prompt archaeological advice and, if necessary, for archaeological inspection of important features prior to further construction, maintenance or decommissioning activities in the vicinity. It complies with the Merchant Shipping Act 1995, including notification to the Receiver of Wrecks, in accordance with the Code of Practice for Seabed Developers (Joint Nautical Archaeology Policy Committee (JNAPC) 2006).

9.7.3.3 In view of the potential for the presence of palaeolandscapes, associated prehistoric sites and unidentified wrecks, archaeological monitoring is deemed as appropriate where seabed material is brought to the surface. These proposals may be refined on the basis of the results of any further site investigation.

9.8 Assessment of significant effects

9.8.1 Overview

9.8.1.1 The impacts of the construction, operations and maintenance, and decommissioning phases of the Mona Offshore Wind Project have been assessed on marine archaeology. The potential impacts arising from the construction, operations and maintenance and decommissioning phases of the Mona Offshore Wind Project are listed in Table 9.14 along with the MDS against which each impact has been assessed.

9.8.1.2 A description of the potential effect on marine archaeology receptors caused by each identified impact is given below.

9.8.2 Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.

9.8.2.1 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project may lead to sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors identified in section 9.4.4. The MDS is represented by site preparation activities such as sandwave clearance, foundation and cable installation and is summarised in Table 9.14.

9.8.2.2 The disturbance of sediment/seabed deposits can result in the exposure of known marine archaeology receptors (i.e. wreck sites) and the exposure of as yet unknown

wreck sites and associated materials. Such activities can also result in the burial of known receptors.

Construction, operations and maintenance and decommissioning phases

Magnitude of impact

9.8.2.3 The installation of infrastructure within for the Mona Offshore Wind Project may lead to increased suspended sediment concentrations and associated deposition. The MDS for sandwave clearance was along 163 km length of the inter array cable and width of 80 m, to an average depth of 3 m. Similarly, sandwave clearance at the same depth and width was determined along the interconnector cable (30 km). For the export cable the clearance length was 72 km with a 40 m width of clearance.

9.8.2.4 Sandwave clearance may be required at up to 50% of the potential locations for suction bucket foundations and both sandwave clearance and dredging may be required for the installation of gravity base foundations. For the largest conical gravity bases the maximum dredging area per foundation may be 32,761 m2 whilst the average area is 14,641 m2, similarly the maximum dredging depth may be 10 m with an average depth of 3 m. It is proposed that a small proportion of the dredged material from site preparation, 7,000 m3 per foundation, is to be sequestered as ballast within the gravity base foundation. Therefore, although this material will be removed from the sediment budget, the sediment in question represents a smaller volume than that occupied by the gravity base foundation within the seabed.

9.8.2.5 The MDS is for the drilled installation of 45 wind turbine foundations each with three-legged piles of 5.5 m diameter and the remaining 23 foundations being conical gravity base foundation with a caisson diameter of 37 m. Included is the installation of one OSP with foundations consisting of six legs with three 5.5 m piles per leg, drilled to a depth of 75m. Up to two piles may be installed concurrently. For the installation of inter-array cables (325 km), interconnector cables (50 km) and export cables (360 km) a trench of up to 3 m in width and typical maximum depth 3 m in depth with a triangular cross section may be excavated. It may be necessary in selected locations to increase the burial depth to 6 m.

9.8.2.6 Volume 2, Chapter 1: Physical processes of the Environmental Statement) modelled scenarios examined a range of locations within and in close proximity to the Mona Array Area, with two concurrent drilling operations at adjacent locations. The modelled scenarios examined drilling of larger 16 m diameter piles at a similar drilling rate. These are anticipated to generate plumes with a suspended sediment level of <50 mg/l therefore the smaller diameter piles would result in lower SSC. These levels would be localised and only persist for a short period. Concentrations within the plume envelope are much lower, typically <1 mg/l a short distance from the discharge locations. Following the cessation of drilling the turbidity levels reduce within a few hours as tidal currents reduce. Some of the finer material associated with the drilling process is re-suspended during successive tides as it is redistributed, but turbidity levels remain low. The sedimentation beyond the immediate drilling location is indiscernible (less than 1 mm). This is due to the relatively slow drilling rate, allowing the fine sediment to be widely dispersed while the larger material settles at the release point due to the limited current speed.

9.8.2.7 For the inter-array cable installation, the sediment plumes are much larger than those for the pile installation. The reason for this is twofold, firstly there is a large amount of sediment mobilised (220,500 m3 of material was mobilised during the 4 day simulation along the 49 km modelled route), and secondly there was elevated tidal currents on

successive tides which remobilised material over the extended period of installation. Peak plume concentrations are highest at around 500 mg/l (at the release site), with the sediment settling during slack water becoming resuspended in the form of an amalgamated plume. Sedimentation of 30 mm depth occurs at the trench site, with sediment depths reducing moving away from the trench but remaining in the sediment cell and retained in the sediment transport system.

