

# Scotland England Green Link 1 / Eastern Link 1 - Marine Scheme

Environmental Appraisal Report Volume 2

Chapter 12 - Marine Archaeology

nationalgrid



National Grid Electricity Transmission and Scottish Power Transmission

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# **Executive Summary**

Wessex Archaeology was commissioned by AECOM on behalf of National Grid Electricity Transmission and Scottish Power Transmission to prepare a Marine Archaeological Technical Report, including a high-level Environmental Appraisal (EA), that informed this Environmental Appraisal Report (EAR), for the marine component of the Scotland England Green Link 1 (SEGL 1) / Eastern Link 1 (EL1) (hereafter referred to as Marine Scheme).

The Marine Scheme extends from the Mean High Water Springs (MHWS) at the landfall on Thorntonloch Beach, East Lothian, Scotland to the MHWS at the English landfall, at Seaham, England. The Marine Scheme comprises an installation corridor of approximately 176 km length and 500 m maximum width within which cables will be installed (hereinafter referred to as the 'marine installation corridor'). The marine installation corridor extends from kilometre point (KP) 0, at its landfall in Scotland, to KP 176, at its landfall in England. The Marine Scheme activities cover the following phases: installation, operation (including maintenance and repair), and decommissioning.

The Marine Archaeological Technical Report (EAR Volume 3 Appendix 12.1) comprises a marine archaeological baseline study of the Marine Scheme, based on an archaeological assessment of geophysical and geotechnical data, gathered as part of the project surveys, together with a review of records held by national and local inventories and secondary sources relating to the marine and intertidal historic environment of the region. This archaeological baseline also includes an assessment of the value and sensitivity of any identified marine or intertidal archaeological assets within the Marine Scheme and additional 1 km buffer area (known as the Archaeological Study Area). An assessment of the seascape character was also undertaken.

The potential effects of the Marine Scheme on marine archaeology have been appraised in Section 12.6. Where appropriate, proportionate measures to avoid, mitigate or compensate for any identified adverse effects are identified. This assessment concludes that potential impacts during the installation, operation (including maintenance and repair) and decommissioning of the Marine Scheme on marine archaeology receptors are not significant.

The potential for interaction between the Project and other plans/projects to result in significant cumulative effects, is considered in Chapter 16: Cumulative and In-Combination Effects. No interaction between the Marine Scheme and the English and Scottish Onshore Schemes is anticipated because of the proposed HDD use at the landfalls.

# 12. Marine Archaeology

## 12.1 Introduction

This chapter of the Environmental Appraisal Report (EAR) contains an appraisal of the potential interaction of the Marine Scheme with the known and potential marine archaeology and cultural heritage resource below Mean High Water Springs (MHWS).

The Marine Scheme comprises the marine component of the Scotland England Green Link 1 (SEGL1)/ Eastern Link 1 (EL1) and extends from Mean High Water Springs (MHWS) at the Scottish landfall on Thorntonloch beach, to MHWS at the English landfall near Seaham. It is located within both English and Scottish territorial waters, within the 12 nautical mile (NM) limit from the coast. The Marine Scheme comprises an installation corridor of approximately 176 km length and 500 m maximum width within which cables will be installed (hereinafter referred to as the 'marine installation corridor'). The marine installation corridor extends from kilometre point (KP) 0, at its landfall in Scotland, to KP 176, at its landfall in England (See Figure 1-3). The Marine Scheme activities cover the following phases: installation, operation (including maintenance and repair), and decommissioning. Detailed descriptions of each of the Marine Scheme phases can be found in Chapter 2: Project Description.

A description of the baseline has been undertaken through desk-based research, analysis of the geophysical survey results and consultation undertaken to support the Marine Scheme is presented in Section 12.5 of this chapter.

Potential impacts of the Marine Scheme on marine archaeology are appraised in Section 12.6 for the installation, operation (including maintenance and repair) and decommissioning phases as presented in Chapter 2: Project Description. Where appropriate, proportionate measures to avoid, mitigate or compensate for any identified adverse effects are proposed.

The potential for interaction between the Marine Scheme and other plans/projects, which may result in significant cumulative effects, is considered in Chapter 16: Cumulative and In-Combination Effects.

This chapter is supported by EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report, which can be found in EAR Volume 3 Technical Appendices.

# 12.2 Legislative and Policy Context

This section outlines legislation, policy and guidance relevant to the appraisal of the potential effects on marine archaeology associated with installation, operation (including maintenance and repair), and decommissioning of the Marine Scheme. For further information regarding the legislative context refer to Chapter 3: Legislative and Policy Framework.

A number of policies and regulations aim to assure that marine archaeology is taken into account during the planning and execution of projects within UK waters. For the Marine Scheme these include the UK Marine Policy Statement (MPS) and the UK Marine Plans, specifically the Scottish National Marine Plan (Scottish Government, 2015), and the North East Inshore and North East Offshore Marine Plan¹ (HM Government, 2021) have a number of relevant policies specific to marine archaeology which are presented in EAR Volume 3 Appendix 3.1: Marine Plan Compliance Checklist.

A number of policies and laws require decision makers to consider the environmental impacts of a project. Legislation and policy relevant to the appraisal of Marine Scheme's effects on marine archaeology is presented in EAR Volume 3 Appendix 3.2: Topic Specific Legislation.

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<sup>&</sup>lt;sup>1</sup> The Marine Scheme falls entirely within the UK territorial waters (i.e. 12 NM), therefore within the Inshore portion of the North East marine area. The marine plan for the North East area has combined both inshore and offshore portions.

## 12.2.1 Guidance

There is no specific guidance associated with the installation and operation of marine transmission cables, therefore the guidance below is taken from current best practice. The appraisal has been completed in line with the following national, regional and industry specific standards and guidance:

- Standard and Guidance for Archaeological Advice by Historic Environment Services (ClfA, 2014, updated 2020);
- Code of Conduct (ClfA, 2014 (Revised 2019));
- Military Aircraft Crash Sites Archaeological Guidance on their Significance and Future Management (English Heritage (now Historic England), 2002);
- Managing Significance in Decision-Taking in the Historic Environment (English Heritage (now Historic England), 2015a);
- Management of Research Projects in the Historic Environment: the MoRPHE Project Managers' Guide (English Heritage (now Historic England), 2015b);
- Preserving Archaeological Remains: Decision-Taking for Sites under Development (English Heritage (now Historic England), 2016);
- Deposit Modelling and Archaeology. Guidance for Mapping Buried Deposits, Historic England, Swindon (Historic England, 2020);
- Code of Practice for Seabed Development (Joint Nautical Archaeology Policy Committee (JNAPC), 2006);
- Annexe to the Protocol Guidance on the Use of the Protocol for Reporting Finds of Archaeological Interest in Relation to Aircraft Crash Sites at Sea (Wessex Archaeology, 2008);
- Our Seas A shared resource: High level marine objectives (DEFRA, 2009);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (COWRIE, 2011);
- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007);
- Ships and Boats: Prehistory to Present Designation Selection Guide (Historic England, 2017);
- Standard and Guidance for Historic Environment Desk-based Assessment (ClfA, 2014, revised edition 2020);
- Marine Geophysics Data Acquisition, Processing and Interpretation Guidance Notes (English Heritage (now Historic England), 2013);
- Geoarchaeology: Using Earth Sciences to Understand the Archaeological Record (English Heritage (now Historic England), 2015c);
- Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects. (The Crown Estate, 2021);
- Protocol for Archaeological Discoveries: Offshore Renewables Projects (ORPAD). (The Crown Estate, 2014); and
- Commercial Renewable Energy Development and the Historic Environment (Historic England, 2021).

## 12.3 The Study Area

For the purpose of the marine archaeology appraisal, the Marine Scheme has been sub-divided as follows:

- Scottish Territorial Waters extending from KP 0 to KP 37 / 38; and
- English Territorial Waters extending from KP 37 / 38 to KP 176.

The area appraised in this chapter is defined by the extent of the Marine Scheme, which will be located within a 500 m wide marine installation corridor.

The geophysical study area, located within the boundary of the marine installation corridor, is defined as the extents of the client-supplied side scan sonar (SSS) mosaic, running from the Scottish landfall at Thorntonloch Beach to the English landfall at Seaham. The geophysical study area is approximately 600 m wide, reducing to approximated 400 m wide in some parts of the nearshore section (Fugro, 2021a), as illustrated in Figure 12-1.

An Archaeological Study Area (ASA) consisting of an additional 500 m buffer around the extents of the marine cable route was used as the search area for obtaining records from relevant archive databases. This wider ASA 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 marine archaeology and cultural heritage assets identified to be represented in a broader archaeological context.

# 12.4 Approach to Appraisal and Data Sources

## 12.4.1 Appraisal Methodology

This appraisal applies the environmental appraisal methodology as detailed in Chapter 4: Approach to Environmental Appraisal. The identification and appraisal of effects and mitigation are based on professional judgement and following best guidance practice as detailed below. In order to do this the potential magnitude of environmental feature sensitivity and potential effects have been determined using the terminology outlined in Chapter 4, considering the additional criteria described in Section 12.4.1.1 to assess receptor sensitivity. This is based on best practice guidance outlined by the Chartered Institute for Archaeologists' (CIfA) Standard and Guidance for Historic Environment Desk-Based Assessment (CIfA, 2014, updated 2020).

A non-statutory Scoping Report, submitted to and consulted on by the Marine Management Organisation (MMO) and Marine Scotland Licensing Operations Team (MS-LOT) in 2021<sup>2</sup>, identified aspects of the Marine Scheme that have the potential to impact the marine archaeology during installation, operation and decommissioning (NGET & SPT, 2021).

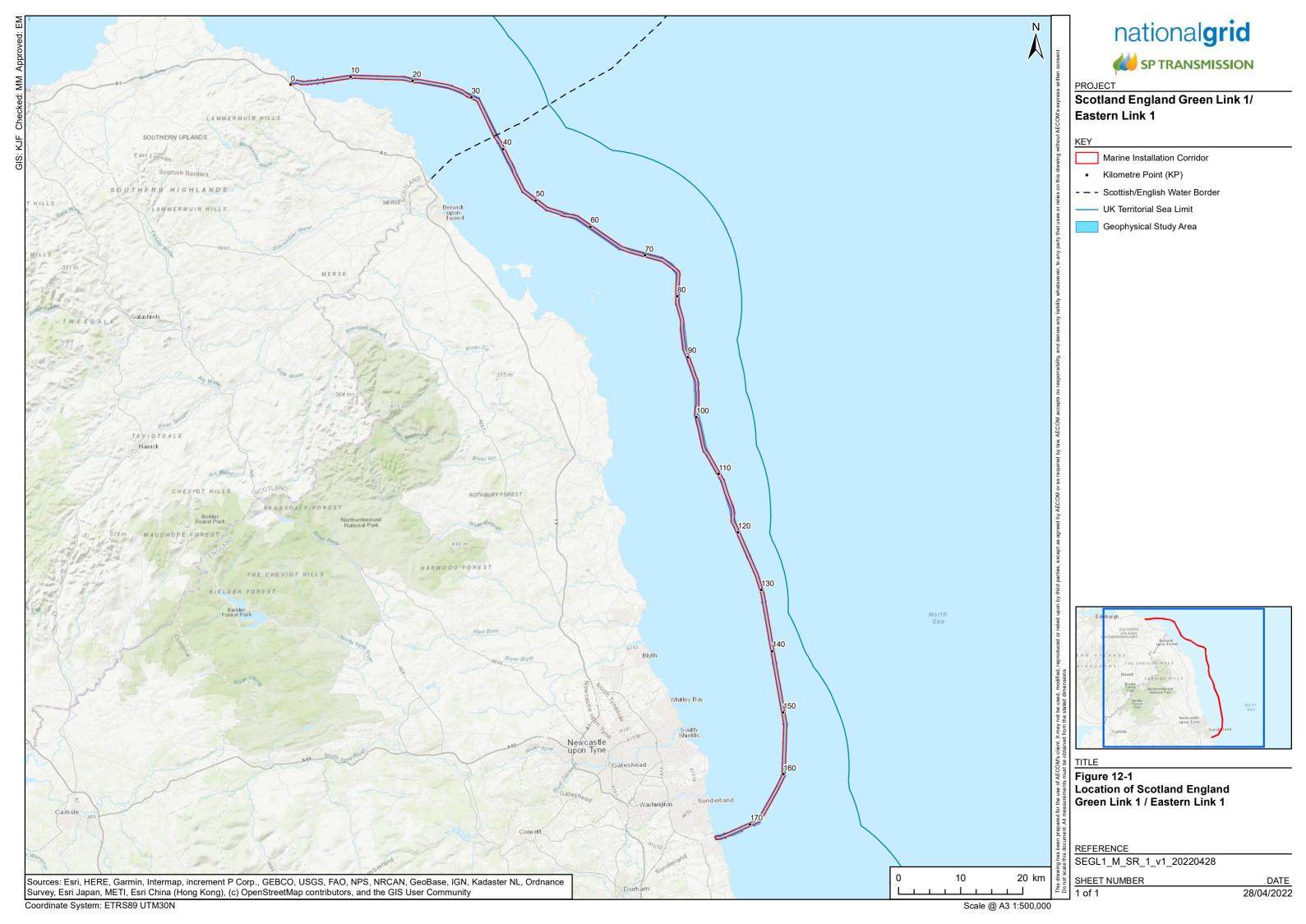
Further detail on the methodology and surveys undertaken to inform the appraisal are presented in EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