9.8.2.8 Following the completion of the works the turbidity levels return to baseline within a couple of tidal cycles. It would however be anticipated that spring tides following the works may mobilise and redistribute unconsolidated seabed material deposited at the end of the construction phase; this material will therefore be incorporated into the existing transport regime. Following installation, the native seabed material settles close to where it is mobilised and remains in situ. This would be expected as the baseline modelling indicated that sediment transport potential is limited across the Mona Offshore Wind Project area. The sedimentation is concentrated along the installation route as material effectively returns to the site from where it was disturbed. Sedimentation depths of <30 mm arise beyond the immediate vicinity of the trench the day after drilling cessation, and therefore, would be indiscernible from the existing seabed sediment.

9.8.2.9 Export cable installation shows a higher variability in suspended sediment concentration due to the change in hydrography along the export cable corridor and, as anticipated, SSC increased in limited water depth. Average levels of suspended sediment concentrations of <300 mg/l are noted along the cable path, with the level dropping to background levels on the slack tide.

9.8.2.10 The project design includes the provision of site preparation/sandwave clearance activities which have the potential to increase suspended sediment concentrations in the construction phase with associated sedimentation. Sandwave clearance was calculated for 50% of the wind turbine and OSP foundations at a width of 205 m and a depth of 7.5 m. Modelling was undertaken for representative areas of sandwave clearance, with clearance of a 104 m wide corridor to facilitate cable installation with an average depth of 5.1 m, with modelling assuming a clearance dredging rate of 10,000 m3/h and a 3% spill of material during the dredging phase.

9.8.2.11 The modelling simulated the use of a suction hopper dredger with a phasing representative of the scale of the sandwaves; dredging, and then depositing material within the Mona Offshore Cable Corridor as it progressed along the route, resulting in higher quantification of sedimentation compared to the plough dredging. It should be noted that when undertaking sandwave clearance the material will be sidecast to a location adjacent to the sandwave clearance to allow this material to be available for migration and sandwave recovery.

9.8.2.12 Refinement of the project description since the modelling was undertaken has subsequently reduced both the length of cable route requiring sandwave clearance and also minimised the corridor width to 80 m for inter-array and interconnector cables and 40 m for export cables. Therefore, the magnitude of impacts would be reduced from those presented in Volume 6, Annex 1.1: Physical processes technical report of the Environmental Statement and also reducing the sandwave recovery period. It is also noted that the refinement of the Mona Array Area for the Environmental Statement means that some of the modelled clearance and cable routes lie beyond the revised Mona Array Area. However, these locations are comparable with those within the Mona Array Area in terms of sediment grading and hydrodynamic conditions, and therefore, it can be assumed that the modelled data is applicable to the revised scheme.

9.8.2.13 The MDS for the operations and maintenance phase is for up to 10 km inter-array cable repair (one event every three years) and reburial event of up to 20 km (once every five years). Including 16 km export cable repair (three events every 10 years) and reburial events of up to 2 km of cable every one event in every five years. The repair of 32 km of offshore export cables (eight events in every five years) and reburial of up to 15 km once every five years, over the 35 year lifetime of the project (Table 9.14). Using similar methods as those for cable installation activities (i.e. trenching/jetting, with trench width up to 3 m and trench depth up to 3 m).

9.8.2.14 In each case the length of the repair or reburial activity may be up to 20 km; therefore, the magnitude of the impacts would be a fraction of those for the construction phase. In the case of the export cable the total length of works would be approximately 60% of the length of the construction phase with events being undertaken over the duration of the 35 year project lifetime. The sediment plumes and sedimentation footprints would be dependent on which section of the cable is being repaired however the entire length has been quantified under the construction phase scenario discussed above.

9.8.2.15 The MDS for the decommissioning phase is represented by the removal of inter-array, interconnector and offshore export cables in which increases in SSC due to would be similar to those experienced during the construction phase, as retrieval would be undertaken using similar techniques to installation. In the case of piled foundations, there is no significant disturbance of the seabed during decommissioning as piles are cut off. SSC would increase temporarily if suction caissons were removed using overpressure to release. Decommissioning of gravity bases would involve the removal of ballast, including sand sequestered during construction. This material, which may also include rock will be disposed of off-site and therefore a small proportion of sediment may be released during the removal/dredging operations. Decommissioning of the foundations is assumed to result in increases in suspended sediments and associated deposition that are no greater than those predicted for the construction phase. For the purposes of this assessment, the impacts of decommissioning activities are therefore predicted to be no greater than those for construction, as set out above.

9.8.2.16 The implementation and adherence to the WSI and PAD as described in section 9.7 will ensure that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported. The burial of marine archaeology receptors could also occur and would have a beneficial impact as this would afford them more protection.

9.8.2.17 Therefore, sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors as discussed in section 9.4.4 during the construction, operations and maintenance, and decommissioning of the Mona Offshore Wind Project is predicted to be of local spatial extent, short term duration, intermittent and medium reversibility and will result in some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, composition or attributes. It is predicted that the impact will affect marine archaeology indirectly. The magnitude is therefore considered to be **low**.