The impacts identified with relevance for marine archaeology would in the main, occur during the installation phase. Impacts from decommissioning are anticipated to be similar to those during installation if infrastructure is removed from the seabed at the end of operational life. The marine themes relevant to marine archaeological baseline as assessed are:

- Seabed prehistory (for example, palaeochannels and other features that contain prehistoric sediment, and derived Palaeolithic artefacts e.g. handaxes);
- Seabed features, including maritime sites (such as shipwrecks and associated material including cargo, obstructions and fishermen's fasteners) and aviation sites (aircraft crash sites and associated debris);
- · Intertidal heritage assets; and
- Historic seascape character.

Impacts resulting from the operation of the Marine Scheme have been appraised on marine receptors relating to seabed prehistory and seabed features, as listed above.

<sup>&</sup>lt;sup>2</sup> The non-statutory Scoping Report is publicly available on https://marine.gov.scot/sites/default/files/segl\_el1\_marine\_scoping\_report\_-\_base\_report\_rev\_2.0.pdf



## 12.4.1.1 Impact Appraisal Criteria

## Receptor/ Asset Sensitivity

To appraise the potential impacts of the Marine Scheme on marine archaeology and cultural heritage, the conceptual approach known as the 'source-pathway-receptor' model has been adopted. This approach is based on the identification of the source (i.e. the origin of a potential impact), the pathway (i.e. the means by which the effect of the activity could impact a receptor) and the receptor that may be impacted (e.g. known/potential heritage assets). For the significance of any given impact to be fully understood and for appropriate mitigation to be identified, the sensitivity of any marine archaeology and cultural heritage assets that may be impacted need to be considered. This section outlines how the sensitivity of marine archaeology and cultural heritage assets is ascertained.

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

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

Marine archaeology and cultural heritage assets cannot typically adapt, tolerate or recover from physical impacts resulting in material damage or loss caused by project activities. Consequently, the sensitivity of each asset is predominantly quantified only by its value.

#### Value of a Receptor/ Asset

Based on Historic England's Conservation Principles, Policies and Guidance for the Sustainable Management of the Historic Environment (English Heritage (now Historic England), 2008, p. 21) 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".

Within this chapter, significance is weighed by consideration of the potential for the asset to demonstrate 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; and
- 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.

With regards to appraising the value of shipwrecks, the following criteria listed in Historic England's Ships and Boats: Prehistory to Present – Selection Guide (Historic England, 2017) can be used to assess an asset in terms of its value:

- Period;
- Rarity;
- Documentation;
- Group value;
- Survival/condition; and

## • Potential.

These aspects help to characterise each asset whilst also comparing them to other similar assets. The criteria also enable the potential to contribute to knowledge, understanding and outreach to be assessed.

The value of known archaeological and cultural heritage assets were appraised on a four-point scale using professional judgement informed by criteria provided in Table 12-1 below.

Table 12-1: Criteria to assess the archaeological value of marine assets

Value	Definition
High	Best known, only example or above average example and / or significant or high potential to contribute to knowledge and understanding and / or outreach. Assets with a demonstrable international or national dimension to their importance are likely to fall within this category;
	<ul> <li>wrecked ships and aircraft that are protected under the Marine Scotland Act 2010, PWA 1973, AMAA Act 1979 or PMRA 1986 with an international dimension to their importance, plus as-yet undesignated sites that are demonstrably of equivalent archaeological value; and</li> </ul>
	<ul> <li>known submerged prehistoric sites and landscapes with the 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.</li> </ul>
Medium	Average example and / or moderate potential to contribute to knowledge and understanding and / or outreach;
	<ul> <li>includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have moderate potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation; and</li> </ul>
	<ul> <li>prehistoric deposits with moderate potential to contribute to an understanding of the palaeoenvironment.</li> </ul>
Low	Below average example and / or low potential to contribute to knowledge and understanding and / or outreach;
	<ul> <li>includes wrecks of ships and aircraft that do not have statutory protection or equivalent significance, but have low potential based on a formal assessment of their importance in terms of build, use, loss, survival and investigation; and</li> </ul>
	<ul> <li>prehistoric deposits with low potential to contribute to an understanding of the palaeoenvironment.</li> </ul>
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.

## Impact Magnitude

The magnitude of an impact is defined by a series of factors including the spatial extent of any interaction, the likelihood, duration, frequency, and reversibility of a potential impact. The definitions of the levels of magnitude used in this appraisal are described in Table 12-2.

Table 12-2: Classification of magnitude of impact

Magnitude	Definition		
High	Complete of comprehensive physical damage or changes to the character of the asset.		
<b>Medium</b> Considerable changes that affect the character of the asset, resulting in considerable ph damage.			
Low Minor change that partially affects the character of the asset, resulting in some physical of			
Negligible	Very minor or negligible change to the character of the asset, with no or negligible physical damage leading to an imperceptible change to the baseline.		

## Significance Criteria

The significance of effect has been appraised by comparing the sensitivity of the receptor against the magnitude of impact. Residual effects (i.e. those remaining after mitigation measures) have been taken into consideration and have been appraised.

The overall significance has been appraised using the matrix shown in Table 12-3. Effects deemed to be significant for the purpose of this appraisal are those which as described as 'major' and 'moderate/major'. In addition, 'moderate' effects can also be deemed as significant. Whether they do so shall be determined by a qualitative analysis of the specific impact and will be based on professional judgement. If/where this is the case, the basis for any judgement will be outlined.

Table 12-3: Significance matrix

		Magnitude of Change			
		Negligible	Low	Medium	High
	High	Negligible/Minor	Moderate	Major	Major
Receptor Sensitivity	Medium	Negligible	Minor	Moderate	Major
Rece	Low	Negligible	Negligible	Minor	Moderate
- 0,	Negligible	Negligible	Negligible	Negligible	Negligible/Minor

## 12.4.2 Data Sources and Consultations

#### 12.4.2.1 Data Sources

Baseline conditions have been established by undertaking a desktop review of published information and through consultation with relevant organisations. The data sources used to inform the baseline description and appraisal include:

- United Kingdom Hydrographic Office (UKHO) data for charted wrecks and obstructions;
- Geophysical survey datasets and reports acquired for the Project (Fugro 2021);
- National Record of the Historic Environment (NRHE) maintained by HE, comprising data for terrestrial and marine archaeological sites, find spots and archaeological events;
- National Heritage List for England maintained by HE, comprising data of designated heritage assets including sites protected under the PMRA 1986 and the PWA 1973;
- Canmore Historic Environment Records (HER) maintained by HES, comprising a database of all recorded terrestrial and marine archaeological sites, find spots and archaeological events;

- East Lothian and Scottish Borders County Council HER, comprising a database of all recorded terrestrial and marine archaeological sites, find spots and archaeological events within the county and offshore;
- Durham and Tyne and Wear County Council HER, comprising a database of all recorded terrestrial and marine archaeological sites, find spots and archaeological events within the county and offshore:
- Historic Seascape Characterisation (HSC) for the North East Rapid Coastal Zone assessment (NERCZA) carried out by Archaeological Research Services in 2009, and the HSC undertaken by the University of Newcastle in 2012-2013;
- Relevant mapping including Admiralty Charts, British Geological Survey (BGS), Ordnance Survey and historic maps; and
- Relevant documentary sources and grey literature held by Wessex Archaeology, and those available through the Archaeology Data Service and other websites (presented in the 'References').

#### **Desk-based Assessment**

This chapter is supported by a Geographic Information System (GIS) using ArcGIS 10.6.1, incorporating the positional information of the various data sources listed above, allowing the data to be spatially analysed. The data were subsequently compiled into gazetteers of the prehistoric, maritime and aviation, and intertidal resources within the study area; these were used to inform the assessment of geophysical data.

Within this appraisal, the gazetteers for the marine and intertidal datasets are compiled and presented in Universal Transverse Mercator (UTM) Zone 30 North projected from a European Terrestrial Reference System (ETRS) 1989 datum.

Information relating to the marine archaeology assets that did not include location or positional information were also used to inform the baseline assessment where relevant.

Further information on the key themes relevant to the baseline is described in Section 12.3 of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

#### Geophysical Survey Analysis

Geophysical data were acquired for the Marine Scheme, including sub bottom profile (SBP), multi beam echo sounder (MBES), side scan sonar (SSS), and magnetometer (Mag.) survey. The geophysical data were acquired between 19 October 2020 and 29 January 2021 by Fugro. Further details on the equipment used is presented in Section 12.3.3.2 of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

The geophysical data sets were individually appraised for quality and their suitability for archaeological purposes rated, following criteria presented in Section 12.3.3.4 of EAR Volume 3 Appendix 12.1 Marine Archaeology Technical Report. Data sets from the nearshore parametric sonar data and hull-mounted chirp data were rated as 'Good'. MBES and SSS data were also rated as 'Good'. AUV chirp data and Mag. data were rated as 'Average'. Overall, the data sets were found to be of a good standard and suitable for archaeological appraisal.

#### 12.4.2.2 Summary of Consultations

Following the submission of the non-statutory Scoping Report in April 2021, the MMO, MS-LOT and respective consultees and advisers had the opportunity to express their opinions and provide feedback on the proposal and EAR scope, which has been considered in this chapter.

Further details of the consultation process and associated responses are presented in Chapter 6: Consultation and Stakeholder Engagement.

Table 12-4 summarises consultation undertaken with relevant statutory and non-statutory consultees in relation to marine archaeology for the Marine Scheme and outlines how and where this has been addressed in the EAR.

**Table 12-4: Summary of consultation** 

Consultee	Consultee response/ comment	How and where addressed
Historic Environment Scotland	Section 2.2.11: this section describes the horizontal directional drilling method to be used at the point where the cable transitions from the terrestrial to the marine environment. The only dimensions given for the works appear to be "a small diameter pilot hole". At this stage, we do not need to know the dimensions of the area to be disturbed, but this information will be essential for assessing the final scheme.	Information included in Section 2.7 of Chapter 2: Project Description
Historic Environment Scotland	Section 2.3.2: the dimensions provided for the sub-sea cable trench are limited in detail, but we note the technique to be used has not been finalised yet. As with section 2.2.11, we would need to know the dimensions of the trenches required in addition to the technique to be used in order to advise on the impact of any finalised scheme.	Information included in Section 2.7 of Chapter 2: Project Description
Historic Environment Scotland	Section 11.2.1.1: this section lists the known features within the study area. Although it is located outwith the 1km study corridor, it may also be worth noting the presence of the wreck of submarine U714 in the vicinity: it is a protected place designated under the Protection of Military Remains Act 1986. While the U714 is extremely unlikely to experience any impacts from the development, if there is a need to remove and detonate unexploded ordnance encountered during the cable installation, its location must be avoided.	Canmore 282150 is located 1.58 km due north of KP27. Location of wreck is approximate and amended to Dead by the UKHO in 2004. Although not located within the ASA, Section 12.7 of Chapter 12: Marine Archaeology addresses mitigation measures in instances where new discoveries are made.
Historic Environment Scotland	Section 11.3: this section states that geophysical and geotechnical data will be archaeologically assessed. This is welcome, but does not make it clear whether the survey techniques to be used will be suitable for archaeological purposes. Archaeological requirements should be built into any survey programme to ensure that the correct information can be obtained to make an informed decision on cultural heritage impacts. This could be particularly important for site UKHO95243 which is currently only identified as an unspecified anomaly.	Information included in Section 12.4.2.1 of Chapter 12: Marine Archaeology
Historic Environment Scotland	Appendix A: this is an Environmental Issues Identification Matrix which details potential environmental impacts and how they will be resolved. We recommend that Marine Archaeology should be noted as a Receptor for UXO clearance activities	UXO activities are described in Section 2.3.1 of Chapter 2: Project Description
East Lothian Council	Cultural Heritage Any impact on the archaeological heritage of the landfall area should be considered, in addition to the more fully marine element. There has been a Coastal Survey - from North Berwick to the Scottish Borders, 2006, for heritage interest. The findings of this can be seen at http://www.johngraycentre.org/collections/getrecord/ELHER_EEL535; this link also links to the Historic Environment Record map where other records can also be viewed. Further information is available from heritage@eastlothian.gov.uk. The Report notes the potential for effects from the HDD drill compound on nearby listed buildings and if this will occur it should be included.	Information included in Section 12.5.5 of Chapter 12: Marine Archaeology
ММО	12.1. The MMO acknowledge Section 11 'Marine Archaeology' includes a brief consideration of the three broad offshore heritage categories; prehistoric remains and landscape features, maritime and aviation remains. It is noted that intertidal receptors and historic seascape are also referenced. The available data from the UK Hydrographic Office (UKHO) has been reviewed within the report and	Information included in Section 12.5 of Chapter 12: Marine Archaeology

Consultee	Consultee response/ comment	How and where addressed
	demonstrates a number of known wreck sites as well as shipwreck and aviation losses. These recorded losses indicate potential for both maritime and aviation remains to be present on the seabed in the Marine Scheme (PMS). 12.2. The MMO note the report highlights that recent discoveries at Howick and Low Hauxley has demonstrated that important prehistoric sites and landscape features are present within the wider area, which could contain important information about past landscape features and landscape development into the later Quaternary period.	
ММО	12.3. Additionally, there is potential for Second World War remains to be present at the landfall site. Records showing a Bevin Boys Hostel was located in the current car park opposite Seaham Hall and a Star Fish Decoy site is present further north near Ryhope Dene demonstrate this. There is also early medieval activity (a cemetery site) at Seaham Headland, which demonstrates further potential from earlier periods. As such, there is potential for undesignated archaeological remains to survive within the PMS at the landfall location. The precise potential and importance of such remains is unknown as this has not yet been comprehensively assessed.	Information included in Section 12.5.4 of Chapter 12: Marine Archaeology
ММО	12.4. The MMO note from Section 2 'Project Description' the marine element of the scheme will involve ground preparation, pre-lay seabed clearance, cable laying activities (including ploughing, cutting and/or water jetting, or Mass Flow Excavation), cable crossings and cable protection. The technique used may vary along the route length, and target depth will be 1.5-2m and below mobile sediments or potential hazards. Installation will likely use a cable laying vessel or cable laying barge, supported by a guard ship and anchor handling ship.  12.5. The MMO consider there to be potential direct and indirect impacts to archaeological receptors below Mean High Water Springs (MHWS) through the interaction with the seabed of the seabed preparation and cable installation equipment within the 500m cable corridor project area. The note Section 11.5 and Table 11.3 set out the potential impacts for construction, operation and decommissioning.	Information included in Section 12.6 of Chapter 12: Marine Archaeology
ММО	12.6. The statements in Section 11.6.1 and 11.6.2 detail that maintenance and decommissioning impacts of the project (for the offshore elements) would be largely similar to the construction phase. However, further details regarding potential impacts and relevant mitigation measures should be included within the Environmental Appraisal Report.	Information included in Section 12.6 and 12.7 of Chapter 12: Marine Archaeology
ММО	12.7. It is noted that Section 11.6.3 includes a description of potential cumulative impacts, which acknowledges the impact of multiple small-scale effects from different projects over the resources as a whole, or larger features like palaeo landscape features. This should be explored within the Environmental Appraisal Report.	Information included in Section 12.9 of Chapter 12: Marine Archaeology and Chapter 16: Cumulative and In-Combination Effects
ММО	12.8. The MMO acknowledge the scoping report generally has identified the main elements for inclusion with a marine historic environment baseline assessment and subsequent assessment of archaeological receptors within the EA. The MMO is pleased to see reference to the use of further desk-based data, including the NRHE and local HERs, and the assessment of project specific geophysical and geotechnical data.	Noted. No response required
ММО	12.9. To support production of the Environmental Appraisal Report, the planned surveys should be designed to collect data for archaeological assessment, and as such early involvement of an archaeological consultant should be	Information included in Section 12.7 of Chapter 12: Marine Archaeology

Consultee	Consultee response/ comment	How and where addressed
	sought to ensure the data is appropriate. It is therefore recommended that a qualified and experienced marine archaeological consultant is commissioned to provide input to the planning stages of these surveys. Furthermore, if such survey work is to be initiated during pre-application you may wish to provide survey specifications to Historic England prior to commencement, to maximise the opportunities for archaeological assessment and analysis, and to feed into discussions of mitigation for archaeological receptors to be set out within the Environmental Appraisal Report.	
ММО	12.10. Further to the datasets referenced in the scoping report, use of further site-specific data, for example grey literature available through the Archaeological Data Service (ADS) and available data and reports from nearby developments, such as Blyth Offshore Demonstrator Project, should be included. This would provide greater detail on known archaeological receptors of all types and periods within the study area which will require mitigation measures including avoidance, but it would also demonstrate the potential for unknown remains.	Information included in Section 12.4.2.1 of Chapter 12: Marine Archaeology
ММО	12.11. As such, the identified key guidance documents are standards within Section 11.4.1 are noted as appropriate but should also include Historic England (2020) 'Deposit Modelling and Archaeology: Guidance for Mapping Buried Deposits'.	Information included in Section 12.2.1 of Chapter 12: Marine Archaeology
ММО	12.12. The results of any desk-based assessment should be used in any Environmental Appraisal Report produced to inform the final design of the proposal. The any Environmental Appraisal Report should therefore include decisions on whether any design changes may be necessary to avoid or minimise harm; or whether any further predetermination and/or post-determination archaeological works may be required to further assess and/or mitigate harm.	Information included in Section 12.7 of Chapter 12: Marine Archaeology
ММО	120.13. The MMO note from Section 11.6.4 that embedded mitigation measures would include the use of Archaeological Exclusion Zones (AEZs), and micro-siting of the cable route, with unavoidable impacts mitigated through an agreed Written Scheme of Investigations (WSI). Broadly, the MMO accept this approach is appropriate.  12.14. Further detail on the mitigation measures including AEZs, micro-siting and further investigations, should be included as part of a WSI within any marine licence applications. It is therefore recommended that an Archaeological WSI is developed to set out appropriate mitigation measures for the project including appropriate standards for data collection, assessment, reporting and dissemination to ensure appropriate mitigation of the project.  12.15. The WSI should include the application of a project specific Protocol for Archaeological Discoveries, drawing from established examples from the marine aggregate and offshore renewables industries, to act as mitigation by the reporting of chance finds.	Information included in Section 12.7 of Chapter 12: Marine Archaeology
National Trust	We have noted the approach for the assessment of the marine archaeology but we would like to have further information on the scope of proposed marine survey work	Discussed with National Trust during meeting held in September 2021 and information provided during meeting.

Consultee	Consultee response/ comment	How and where addressed
	coastal and marine heritage in the north east of England.  'Seascapes' is sponsored by the Durham Heritage Coast Partnership who have an adopted management plan for the defined Heritage Coast south of the Wear.  We are currently in the process of delivering a new centre within the Whitburn Coastal Park, which will provide a local gateway to the coast to showcase the area's cultural and natural heritage. It has a strong focus on marine life and seeks to facilitate wildlife conservation, community engagement with the coast and support learning activities about the significance of this coastal location.  One specific project 'Beneath the Waves' aims to reveal hidden heritage long the coast including shipwreck modelling and marine recording. We are keen to understand whether the proposed development has implications for this project.	

## 12.4.3 Data Gaps and Limitations

## 12.4.3.1 Archaeological Data

Data used to compile this chapter comprises primary geophysical survey data and secondary information derived from a variety of sources, only some of which have been directly examined for the purposes of this appraisal. The assumption is made that the secondary data, as well as that derived from other secondary sources, are reasonably accurate.

The records held by the UKHO, NRHE, Canmore, HER and the other sources used in this appraisal 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. For example, data from the UKHO is skewed towards the 19th and 20th century wrecks and therefore does not include all assets. The information held within these 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.

## 12.4.3.2 Geophysical Data

Complete magnetometer (Mag.) data coverage was acquired in the nearshore areas, while along the rest of the route, two lines of magnetometer data were acquired along the centre of the originally proposed cable route, plus some additional lines. As such, only the centre portion along the majority of the geophysical study area has direct Mag. coverage. Acquisition of data in this manner and extent is standard practise for EIA level surveys, and it is anticipated that future pre-installation and UXO surveys will provide more complete coverage of the proposed cable route.

Mag. data acquired in the marine installation corridor were centred on the originally proposed cable route, which has since been amended (Fugro 2021a: 5). There is full acoustic (i.e. SSS and MBES) data coverage of the updated proposed cable route, but often no direct Mag. coverage in some sections where it differs from the originally proposed cable route.

Any magnetic signal associated with small ferrous objects is only likely to be detected on Mag. survey lines acquired directly over or very close to the object. As such, any seabed features of possible archaeological interest identified outside of the central area of direct Mag. coverage could not be appraised for ferrous content at this time. Larger features, such as steel hulled wrecks, will have been visible in the data, but a more conservative approach has been adopted in determining Archaeological Exclusion Zones around wrecks and debris fields not directly covered by Mag. data. However, these can be refined based on any future geophysical survey results.

In addition, Mag. data are used to identify any discrete magnetic contacts which could represent buried ferrous debris or structures such as wrecks. Again, any such anomalies could not be identified beyond the area of direct Mag. data coverage at this time, and the potential remains for additional buried ferrous material to be present at the outer edges of the geophysical study area.

## 12.5 Baseline Conditions

The detailed baseline resource of marine archaeology and cultural heritage, which includes known wrecks and obstructions, identified geophysical receptors, the potential for further maritime and aviation archaeological receptors, potential seabed prehistory, intertidal heritage assets and historic seascape character is presented in EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report. The full gazetteer of anomalies is presented in Appendix B – E in EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report and illustrated in Figure 12.1-3 to Figure 12.1-7 and Wreck Sheets 1 to 10. The section below presents a summary of the baseline.

## 12.5.1 Seabed Prehistory

Eleven palaeogeographic features of archaeological potential have been identified within the geophysical study area, one within Scottish Territorial Waters and ten within English Territorial Waters (for full details see Appendix B in EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report). These are illustrated in Figures 12.1-3, Figure 12.1-4, and Figure 12.1-5 in EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report. A summary of these features is listed in Table 12-5.

The appraisal of SBP data shows that the geology within this area can largely be described as predominantly clayey silty sand with gravel and interbedded sand and clays of fluvio-marine and estuarine origin. The latter sediment (Unit 4b) contains a series of cross-cutting, acoustically unstructured mounded features which have been interpreted as being possibly terrestrial in origin. As such these features have the potential to contain *in situ* and derived archaeological material and palaeoenvironmental material.

Table 12-5 summarises the potential for seabed prehistory assets and their respective value based on the criteria described in Section 12.4.1.1.