Sensitivity of the receptor

9.8.2.18 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors identified in section 9.4.4 are vulnerable sites that can be exposed further by disturbance activities.

9.8.2.19 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore activities associated with Mona Offshore Wind Project such as the installation of wind

turbine and OSP foundations have the potential to directly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.8.2.20 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Therefore as per the methodology described in section 9.5 the sensitivity of the receptor is therefore considered to be **high**.

Significance of the effect

9.8.2.21 The measures adopted as part of the Mona Offshore Wind Project outlined in section 9.7 include measures such as adherence to the WSI and PAD that will ensure that any newly exposed archaeological assets are protected and recorded.

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

9.8.3 Direct damage to marine archaeology receptors ((e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)

9.8.3.1 The seabed activities to facilitate the construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project have the potential to impact both maritime archaeology receptors and submerged prehistoric receptors within the Mona marine archaeology study area. Direct damage to marine archaeology receptors may result from activities including the use of jack-up vessels during the installation of foundations for wind turbines and OSPs, sandwave clearance, pre-lay preparation (e.g. boulder and debris clearance), cable installation and repair as well as anchor placements associated with these activities. Direct damage may also arise as a result of the removal of disused/out of service cables. The MDS for direct damage to marine archaeology receptors is summarised in Table 9.14.

Construction, operations and maintenance and decommissioning phases

Magnitude of impact

9.8.3.2 The maximum design scenario for the construction phase is comprised of seabed preparation activities for foundations and cables; installation of up to 68 wind turbines and four OSPs, with associated scour protection; the installation of inter-array, interconnector and offshore export cables and associated cable protection; and any associated jack-up vessel and vessel anchoring activities.

9.8.3.3 The MDS for the operational and maintenance phase is comprised of component replacement activities using jack-up vessels, inter-array, interconnector and offshore export cable repair or reburial activities, and any associated vessel anchor deployments.

9.8.3.4 Decommissioning of the Mona Offshore Wind Project infrastructure will involve cable decommissioning and any associated jack-up vessel and vessel anchoring activities.

9.8.3.5 These activities have the potential to directly and permanently impact upon marine archaeology receptors and areas of archaeological potential that lie concealed below the covering sands. These activities also have the potential to expose previously

unrecorded marine archaeology receptors. For the purposes of this assessment, the impacts of operations and maintenance and decommissioning activities are predicted to be no greater than those for construction, as set out above.

9.8.3.6 As described in section 9.7, measures adopted as part of the Mona Offshore Wind Project account for preservation by record of submerged prehistoric archaeology through data acquired from geotechnical surveys which will be reviewed by a marine archaeologist and the findings will be communicated to Cadw and HE. This, along with the implementation and adherence to the PAD for any prehistoric discoveries, ensures preservation by record, reducing the magnitude of the impact on submerged prehistoric archaeology to low.

9.8.3.7 AEZs will be established around each known shipwreck site and within which no activities will take place unless agreed by Cadw. This will reduce the magnitude of the impact on known marine archaeology receptors to no change.

9.8.3.8 Pre-construction site investigation surveys will be reviewed by a marine archaeologist to inform the refined layout of infrastructure around any newly identified archaeological constraints. Provision will also be made for the recording of any new discoveries via the WSI and PAD. These measures will ensure preservation by record and reduce the magnitude of the impact on as yet unknown marine archaeology receptors to low.

9.8.3.9 Direct damage to marine archaeology receptors is predicted to result in some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, composition or attributes. Due to the primary measures adopted as part of the project (section 9.7), the magnitude is considered to be **low** or no change.

Sensitivity of receptor

9.8.3.10 The Mona marine archaeology study area retains a substantial number of shipwrecks and the potential for more discoveries arises with the installation works proposed. Shipwrecks are vulnerable sites that can be exposed by disturbance activities. Shipwrecks are regarded as being of importance, as they add to our understanding of ship construction, maritime routes and movements of their period.

9.8.3.11 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore activities associated with Mona Offshore Wind Project such as the installation of wind turbine and OSP foundations have the potential to directly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.8.3.12 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Therefore as per the methodology described in section 9.5 the sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

9.8.3.13 Overall, the magnitude of the impact is low or no change and the sensitivity of the receptor is high. Due to the proposed mitigation strategy the effect will, therefore, be of at worse **minor adverse** significance, which is not significant.

9.8.4 Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. palaeolandscapes and associated archaeological receptors)

9.8.4.1 The seabed activities required to facilitate the construction of the Mona Offshore Wind Project have the potential to impact on previously unrecorded palaeolandscape locations within the Mona marine archaeology study area.

Construction phase

Magnitude of impact

9.8.4.2 The MDS for the construction phase is comprised of seabed installation of up to 57 wind turbines and four OSPs on four legged jacket foundations with pile penetration depth of up to 75 m. These activities have the potential to directly and permanently impact palaeolandscape locations that might lie deeply buried below the covering sands.