Asset Type	Definition	Value	
Potential <i>in situ</i> prehistoric sites	Primary context features and associated artefacts and their physical setting (if found).	High	
	Known submerged prehistoric sites and landscape features with the demonstrable potential to include artefactual material.	High	
Potential submerged landscape features	Other known submerged palaeo-landscape features and deposits likely to date to periods of prehistoric archaeological interest with the potential to contain <i>in situ</i> material.	High	
Potential derived prehistoric finds	Isolated discoveries of prehistoric archaeological material discovered within secondary contexts.	Medium	
Potential palaeo- environmental	Isolated examples of palaeo-environmental material.	Low	
evidence	Palaeo-environmental material associated with specific palaeo-landscape features or archaeological material.	High	

Table 12-5: Value of seabed prehistory heritage assets.

## 12.5.2 Seabed Features: Maritime

There are currently no sites within the ASA that are subject to statutory protection from the PWA 1973, the PMRA 1986 or the AMAA Act 1979; the three legislative acts that are used to protect marine archaeological sites.

A total of 247 features have been identified as being of possible archaeological potential within the geophysical study area, discriminated as follows:

• 32 A1 anomalies (anthropogenic origin of archaeological interest); and

• 215 A2 anomalies (uncertain origin of possible archaeological interest).

Full details can be found in Section 12.4.2.4 and Appendix D of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report and illustrated in Figure 12.1-6 and Figure 12.1-7.

There is also one charted wreck sites located within the marine installation corridor which has not been identified by geophysical survey data sets. Full details can be found in Section 12.5.2.1 and Appendix C of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

#### 12.5.2.1 Scotland

There is one charted wreck within the marine installation corridor not covered by geophysical survey data, detailed in Appendix C of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

The charted wreck WA 2002 (KP 20) is the wreck of an unknown fishing vessel.

There is one identified and named wreck site within the marine installation corridor, wreck 7051 (KP 7), which had been classified as A1 anomaly (features of anthropogenic origin of archaeological interest). Full details can be found in Section 12.4.2.4 and Appendix D of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

Wreck 7051 was identified in the SSS dataset as a cluster of irregular and rounded dark reflectors, possibly representing internal structures, within a thin, elliptical outline or edge with varying height, which is interpreted as the hull outline (Wreck Sheet 1 of Appendix 12.1). The wreck is located within a boulder field, making identification of surrounding debris objects difficult. This feature was not directly covered by the Mag. dataset, and so it is not possible to ascertain whether ferrous material is present at this location. The feature was also outside of the MBES data coverage. The wreck coincides with UKHO 95243, which is that of an unknown vessel which was first located in 2020, with recorded dimensions of 48 x 9 m at a general depth of 38.5 m.

## 12.5.2.2 England

There are nine wrecks that have been identified within the marine installation corridor, which have been classified as A1 anomalies (features of anthropogenic origin of archaeological interest). Full details can be found in Section 12.4.2.4 and Appendix D of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

Four features have been identified and named, consisting of the wreck of the Saga (7191), Morlaix (7137), debris field of the possible steamship Maystone (7095) and Eventide (7165).

Wreck 7191 (KP 168) was identified in the SSS data as a large, broken-up wreck, measuring  $80.3 \times 35.0 \times 5.3$  m, with a relatively defined outline lying upright on the seabed (Wreck Sheet 8 of Appendix 12.1). The wreck was seen to comprise numerous linear, sub-angular and irregular dark reflectors and objects with height, including one particularly tall object at one end and a possible slatted deck. In the MBES data, the wreck was identified as a wreck orientated north-east to south-west with some sediment build-up on the western side and apparent scour along the eastern edge. The wreck corresponds with a very large magnetic anomaly, measuring 1,678 nT, indicating ferrous content or construction. Wreck 7191 is associated with UKHO 5672, which is the possible position for the wreck of the Saga, a Norwegian cargo vessel operating under the British Flag which was torpedoed by a German submarine in February 1918. It is listed by the UKHO as having dimensions of 75.8 x 20.2 x 6.3 m and as being well broken up but with clearly discernible features.

Wreck 7137 (KP104) was identified in the SSS data as a relatively broken up, possibly upright wreck with a distinct outline and a spread of linear dark reflectors with shadows within the wreck boundary (Wreck Sheet 3 of Appendix 12.1). The wreck measures 62.1 x 26.3 x 1.1 m and has a jagged shadow suggesting it has varying height. The wreck was not covered by the MBES or Mag. data and, as such, it is not possible to confirm the presence of ferrous material at the location, although the associated UKHO record notes that the vessel is composed of steel and therefore it is expected to be ferrous in construction. Wreck 7137 corresponds with the UKHO position for the *Morlaix* (UKHO 4367), a steamship built in 1911 which sank 6 May 1942 whilst passage to Sunderland from Macduff due to a collision.

Feature 7095 (KP 62) is a debris field comprising parallel linear features and containing multiple angular dark reflectors with height (Wreck Sheet 2 of Appendix 12.1). The debris field is located approximately 18 m north-east of UKHO 4467, which is the location of the wreck of the steamship *Maystone* (possibly), which sank 18 October 1949 after a collision with an aircraft carrier. It is likely that debris field 7095 either represents a section of the wreck, or associated wreck debris. However, as the feature has only been partially covered by the geophysical data, this cannot be confirmed and, as such, the feature has been classified as a debris field rather than a wreck.

Wreck 7165 (KP 152) was identified in the SSS data as an elongate, slightly dispersed area of dark reflectors of varying size measuring 19.6 x 5.7 m, with bright, irregular shadows, possibly indicating uneven heights of up to 4 m (Wreck Sheet 5 of Appendix 12.1). The feature was not covered by the MBES or Mag. data and, as such, it is not possible to confirm the presence of ferrous material at the location. Wreck 7165 corresponds with the UKHO position fishing vessel *Eventide* (UKHO 4248), a wooden hulled vessel which sank 19 June 1976 after taking on water. Based on the vessel's sinking date, it is possible that it is too modern to be of archaeological interest. However, without further information on the vessel's build date, it has been retained as of potential archaeological interest as a precaution.

The other five features are wrecks of unknown date and name (7158 (KP 146), 7172 (KP 160), 7181 (KP 165), 7235 (KP 175), 7240 (KP 176)). Anomaly 7172 (KP 160) has been suggested to represent a modern debris item. However, based on its form in the geophysical data, and the fact the feature has not been ground-truthed by divers or remotely operated vehicle, it has been retained as a possible wreck as a precaution.

## 12.5.3 Marine Recorded Losses

Recorded Losses can be considered as an indication of the potential for archaeological maritime remains to exist within the marine installation corridor and the type and number of wrecks that could be present. These records relate to vessels reportedly lost or for which no physical wreck remains have ever been identified. Table 12-6 shows the distribution of these documented losses according to the date of loss for those records whose position fall within the ASA, for both Scotland and England. Details regarding these losses are presented in Appendix E of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report.

Table 12-6: Recorded losses – summary by date

Date	Number of records of ships
Post-medieval	1
19 <sup>th</sup> century	17
Modern	9
Unknown	35
Total	62

## 12.5.4 Seabed Features: Aviation

There are no known aircraft crash sites within the marine installation corridor. Nonetheless, there is the potential for aircraft or aircraft-related debris to exist on the seafloor within the marine installation corridor. Given the identified potential of the area for military aircraft crashes, particularly relating to the Second World War, the likelihood would be for any aircraft crash to be of military origin, which would be protected under PMRA 1986 and therefore would be of high value. This would include both Allied and Axis aircraft and would relate to both complete aircraft wrecks and debris scatters.

A number of recorded losses are located within the wider area; at least 28 recorded aircraft crash sites have been identified at sea within the 12 NM limit, including two that lie within one kilometre of the ASA as recorded in the HER's for the area. As these are recorded losses the positional data is unreliable and serve only to provide an indication of the types of aircraft that flew over this coastline. In many

cases the location is only a set of general coordinates, a general distance and bearing from a landmark, or the location of the crew's dinghy, or recovered remains.

## 12.5.5 Intertidal Heritage Potential

There are no records relating to archaeological sites, artefacts, material and standing remains within the intertidal zone (to MHWS) of the proposed landfalls within the marine installation corridor. However, generally coastal areas, particularly soft sandy coasts, may contain an array of isolated finds from a wide range of archaeological periods.

At the Scottish landfall, within the ASA, there are no records that fall below MHWS. However, there are a number of sites recorded by Canmore and the HER's, including four records (Canmore\_325631, 327686, 329683, 326380) consisting of maritime records - recorded losses discussed above, and one terrestrial record located above MHWS consists of mine workings dating from the 18th to 20th century (Canmore 365960).

At the English landfall, within the ASA, there are no records that fall below MHWS. One asset consisting of a round concrete pillbox (NRHE\_1421198), constructed during Second World War falls within the Marine Scheme, located above MHWS. There are a further 22 terrestrial sites recorded by the English HER's located above MHWS within the ASA.

## 12.6 Appraisal of Potential Impacts

Archaeological receptors relating to seabed prehistory, maritime and aviation archaeology have been identified within the ASA, as has the potential for further assets to be discovered. The Marine Scheme has the potential to physically and adversely impact known and potential archaeological receptors within the marine installation corridor and areas within which indirect physical effects occur, such as changes in seabed sediment regimes, scour etc.

This section describes the effects on marine archaeology which could potentially occur during cable installation, operation, and decommissioning phases of the Marine Scheme. This appraisal considered the project design described within Chapter 2: Project Description, and the realistic worst-case methods considered in terms of areas of impacts to seabed and depth of sediment disturbance.

A summary of the impacts considered as part of this appraisal are provided in Table 12-7 below. Activities undertaken as part of decommissioning works have the potential to impact marine archaeology and cultural heritage resource directly and indirectly, similar to potential impacts considered during installation works. Therefore, these two have been presented together in Table 12-7.

Table 12-7: Impact summary

Phase	Activities	Sub Activity	Potential Impact
Installation	Pre-Installation	Survey (geophysical and geotechnical surveys)	Direct disturbance to known and recorded maritime and aviation receptors (A1s); geophysical anomalies of possible anthropogenic origin (A2s)
			Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
	Cable Installation	Route Clearance (involving pre-lay grapnel run for clearance of seabed debris;	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and

Phase	Activities	Sub Activity	Potential Impact
		removal of seabed debris and boulder by ploughing and /or grabs)	aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
			Indirect disturbance to known and potential seabed prehistory receptors; maritime and aviation receptors, caused by changes to the hydrodynamic and sedimentary regimes due to spoil removal and sediment redistribution.
		Cable Laying and Burial (placement of rock and / or installation of mattress to level out uneven seabed prior to cable installation; construction of crossing structures over inservice cables)	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
		Cable Protection (placement of non-burial protection on the seabed, including tubular protection, concrete mattresses rock placement)	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
			Indirect disturbance to known and potential seabed prehistory receptors; maritime and aviation receptors, caused by changes to the hydrodynamic and sedimentary regimes due to spoil removal and sediment redistribution.
		Anchor deployment	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
	Installation at Landfall	HDD installation; HDD ducts; excavation of HDD pits and installation of cable (by means of a jack-up mounted back-hoe dredger or Mass Flow Excavator)	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.

Phase	Activities	Sub Activity	Potential Impact
		Anchor deployment: Cable laying barge (CLB); jack-up rig/barge	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
Operation	In-situ cable	Cable monitoring and repairs	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
			Indirect disturbance to known and potential seabed prehistory receptors; maritime and aviation receptors, caused by changes in local scouring and sedimentation patters.
		Anchor deployment	Direct disturbance to known and potential seabed prehistory receptors; direct disturbance to known and recorded maritime and aviation receptors (A1s); direct disturbance to geophysical anomalies of possible anthropogenic origin (A2s); direct disturbance to unknown archaeological sites and artefacts.
Decommissioning	The activities, sub	p-activities and potential impacts	are as per installation phase

## 12.6.1 Embedded Mitigation

The Marine Scheme has been developed through an iterative process, where avoidance or reduction of potential environmental effects were taken into consideration. Early on in the routeing and siting of the marine installation corridor, avoidance of known wrecks was taken into account when narrowing down the suitability of landfall locations and identify the marine installation corridor routing.