9.8.4.3 The measures adopted as part of the Mona Offshore Wind Project, as described in section 9.7 account for preservation by record of submerged prehistoric archaeology through data acquired from geotechnical surveys which will be reviewed by a marine archaeologist and the findings communicated to Cadw and HE. This, along the implementation and adherence to the PAD which will ensure preservation by record of any prehistoric discoveries that may be made will reduce the magnitude of the impact on submerged prehistoric archaeology to low.

9.8.4.4 Direct damage to deeply buried marine archaeology receptors is predicted to result in some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, composition or attributes. Due to the primary measures adopted as part of the project, the magnitude is considered to be **low**.

Sensitivity of receptor

9.8.4.5 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore the installation of wind turbine and OSP foundations have the potential to directly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.8.4.6 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Therefore as per the methodology described in section 9.5 the sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

9.8.4.7 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Due to the proposed mitigation strategy it is considered that the effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

9.8.5 Alteration of sediment transport regimes

9.8.5.1 The presence of infrastructure on the seabed can obstruct flow in the water column and lead to localised changes in the sediment transport regimes. This has the potential

to indirectly impact on the marine archaeology receptors identified in section 9.4.4 and those that are as yet unknown within the Mona marine archaeology study area and the immediate vicinity by either exposing them, causing the sites to become vulnerable or by burying them, which may have a beneficial impact.

Operations and maintenance phase

Magnitude of impact

9.8.5.2 The MDS is comprised of the presence of up to 68 wind turbines with 4-legged suction bucket foundations for each jacket leg at 5 m diameter spaced 48 m apart, and each bucket with a diameter of 16 m. Scour protection at each bucket foundation of 2.5 m in height and extending 20 m covering a total footprint of 10,816 m2.

9.8.5.3 Additionally, the MDS includes one OSP with a rectangular gravity base foundation with an 80 m by 60 m dimension at the surface and a slab base of 100 m by 80 m at the bed. Associated scour protection extends from the slab base by 25 m at a height of 2.6 m giving rise to 19,500 m2 footprint per unit. The modelled scenario presented in Volume 6, Annex 1.1: Physical processes technical report of the Environmental Statement used an alternate array arrangement and OSPs within the modelled scenario.

9.8.5.4 The modelled array comprised of the same number of units and dimensions as those described by the MDS however following the modelling study the Mona Array Area has been reduced in size to accommodate navigation issues. The influence of each unit quantified by the modelling study remains applicable for the assessment.

9.8.5.5 Sediment transport is driven by a combination of tidal currents and wave conditions, the magnitude of these has been individually quantified as described above. Physical processes modelling as presented in Volume 2, Chapter 2: Physical processes of the Environmental Statement has concluded that changes in magnitude compared to baseline current flow are ±5% which would not be sufficient to disrupt sediment transport.

9.8.5.6 Residual currents are effectively the driver of sediment transport and therefore any changes to residual currents would have a direct impact on sediment transport which would persist for the lifecycle of the Mona Offshore Wind Project. However, physical processes modelling as presented in Volume 2, Chapter 2: Physical processes of the Environmental Statement has concluded that the presence of the foundation structures does not have a significant influence on either tide or wave conditions therefore they cannot therefore have a significant effect on the sediment transport regime. For completeness, the residual current and sediment transport was simulated with the foundations in place. The maximum change in residual current and sediment transport is circa ±10% which is largely sited within close proximity to the wind turbine foundation structures (i.e. as a result of the scour protection). Changes in the residual current and sediment transport reduce with increasing distance from the wind turbines towards baseline levels.

9.8.5.7 The use of a single rectangular gravity base OSP forms a greater obstruction to sediment transport than the suction bucket foundations considered for the wind turbine structures. The footprint of the foundation is 19,500 m2, therefore, the orientation of the unit and the detail of the scour protection design will determine the impact of sediment transport pathways. The influence of wave and tides and therefore the driving force of sediment transport, diminished rapidly from the unit, therefore, the OSP being sited within the Mona Array Area would not induce changes to sediment transport beyond the immediate vicinity.

9.8.5.8 Sandwave clearance may be required at the site of turbine locations, particularly in the case of gravity based structures to accommodate a slab base. For the largest gravity base foundation proposed, the slab base has a diameter of 43 m with scour protection extending 22 m from the slab base. Dredging and sandwave clearance may be required up to a diameter of 173 m to accommodate seabed profiling; therefore, there may be localised disruption to sandwave features. It is proposed to sequester 7,000 m3 of the dredged material to provide ballast, however the majority (92.8%) of the dredged material will be placed in the immediate vicinity of the seabed preparation activities. This material will be available for sediment transport under the revised transport pathways, which are altered by typically 10% in the immediate vicinity of the structures as flow and transport are redirected around the infrastructure.

9.8.5.9 The hydrodynamic regime is highly variable through tidal cycles and due to meteorological conditions, with the scale of the impact being well within the natural variation. The changes to tidal currents, wave climate, littoral currents, and sediment transport are insignificant in terms of the hydrodynamic regime. Effects on tidal current and wave climate would be reversible on decommissioning (i.e. following removal of the wind turbine structures).