Mitigation measures that were identified and adopted as part of the evolution of the project design (embedded into the project design) and that are relevant to marine archaeology and cultural heritage are presented in Table 12-8. These general measures apply to all parts of the Marine Scheme.

Table 12-8: Marine Archaeology embedded mitigation

Measure	Description
Pre-installation surveys	Pre-installation surveys will inform detailed engineering and cable installation planning. They will focus on collection of detailed information within the preferred route for each of the cables, all within the marine installation corridor. They will confirm the absence or presence of any new obstructions or significant changes to seabed conditions and bathymetry, and also help to inform detailed unexploded ordnance (UXO) assessment. Survey methods may include:

Measure	Description
	<ul> <li>Acoustic methods such as multibeam and single beam echo sounders, side scan sonar (SSS), and sub-bottom profiler;</li> </ul>
	Magnetometer/gradiometer to identify magnetic anomalies and metallic targets;
	<ul> <li>Visual methods including drop down video or remotely operated vehicle (ROV); and</li> </ul>
	Geophysical investigations such as vibrocore and cone penetration test (CPT).

## 12.6.2 Installation Phase

## 12.6.2.1 Damage to known and unknown assets from direct impacts

All seabed assets have the potential to be damaged or destroyed if they are directly impacted during the installation phase of the Marine Scheme. Furthermore, all damage to archaeological sites or material is permanent and recovery is limited to stabilisation or re-burial so as to limit further impact. There is no potential for the recoverability of any seabed assets if they are affected following a direct impact. As such, all wrecks, aircraft, associated material and debris and seabed prehistory should be regarded as having high sensitivity.

If direct impacts were to occur upon the archaeological receptors that have been identified in Section 12.5 of this chapter and any potential archaeology within the Marine Scheme, these are most likely to occur during the installation phase of the Marine Scheme. Impacts resulting in negative effects upon archaeological assets as part of installation phase are those involving contact with the seabed and/or the removal of seabed sediments. Marine archaeological receptors with height, such as shipwrecks, may also be impacted by activities that occur within the water column, including pre-installation activities and cable installation activities. Installation activities that may lead to direct physical impacts include:

- Pre-installation surveys and sea trials;
- Cable installation, including route clearance, cable laying and burial, and cable protection;
- Landfall installation activities, including Horizontal Directional Drilling (HDD), HDD duct installation, and cable installation; and
- Seabed contact by jack-up vessel, and / or anchors of other vessels.

#### Magnitude of impact

The magnitude of direct impacts on known maritime and aviation receptors, and potential seabed features as part of installation activities, if they were to occur, would be high.

All A1 receptors and currently unknown archaeological sites are considered as high sensitivity receptors.

For all A2 anomalies, there is insufficient data to appraise the value of each individual anomaly at this point. As such, all A2 anomalies must be considered to potentially have archaeological value, to a greater or lesser degree and, in accordance with the precautionary principle are considered as high value assets.

Impacts on known and potential seabed prehistory receptors, such as potential *in situ* prehistoric sites and submerged landscape features, could result in major effects, as these are considered as high value assets. However, for the majority of the marine installation corridor, cable burial depths are anticipated to be between 0.6 and 1.5 m (see Table 2-1 in Chapter 2: Project Description), whilst HDD duct installations will reach burial depths of between 1 to 3 m (see Table 2-4 in Chapter 2: Project Description), and therefore too shallow to penetrate the depths within the sediment at which submerged landscapes may be present. In addition, should potential seabed prehistoric features be impacted, the footprint of a linear installation such as the Marine Scheme on these extensive landscape features will be minimal, and therefore the magnitude of direct impacts on such resources would be low.

## Significance of effect

If appropriate mitigation is not applied, both the sensitivity and the magnitude of direct impacts on known maritime and aviation receptors, and potential seabed features would result in **major** negative effects considered to be **significant**. However, for known and potential seabed prehistory receptors the low magnitude of impact results in **moderate** effects which is **significant**.

## 12.6.2.2 Damage to known and unknown assets from indirect impacts

The indirect effects upon the known and potential marine archaeological assets considered here are those which occur as a result of changes to hydrodynamic and sediment transport regimes, where these changes have occurred as a consequence of activities and structures associated with the installation activities. These impacts may occur from the clearance of areas of sand waves during route preparation but may also occur through sediment dispersal / deposition or the placement of non-burial cable protection on the seabed. Installation activities that could potentially create indirect physical impacts include:

- Clearance of areas where sand waves and ripples are present, potentially resulting in changes to local hydrodynamics;
- Dispersal of suspended sediment (during installation of cables and excavation of HDD entry/exit pits) potentially resulting in increased sediment transport regimes; and
- Scour associated with the disturbance from construction activities and structures.

Indirect impacts may affect marine archaeological baseline conditions where they result in the increased exposure or burial of marine archaeological assets. The increased exposure of marine archaeological assets has the potential to cause erosion and deterioration to the assets. Conversely, should assets be subject to increased sedimentation and burial, they may, in turn, benefit from conditions which afford higher levels of preservation.

#### Magnitude of impact

The magnitude of effect of indirect impacts to marine archaeological assets during installation is expected to be negligible. Following an appraisal of the local hydrodynamic and sediment transport regime, review of data available from similar projects and a numerical modelling (based on a realistic worst-case scenario) appraisal, Chapter 7: Physical Environment concludes that the significance of effect on the sediment transport regime in deeper water depths (> 10 m) from cable installation will be **minor.** This is because seabed disturbance will be temporary and localised, and furthermore, it is anticipated that the bedform system will eventually recover via natural sediment transport processes.

Similarly, within shallower water depths (< 10 m), impacts on the sediment transport regime will be low as seabed disturbance will be temporary and localised, and therefore the effect is appraised to be **minor**, and therefore **not significant**.

For nearshore installation activities (<10 m) at both landfall sites, the worst-case scenario appraised within Chapter 7: Physical Environment is anchor deployment, excavation of HDD pits and cable installation activities. Seabed disturbance due to excavated pits will impact a relatively small area and therefore significance of effect is appraised to be **minor**. Nearshore, the dynamic nature of sediment transport regime driven by natural wave and tidal action will evenly disperse any suspended sediment and therefore the significance of effect from cable installation activities is appraised to be **minor**.

## Significance of effect

The high sensitivity and the negligible magnitude of indirect impacts on such resources would result in **negligible** effects, which is **not significant**. No further mitigation is recommended, and the residual significance is not **significant**.

## 12.6.3 Operation Phase

Activities undertaken as part of operation phase have the potential to impact marine archaeology directly and indirectly, located on or under the seabed, resulting in their loss or the disruption of relationships between receptors and their wider surroundings.

## 12.6.3.1 Damage to known and unknown assets from direct impacts

Operational effects will be limited to those arising from cable repair/replacement, cable protection repair/replacement, maintenance or any monitoring that may be required. Potential direct impacts on marine archaeology during the operation of the Marine Scheme could include:

- · Re-burial of cables;
- Repair / replacement of cables;
- Placement of additional cable protection; and
- Anchors or jack-ups being used for any maintenance activities (although these are likely to be minimal).

#### Magnitude of impact

The magnitude of direct impacts on known maritime and aviation receptors, and potential seabed features as part of operation activities, if they were to occur, would be high. Any impact upon marine archaeology, including A1 anomalies and any unknown archaeology would be permanent and irreversible.

#### Significance of effect

In areas where impact has already occurred during the installation phase, there is unlikely to be further effect.

However, in areas that have not yet been impacted, without mitigation, the effects on marine archaeology could be **major adverse** which is **significant**.

## 12.6.3.2 Damage to known and unknown assets from indirect impacts

The effects upon the known and potential marine archaeology considered here, are those which occur as a result of changes to hydrodynamic and sediment transport, where these changes have occurred as a result of the presence of cable protection associated with the Marine Scheme.

#### Magnitude of impact

The magnitude of change of indirect impacts to marine archaeological assets during operation is expected to be negligible. Following an appraisal of the local hydrodynamic and sediment transport regime, review of data available from similar projects and a numerical modelling (based on a realistic worst-case scenario) assessment, Chapter 7: Physical Environment deduced that the potential impacts caused by operation activities would be the same as those for the installation phase, but on a much smaller scale. Therefore, the magnitude of the impacts associated with repair works and surveys carried out during the operation phase are considered low. The appraisal concludes that the effect on the sediment transport regime, for both nearshore and offshore environments will be **negligible** and therefore **not significant**.

#### Significance of effect

The high sensitivity and the negligible magnitude of indirect impacts archaeological resources would result in **negligible adverse** effects and is therefore **not significant**.

## 12.6.4 Decommissioning Phase

As with cable installation activities, decommissioning activities have the potential to affect archaeological assets either directly or indirectly. Cables in the UK territorial waters are installed on seabed owned by The Crown Estate and Crown Estate Scotland and therefore a lease or licence is generally entered into for a set term, in this case, 40 years. What infrastructure will be decommissioned and the methodology for doing so is not currently known but will be agreed prior to the commencement of decommissioning works.

If the cables are left buried however, likely significant effects from decommissioning will be avoided. If the cables are to be removed at decommissioning this appraisal assumes that impacts from

decommissioning activities are of a similar nature to those for cable installation activities and any effects of those impacts would be of a similar or lesser significance, and therefore would be **not significant**.

## 12.7 Mitigation and Monitoring

Typically, adequate and appropriate mitigation is required to ensure that the archaeological value of the baseline within this chapter is maintained. International best practice and government policy favours preservation *in situ* of the archaeological resource.

The mitigation measures are secured through a Written Scheme of Investigation (WSI) and measures will be required to be agreed and in place, but the exact mitigation design will not be finalised until preconstruction survey are undertaken.

## 12.7.1.1 Archaeological Exclusion Zones (AEZs)

The primary mitigation for the protection of known archaeological assets is avoidance. This is achieved through the implementation and monitoring of Archaeological Exclusion Zones (AEZs), which are proposed for identified high value seabed features of anthropogenic origin (i.e., A1 classified geophysical anomalies).

The Crown Estate document *Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects* (The Crown Estate, 2021) states that AEZs are formed by establishing a buffer around the known extents of sites for which the available evidence suggest that there could be archaeological material present on the seabed. The mitigation will establish appropriately sized AEZs around assets which have been considered to be of high archaeological potential, in consultation with the Archaeological Curators (HE and HES). These areas would be out of bounds to construction activities and to anchoring. Monitoring of any AEZs to ensure there is no disturbance to them will be part of this mitigation.

Although AEZs are fixed, provision should be made for them to be either refined or be removed (with agreement of the Archaeological Curators) as the project progresses, subject to additional archaeological assessment of subsequent surveys that may be required. Surveys could include further geophysical, Remotely Operated Vehicle (ROV), or diver surveys. In addition, in order to maximise the potential benefits of any further surveys, archaeological advice should be sought during the planning stages.

The AEZs all have the potential to be amended or removed at a later date, should further information become available that proves their associated features are not of archaeological potential or represent more widely dispersed sites. This report is intended to inform the decision-making process for confirming the final AEZs.

Table 12-9 lists all the AEZs recommended within the marine installation corridor and illustrated in Figure 12-2a-h. As features of high archaeological potential, it is recommended that AEZs are implemented around the 32 A1 features.

Where features were identified as being highly dispersed, or partially buried, a precautionary 100 m AEZ has been recommended (7165, 7095, 7240). For the wrecks which appear to be more contained (7051, 7137, 7158, 7172, 7181, 7191, 7235), an AEZ of 50 m around the extents is recommended.

A total of 15 items of debris (**7050**, **7138-9**, **7180**, **7182-4**, **7187-8**, **7192-5**, **7241-2**), four debris field (**7159-60**, **7173**, **7190**) and one length of rope or chain (**7189**) have been recommended an AEZ of 25 m based on their form and proximity and likely association with known wreck sites. However, in all cases with the exception of **7160** and **7184**, the areas were already covered by the wreck's recommended AEZ. In the cases where the debris items extend slightly beyond those of their associated wrecks, the AEZs have been merged with that of the wreck site to ensure the full exclusion zone has been covered.

Two magnetic anomalies over 1,000 nT (**7077** and **7103**) have been recommended a precautionary 100 m exclusion zone. This is due to the possible presence of a significant amount of ferrous material at these locations which is either buried or without surface expression. It should be noted that, due to the limited Mag. coverage, a more precautionary approach has been taken with these features. Further

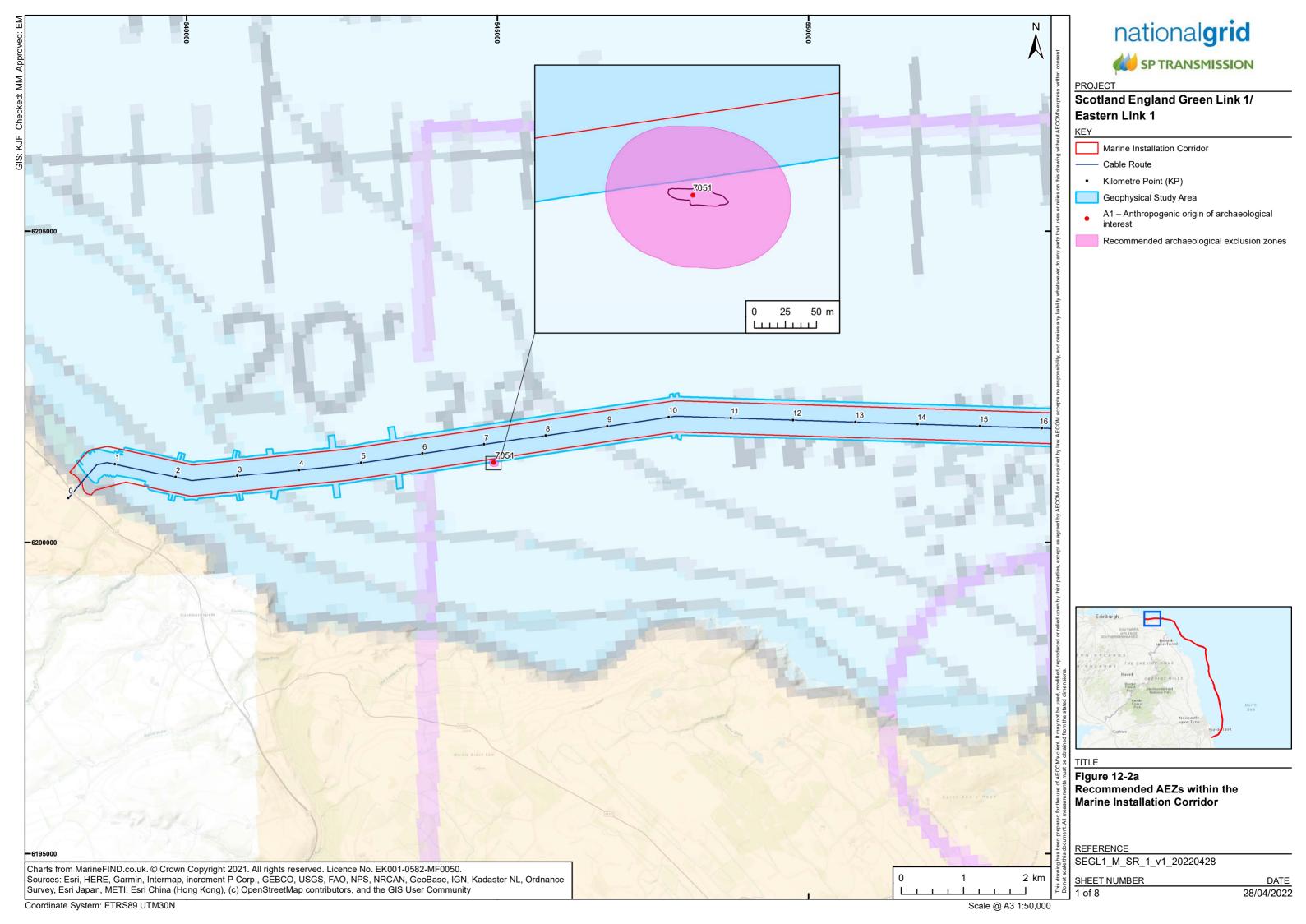
acquisition and archaeological interpretation of Mag. data, or ground truthing, may show these features to be of little or no archaeological interest which may result in the reduction or removal of the recommended AEZ.

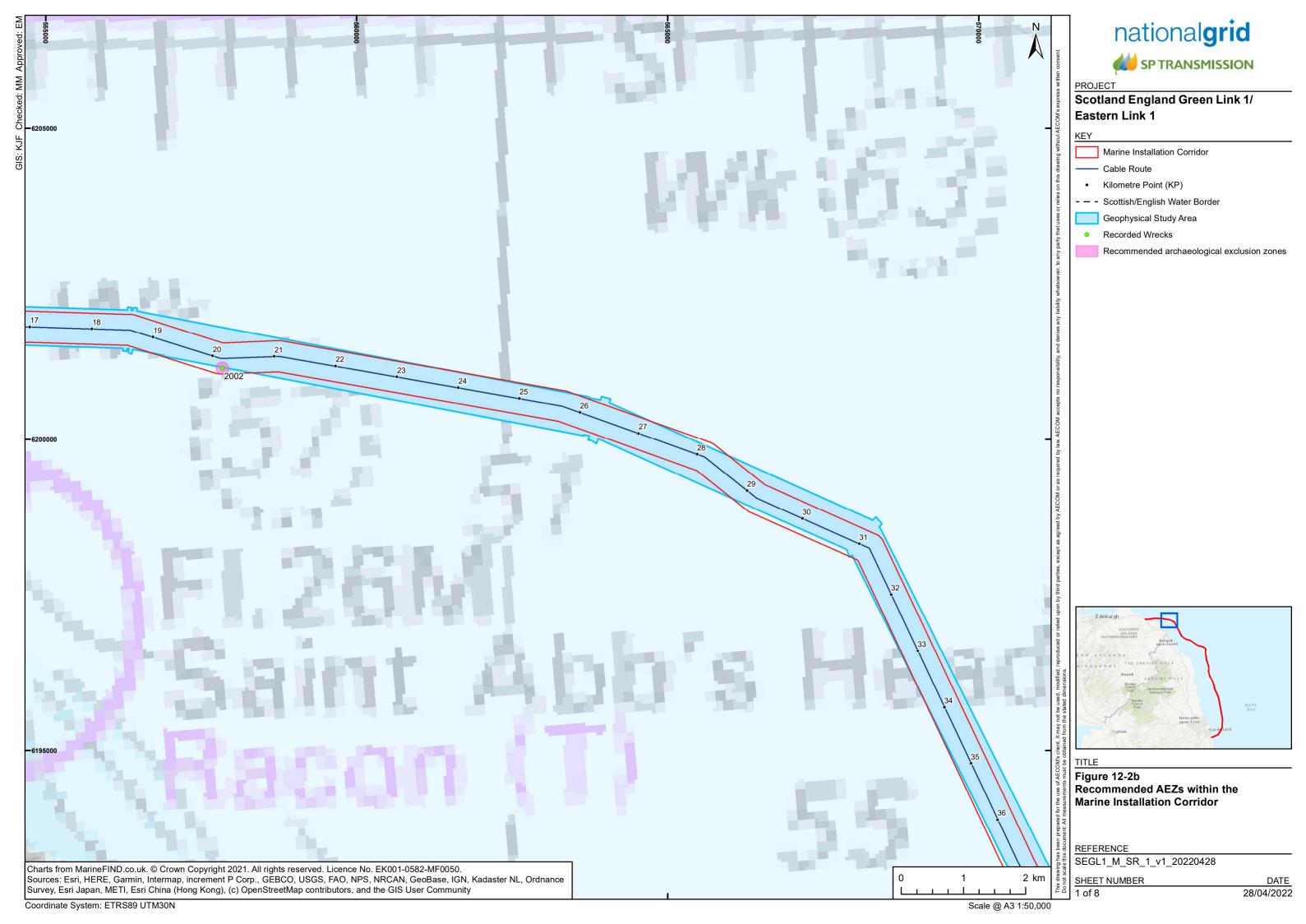
One charted wreck position is also located within the marine installation corridor. As this is beyond the limits of the geophysical data coverage, no comment can be made on its presence and current condition and, as such, it has not been reported on within the geophysical gazetteer (Appendix D of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report) or given a geophysical anomaly number. However, as a record of potential archaeological interest, it has been retained and reported on in Appendix C of EAR Volume 3 Appendix 12.1: Marine Archaeology Technical Report, and recommended a precautionary archaeological exclusion zone of 100 m.

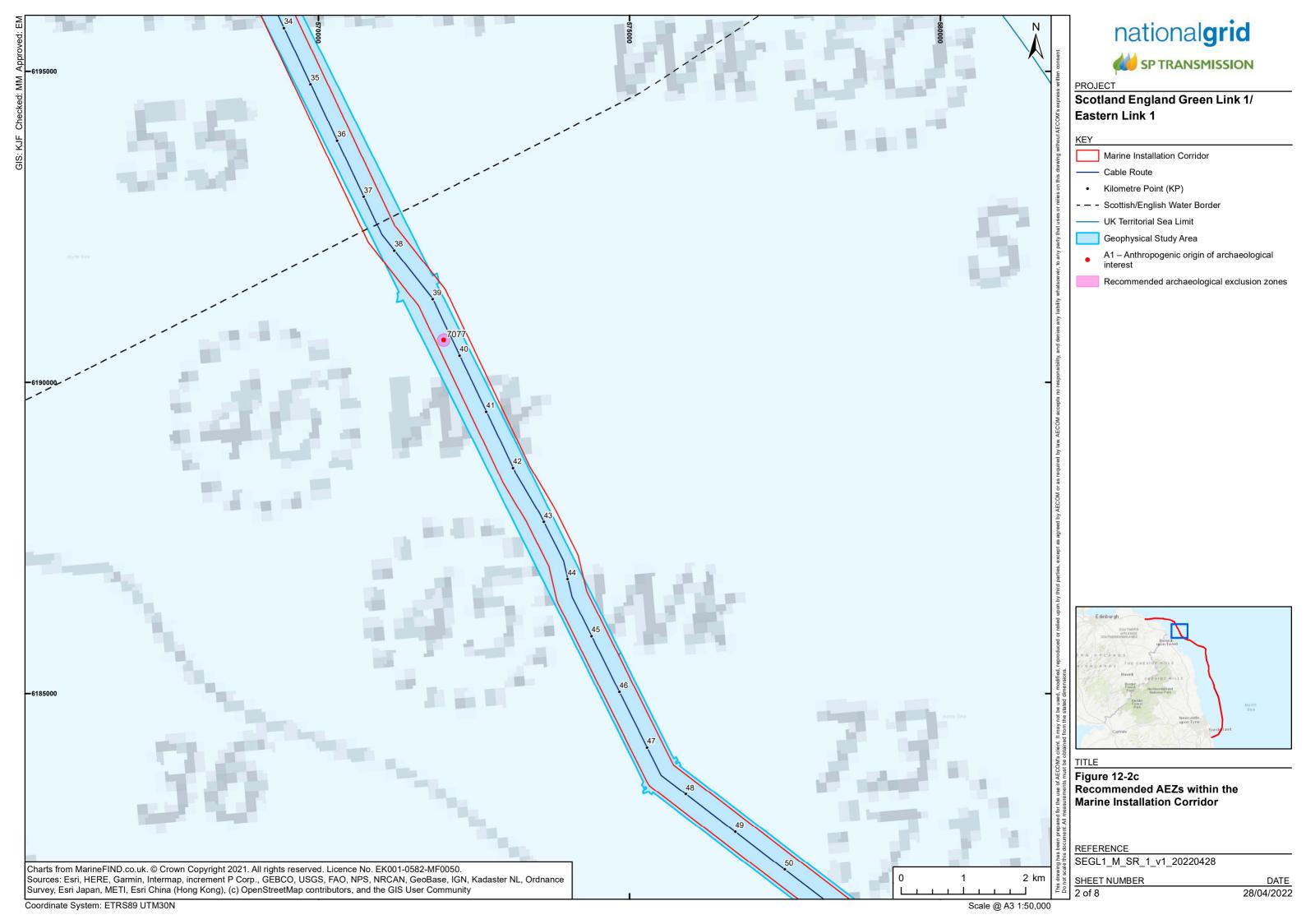
Table 12-9: Recommended AEZs around A1 features within the marine installation corridor