9.8.5.10 The implementation and adherence to the WSI and PAD as described in section 9.7 will ensure that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported. The burial of marine archaeology receptors would have a beneficial impact as this would afford them more protection.

9.8.5.11 The impact is predicted to be of local spatial extent and long term duration as it relates to permanent infrastructure. Therefore, the alteration of sediment transport regimes leading to indirect impacts on marine archaeology receptors during the operations and maintenance phase of the Mona Offshore Wind Project is predicted to result in some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, composition or attributes. The magnitude is therefore considered to be **low**.

Sensitivity of the receptor

9.8.5.12 The Mona marine archaeology study lies in a wider area that retains a substantial number of shipwrecks. Shipwrecks are vulnerable sites that can be exposed or buried by significant alteration of the sediment transport regimes.

9.8.5.13 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore activities associated with Mona Offshore Wind Project such as the installation of wind turbine and OSP foundations have the potential to directly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.8.5.14 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Therefore as per the methodology described in section 9.5 the sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

9.8.5.15 Overall, the magnitude of the impact is deemed to be low and the sensitivity of the receptor is considered to be high. Based on professional judgement it is considered that the effect will, therefore, be of **negligible** significance, which is not significant in EIA terms.

9.8.6 Effects on Historic Seascape Character

9.8.6.1 The Mona Offshore Wind Project would involve the construction of new infrastructure. The effects on the Historic Seascape Character (HSC) are therefore assessed.

9.8.6.2 The assessment identified a variety of seascape characteristics within the Mona marine archaeology study area. These can be summarised as:

- Modern installations and activities such as hydrocarbon installations, oil and gas fields and pipelines and submarine cables
- A range of fishing methods used in the modern period
- Navigation routes, both modern and post medieval
- Wrecks and maritime debris (in some cases undated)
- Seabed types and characteristics including coarse fine sediment plains.

9.8.6.3 There are also known to be a number of proposed offshore wind farms within the wider seascape, including the Morecambe Offshore Windfarm: Generation Assets (hereafter referred to as the Morecambe Generation Assets) and the Morgan Offshore Wind Project: Generation Assets (hereafter referred to as the Morgan Generation Assets. Overall, the Mona Offshore Wind Project would be in line with the modern installations already present within the area.

Magnitude

9.8.6.4 The Mona Offshore Wind Project will introduce new infrastructure to the existing seascape. These developments are in line with the character and location of the existing seascape, likewise, operations and maintenance activities are likely to be in line with those which have characterised the area in its previous use for the energy industry. Decommissioning may lead to removal of some infrastructure, though again this is likely to be in line with previous conditions.

9.8.6.5 While the development type would be new it would not pose a significant change to the character of the area, which is currently utilised by energy and other industries. Potential impacts to wrecks have been mitigated through implementation of AEZs and thus no change to the character of these assets is anticipated. Therefore, it is considered the HSC can accommodate the introduction of the Mona Offshore Wind Project without altering the existing characteristics of the HSC as historic elements and other activities including fishing, navigation and seabed character would remain substantially unchanged.

9.9 Cumulative effect assessment methodology

9.9.1 Methodology

9.9.1.1 The Cumulative Effects Assessment (CEA) takes into account the impact associated with the Mona Offshore Wind Project together with other projects and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise (see Volume 5, Annex 5.1: CEA screening matrix of the Environmental Statement). Each project has been considered on a case by case basis for screening in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

9.9.1.2 The marine archaeology CEA methodology has followed the methodology set out in Volume 1, Chapter 5: EIA methodology of the Environmental Statement. As part of the assessment, all projects and plans considered alongside the Mona Offshore Wind Project have been allocated into 'tiers' reflecting their current stage within the planning and development process, these are listed below.

9.9.1.3 A tiered approach to the assessment has been adopted, as follows:

- Tier 1
  - Under construction
  - Permitted application
  - Submitted application
  - Those currently operational that were not operational when baseline data were collected, and/or those that are operational but have an ongoing impact
- Tier 2
  - Scoping report has been submitted and is in the public domain
- Tier 3
  - Scoping report has not been submitted and is not in the public domain
  - Identified in the relevant Development Plan
  - Identified in other plans and programmes.

9.9.1.4 This tiered approach is adopted to provide a clear assessment of the Mona Offshore Wind Project alongside other projects, plans and activities.

9.9.1.5 The specific projects, plans and activities scoped into the CEA, are outlined in Table 9.17.

Table 9.17: List of other projects, plans and activities considered within the CEA [to be based on the CIA screening matric].

Project/Plan	Status	Distance from the Mona Array Area (km)	Distance from the Mona Offshore Cable Corridor and access areas (km)	Description of project/plan	Dates of construction (if applicable)	Dates of operation (if applicable)	Overlap with the Mona Offshore Wind Project
Tier 2-							
Morgan and Morcambe Offshore Windfarms: Transmission Assets (hereafter referred to as the Morgan and Morecambe Transmission Assets)	Pre-application	8.9	20.1	Morgan and Morcambe Transmission Assets	01/01/2028-31/12/2029	01/01/2030-31/12/2065	Temporal overlap during the construction and operations and maintenance phase of the Mona Offshore Wind Project.