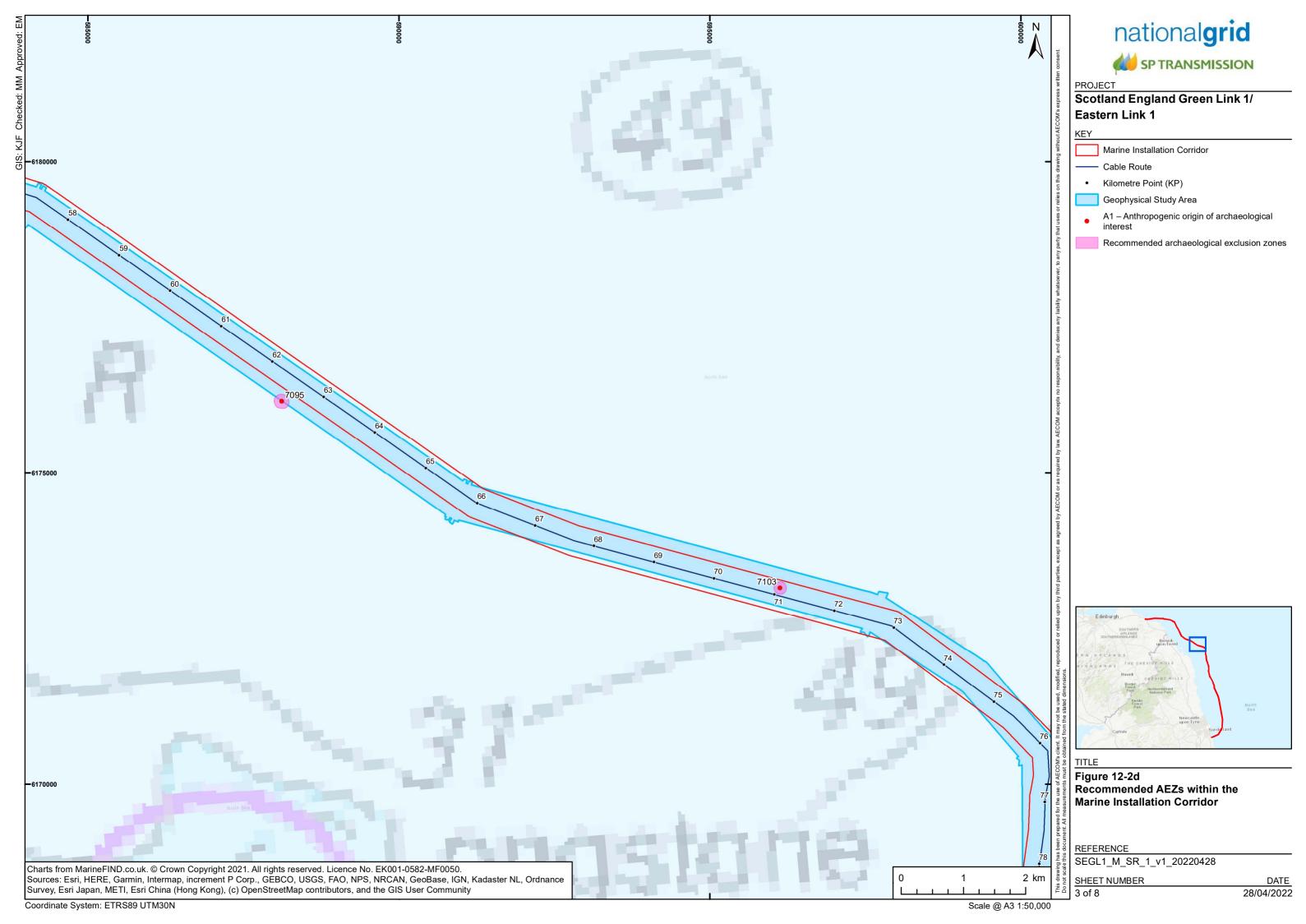
ID Number	Classification		(ETRS89 130N)	Nearest KP	Exclusion Zone
		Easting	Northing	1	
7050	Debris	544918	6201285	7	25 m buffer around central position. Covered by larger wreck AEZ.
7051	Wreck	544938	6201279	7	50 m buffer around current feature extent.
7077	Magnetic	572011	6190678	40	100 m around recorded position.
7095	Debris field	588115	6176150	62	100 m buffer around current feature extent.
7103	Magnetic	596126	6173151	71	100 m around recorded position.
7137	Wreck	604787	6143081	104	50 m buffer around current feature extent.
7138	Debris	604783	6143103	104	25 m buffer around central position. Covered by larger wreck AEZ.
7139	Debris	604813	6143057	104	25 m buffer around central position. Covered by larger wreck AEZ.
7158	Wreck	616801	6103403	146	50 m buffer around current feature extent.
7159	Debris field	616793	6103395	146	25 m buffer around current feature extent. Covered by larger wreck AEZ.
7160	Debris field	616812	6103396	146	25 m buffer around current feature extent. Merged with <b>7158</b> .
7165	Wreck	617891	6097823	152	100 m buffer around current feature extent. Covered by larger wreck AEZ.
7172	Wreck	617095	6090068	160	50 m buffer around current feature extent.
7173	Debris field	617100	6090075	160	25 m buffer around current feature extent. Covered by larger wreck AEZ.
7180	Debris	615208	6085131	165	25 m buffer around central position. Covered by larger wreck AEZ.
7181	Wreck	615196	6085125	165	50 m buffer around current feature extent
7182	Debris	615204	6085124	165	25 m buffer around central position. Covered by larger wreck AEZ.

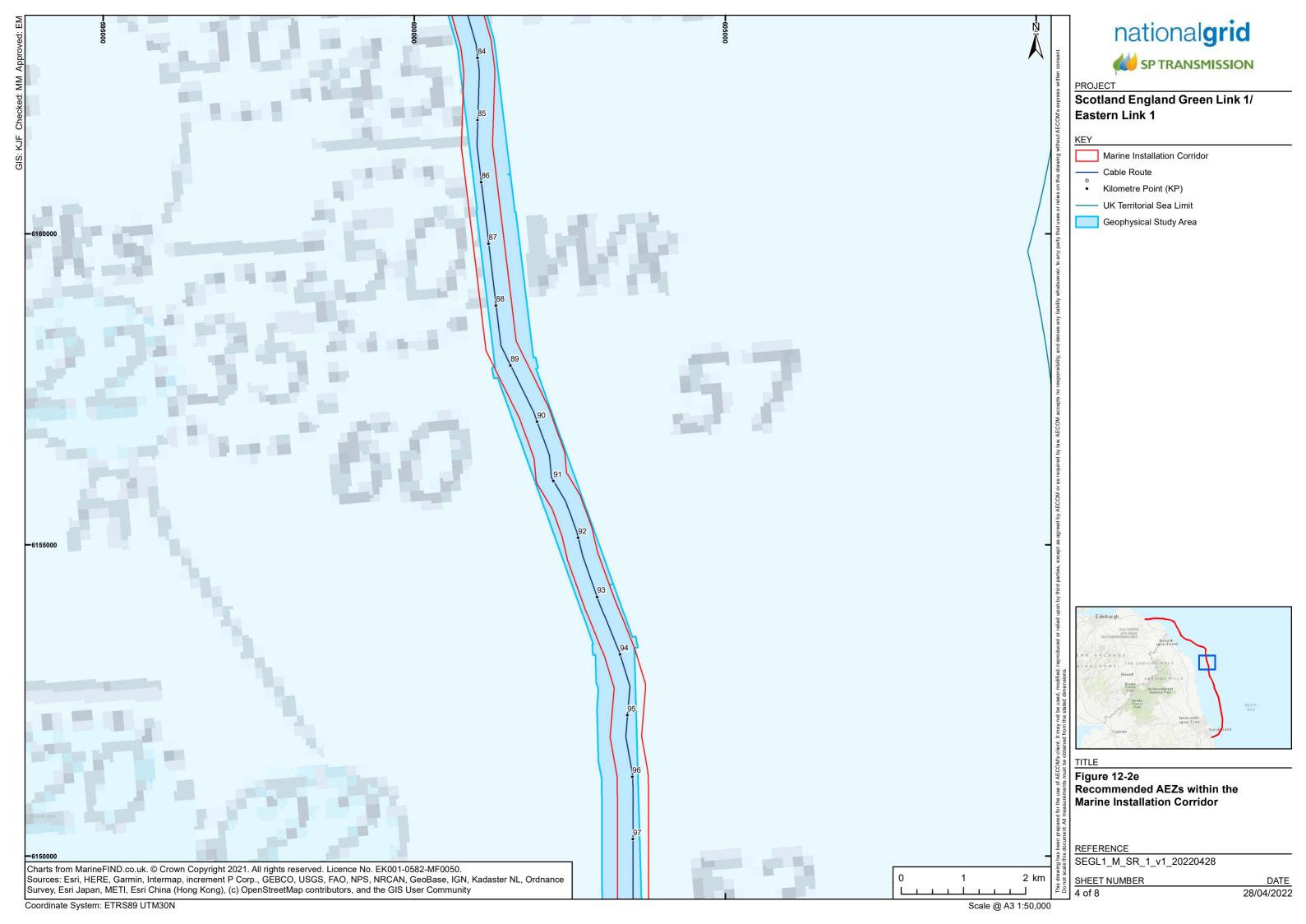
ID Number	Classification	Position ( UTM3		Nearest KP	Exclusion Zone
		Easting	Northing		
7183	Debris	615204	6085118	165	25 m buffer around central position. Covered by larger wreck AEZ.
7184	Debris	615196	6085093	165	25 m buffer around central position. Merged with <b>7081</b> .
7187	Debris	613228	6082639	168	25 m buffer around central position. Covered by larger wreck AEZ.
7188	Debris	613208	6082646	168	25 m buffer around central position. Covered by larger wreck AEZ.
7189	Rope/chain	613227	6082628	168	25 m buffer around central position. Covered by larger wreck AEZ.
7190	Debris field	613221	6082624	168	25 m buffer around current feature extent. Covered by larger wreck AEZ.
7191	Wreck	613200	6082613	168	50 m buffer around current feature extent.
7192	Debris	613205	6082580	168	25 m buffer around central position. Covered by larger wreck AEZ.
7193	Debris	613193	6082580	169	25 m buffer around central position. Covered by larger wreck AEZ.
7194	Debris	613188	6082576	169	25 m buffer around central position. Covered by larger wreck AEZ.
7195	Debris	613176	6082570	169	25 m buffer around central position. Covered by larger wreck AEZ.
7235	Wreck	607303	6080190	175	50 m buffer around current feature extent. Covered by larger wreck AEZ.
7240	Debris field	606618	6079955	176	100 m buffer around current feature extent.
7241	Debris	606590	6079939	176	25 m buffer around central position. Covered by larger AEZ.
7242	Debris	606584	6079931	176	25 m buffer around central position. Covered by larger AEZ.
2002	Recorded wreck	557842	6201141	20	100 m around recorded position.