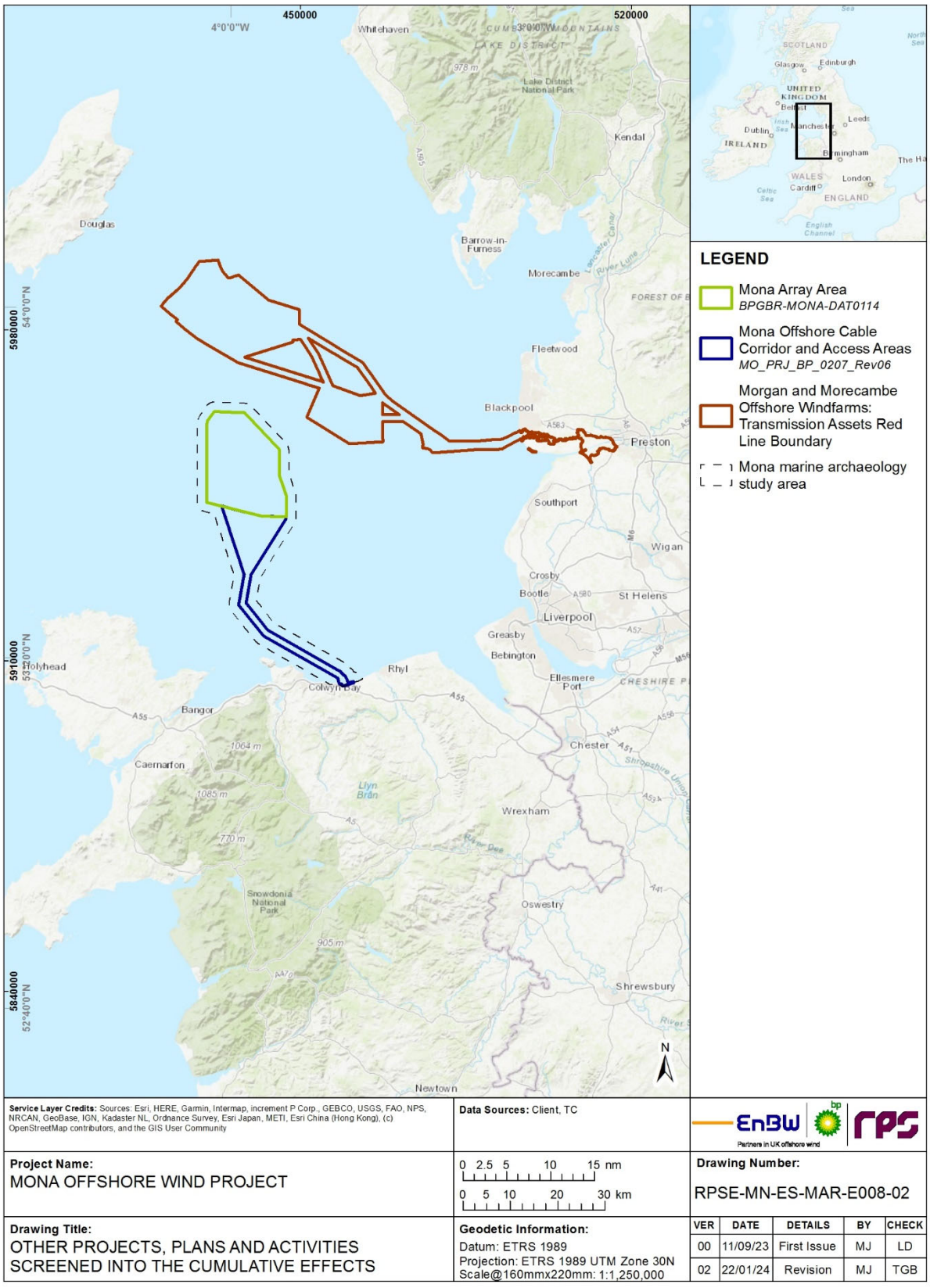

Figure 9.8: Other projects, plans and activities screened into the cumulative effects assessment.

9.9.2 Maximum design scenario

9.9.2.1 The MDSs identified in Table 9.18 have been selected as those having the potential to result in the greatest effect on an identified receptor or receptor group. The cumulative effects presented and assessed in this section have been selected from the Project Design Envelope provided in Volume 1, Chapter 3: Project description of the Environmental Statement as well as the information available on other projects and plans, in order to inform an MDS. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Design Envelope (e.g. different wind turbine layout), to that assessed here, be taken forward in the final design scheme.

9.9.2.2 Of the impacts set out in Table 9.14, the following have not been included in the CEA as there is no spatial overlap of the projects and therefore no impact receptor pathway for direct damage:

- Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)
- Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors).

9.9.2.3 Additionally, alteration to sediment transport regimes has not been included in the CEA as the Morgan and Morcambe Transmission Assets will not have infrastructure that obstructs the tidal flow.

Table 9.18: Maximum design scenario considered for the assessment of potential cumulative effects on marine archaeology.

[a] C=construction, O=operations and maintenance, D=decommissioning

Potential cumulative effect	Phase [a]			Maximum Design Scenario	Justification
	C	O	D		
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors.	✓	✓	✓	MDS as described for the Mona Offshore Wind Project (Table 9.14) assessed cumulatively with the following other project: **Tier 2** • Morgan and Morecambe Transmission Assets.	Maximum potential for cumulative effects of sediment disturbance and deposition leading to indirect effects on marine archaeology receptors.

9.10 Cumulative effects assessment

9.10.1.1 A description of the significance of cumulative effects upon marine archaeology receptors arising from each identified impact is given below.

9.10.2 Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors

9.10.2.1 The Mona Offshore Wind Project, together with the projects and plans identified in Table 9.17, may result in sediment disturbance and deposition leading to indirect effects on marine archaeology receptors. Other projects and plans screened into the assessment include the construction, operations and maintenance and decommissioning phases of the Morgan and Morecambe Transmission Assets.

Tier 2

Construction phase

Magnitude of impact

9.10.2.2 The construction phase of the Morgan and Morecambe Transmission Assets is due to happen simultaneously with the construction phase of the Mona Offshore Wind Project and therefore activities such as site preparation/sandwave clearance and cable installation have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors.

9.10.2.3 Construction activities for the Morgan and Morecambe Transmission Assets may result in increased suspended sediment concentrations; however, these activities would be of limited spatial extent and frequency and unlikely to interact with sediment plumes from the Mona Offshore Wind Project. As described in section 9.8.2, SSC plumes are localised to within the immediate vicinity of the construction activity and returning to background levels, therefore, travelling on the tide in parallel will most likely avoid interception of the most concentrated suspended sediment part of each plume.

9.10.2.4 The implementation and adherence to the WSIs and PADs that will be developed across both projects and as described in section 9.7, will ensure that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported. The burial of marine archaeology receptors could also occur and would have a beneficial impact as this would afford them more protection. Therefore, the cumulative sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors during the construction phase of the Mona Offshore Wind Project is predicted to result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes of the marine archaeology receptors.

9.10.2.5 The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and high reversibility. It is predicted that the impact will affect the receptor indirectly. The magnitude is therefore- considered to be **low**.

Sensitivity of the receptor

9.10.2.6 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors identified in section 9.4.4 and those that are as yet unknown are vulnerable sites that can be exposed further by disturbance activities. Shipwrecks are regarded as being of importance, as they add

to our understanding of ship construction, maritime routes and movements of their period.

9.10.2.7 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore activities associated with Mona Offshore Wind Project have the potential to indirectly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.10.2.8 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Overall, the marine archaeology resource is deemed to be of high value, therefore as per the methodology described in section 9.5 the sensitivity of the receptor is therefore considered to be **high**.

Significance of effect

9.10.2.9 Overall, the magnitude of the impact is low and the sensitivity of the receptor is high. Due to the proposed mitigation strategy, outlined in section 9.7, which ensures that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported, the cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

Operations and maintenance and decommissioning phase

Magnitude of impact

9.10.2.10 The operations and maintenance and decommissioning phases of the Morgan and Morecambe Transmission Assets are due to happen simultaneously with the operations and maintenance and decommissioning phase of the Mona Offshore Wind Project and therefore activities such as offshore export cable repair and reburial activities, any associated jack-up vessel and vessel anchoring and removal of foundations have the potential to increase sediment disturbance and deposition leading to a cumulative indirect impact on marine archaeology receptors.

9.10.2.11 Any suspended sediments and associated deposition will be of the same magnitude as, or lower than, the construction phase. For the purposes of this assessment, the impacts of the operational and maintenance and decommissioning activities predicted to be no greater than those for construction, as set out above.

9.10.2.12 The implementation and adherence to the WSIs and PADs that will be developed across both projects and as described in section 9.7, will ensure that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported. The burial of marine archaeology receptors could also occur and would have a beneficial impact as this would afford them more protection. Therefore, the cumulative sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors during the construction phase of the Mona Offshore Wind Project is predicted to result in very minor loss or detrimental alteration to one or more characteristics, composition or attributes of the marine archaeology receptors.

9.10.2.13 The cumulative effect is predicted to be of local spatial extent, short term duration, intermittent and low reversibility. It is predicted that the impact will affect the receptor indirectly. Based on the activities associated with the operations and maintenance phase and the results of the physical processes modelling the magnitude is therefore considered to be **negligible**.

Sensitivity of the receptor

9.10.2.14 The east Irish Sea has historically been an area of high maritime activity and the number of shipwrecks associated with the area highlight the potential for more discoveries to arise. The marine archaeology receptors identified in section 9.4.4 and those that are as yet unknown are vulnerable sites that can be exposed further by disturbance activities.

9.10.2.15 There is some potential for palaeolandscapes and associated submerged prehistoric archaeology to survive in the Mona marine archaeology study area and therefore activities associated with Mona Offshore Wind Project have the potential to indirectly impact marine archaeology receptors, material of this nature so rare that any discoveries would be considered important.

9.10.2.16 As there is a high potential for the discovery of currently unknown archaeological receptors a precautionary approach is applied and the overall value of the marine archaeology resource is deemed to be high. Shipwrecks are regarded as being of importance, as they add to our understanding of ship construction, maritime routes and movements of their period. Overall, the marine archaeology resource is deemed to be of high value, therefore as per the methodology described in section 9.5 the sensitivity of the receptor is considered to be **high**.

Significance of effect

9.10.2.17 Overall, the magnitude of the impact is negligible and the sensitivity of the receptor is high. Due to the proposed mitigation strategy, outlined in section 9.7, which ensures that the exposure of any as yet unknown marine archaeology receptors will be properly mitigated and reported, the cumulative effect will, therefore, be of **minor adverse** significance, which is not significant in EIA terms.

9.11 Transboundary effects

9.11.1.1 A screening of transboundary impacts has been carried out and has identified that there was no potential for significant transboundary effects with regard to marine archaeology from the Mona Offshore Wind Project upon the interests of other states.

9.12 Inter-related effects

9.12.1.1 Inter-relationships are considered to be the impacts and associated effects of different aspects of the proposal on the same receptor. These are considered to be:

- Project lifetime effects: Assessment of the scope for effects that occur throughout more than one phase of the Mona Offshore Wind Project (construction, operations and maintenance, and decommissioning), to interact to potentially create a more significant effect on a receptor than if just assessed in isolation in these three phases (e.g. subsea noise effects from piling, operational wind turbines, vessels and decommissioning)
- Receptor led effects: Assessment of the scope for all effects to interact, spatially and temporally, to create inter-related effects on a receptor. As an example, all effects on marine archaeology, such as sediment disturbance and deposition and direct damage to marine archaeology receptors, may interact to produce a different, or greater effect on this receptor than when the effects are considered in isolation. Receptor-led effects may be short term, temporary or transient effects, or incorporate longer term effects

9.12.1.2 A description of the likely interactive effects arising from the Mona Offshore Wind Project on marine archaeology is provided in Volume 2, Chapter 11: Inter-related effects of the Environmental Statement.

9.13 Summary of impacts, mitigation measures and monitoring

9.13.1.1 Information on marine archaeology within the Mona marine archaeology study area was collected through desktop review, site- specific surveys and consultation.

- Table 9.19 presents a summary of the potential impacts, measures adopted as part of the project and residual effects in respect to marine archaeology. The impacts assessed include: sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors; direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors)); direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors); and alteration of sediment transport regimes. Overall, it is concluded that there will be no significant effects arising from the Mona Offshore Wind Project during the construction, operations and maintenance or decommissioning phases
- Table 9.20 presents a summary of the potential cumulative impacts, mitigation measures and residual effects. The cumulative impacts assessed include: Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors
- Overall, it is concluded that there will be no significant cumulative effects from the Mona Offshore Wind Project alongside other projects/plans
- No potential transboundary impacts have been identified in regard to effects of the Mona Offshore Wind Project.

Table 9.19: Summary of potential environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of impact	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs by HE and Cadw.	C: Low O: Negligible D: Negligible	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	C: Minor adverse O: Minor adverse D: Minor adverse	N/A
Direct damage to marine archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors))	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs by HE and Cadw.	C: Low O: Low D: Low	C: High O: High D: High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	C: Minor adverse O: Minor adverse D: Minor adverse	N/A
Direct damage to deeply buried marine archaeology receptors – submerged prehistoric receptors (e.g. Palaeolandscapes and associated archaeological receptors)	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs by HE and Cadw.	C: Low	C: High	C: Minor adverse	N/A	C: Minor adverse	N/A
Alteration of sediment transport regimes	×	✓	×	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of	O: Negligible	O: High	O: Minor adverse	N/A	O: Minor adverse	N/A

Description of impact	Phase[a]			Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
	C	O	D							
				the WSI and PAD and review and agreement of the AEZs by HE and Cadw.						

Table 9.20: Summary of potential cumulative environmental effects, mitigation and monitoring.

[a] C=construction, O=operations and maintenance, D=decommissioning

Description of effect	Phase[a] C	O	D	Measures adopted as part of the project	Magnitude of impact	Sensitivity of the receptor	Significance of effect	Further mitigation	Residual effect	Proposed monitoring
Tier 2										
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Avoidance where possible; Archaeological Exclusion Zones; Pre-construction marine geophysical surveys and archaeological review; WSI and PAD; review and agreement of the WSI and PAD and review and agreement of the AEZs by HE and Cadw.	C: Low O: Negligible D: Negligible	C: High O: High D. High	C: Minor adverse O: Minor adverse D: Minor adverse	N/A	C: Minor adverse O: Minor adverse D: Minor adverse	N/A

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