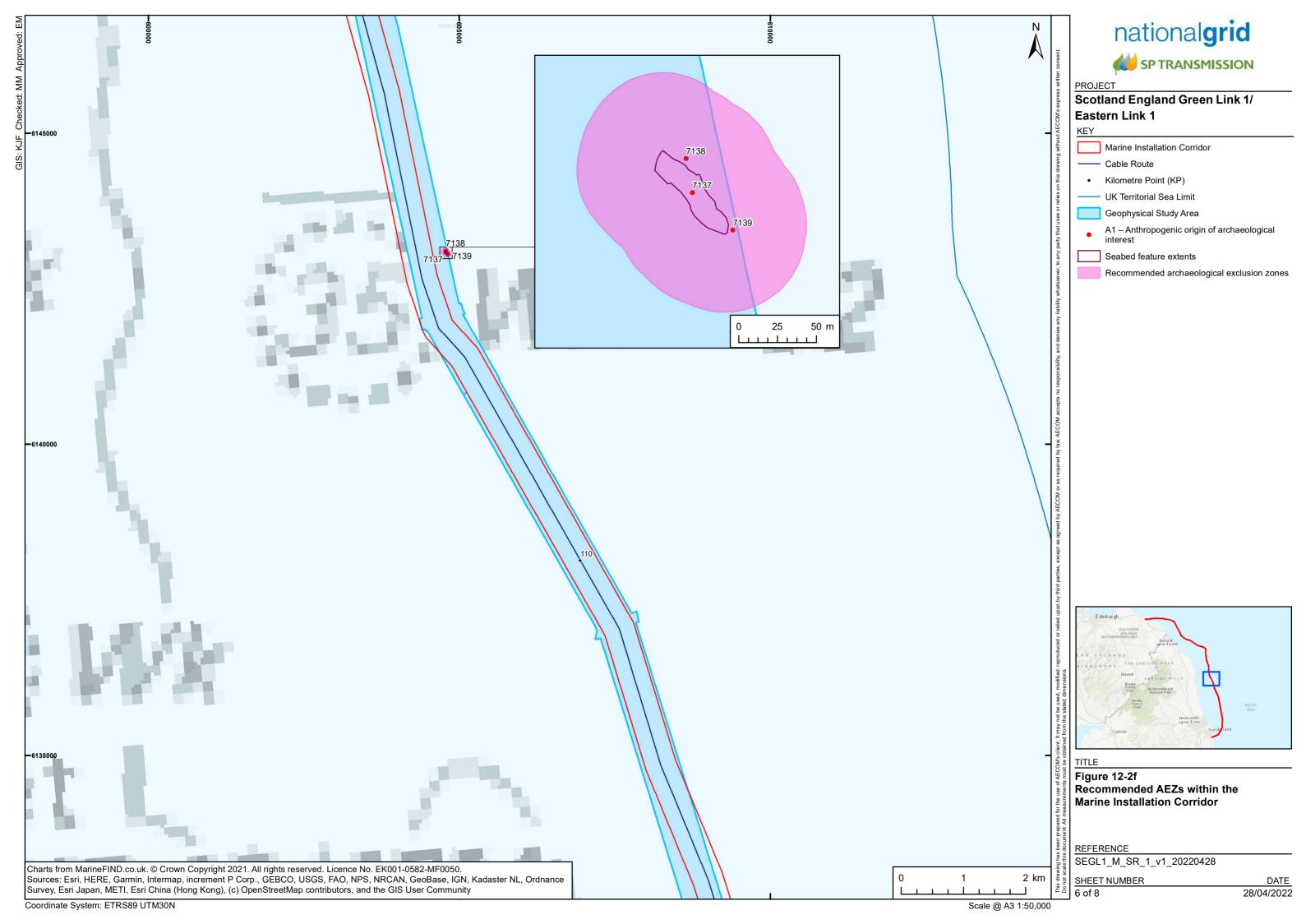


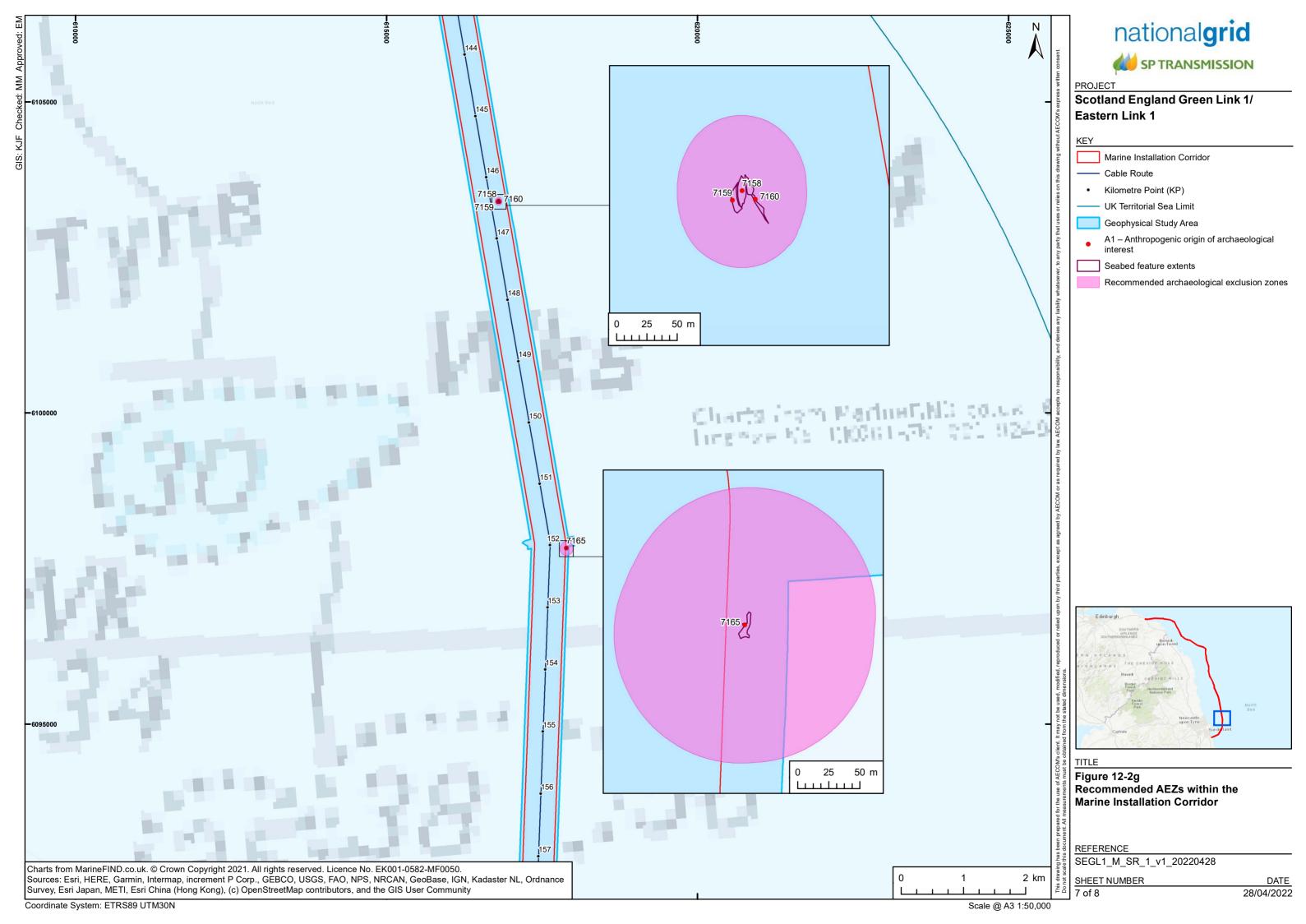


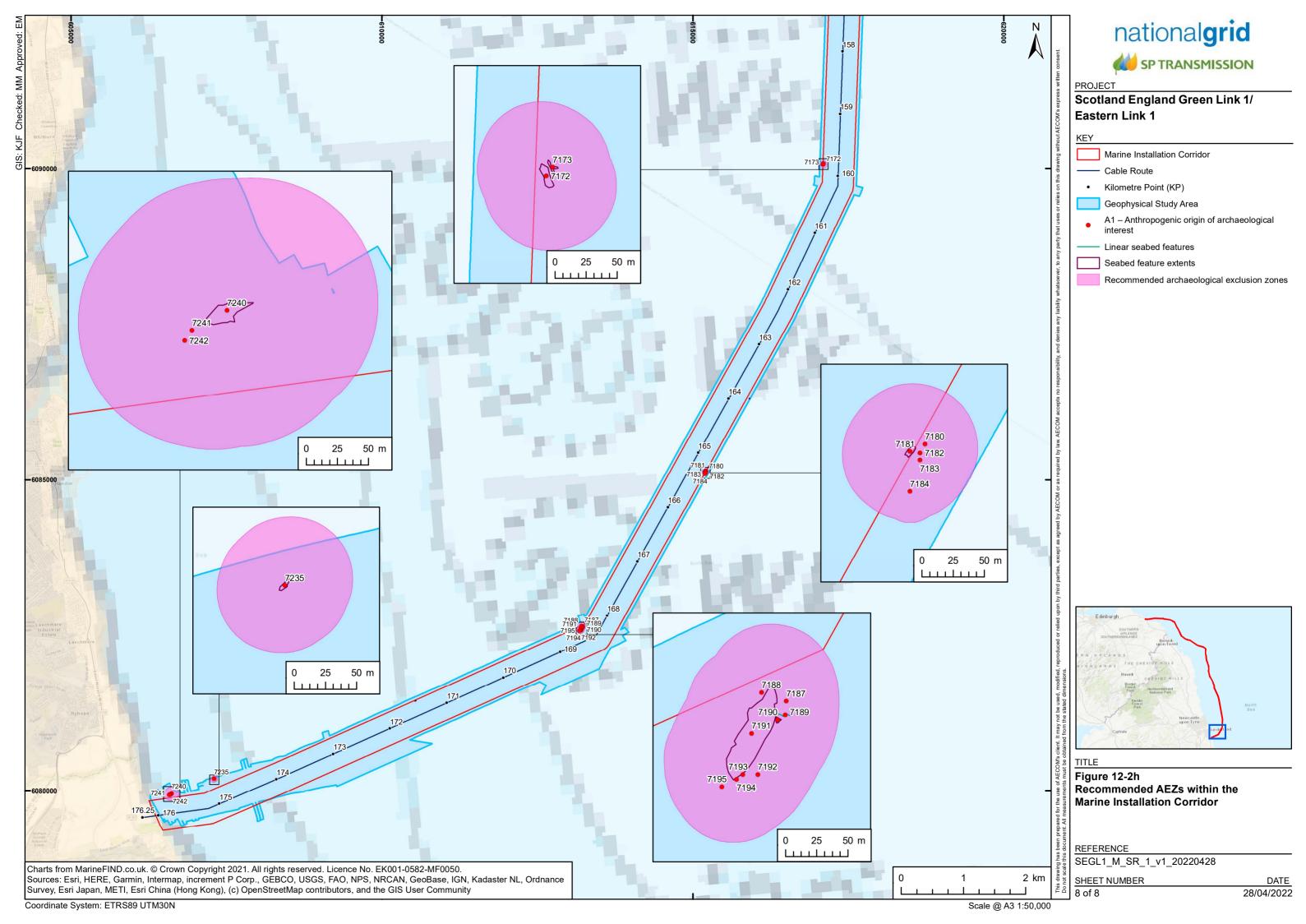












## 12.7.1.2 A2 Anomalies

For features assigned A2 archaeological discrimination rating, no AEZs are recommended. However, these features may be avoided by micro-siting of the cable if they are proposed to be directly impacted by the Marine Scheme in the future. If micro-siting is not possible, then further appraisal to ascertain the nature of the features may be required.

Reduction of impact can be achieved by means of appropriate mitigation identified through potential opportunities for further investigation of assets (e.g. during UXO survey and clearance). Further investigations mean that anomalies can either have their archaeological value removed, if they prove to be of non-anthropogenic nature or modern, or their value as archaeological assets confirmed. If their value is confirmed, mitigation in the form of either avoidance (which may be enacted by the implementation of an AEZ) or through remedying or offsetting measures as identified through a WSI which includes a Protocol for Archaeological Discoveries (PAD).

The WSI will detail the agreed mitigation that will be in place during the cable installation, operation, and decommissioning of the Marine Scheme. The implementation of a WSI is the mitigation, rather than the document itself. The WSI will be developed in line with standard guidance and The Crown Estate document *Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects* (The Crown Estate, 2021), which sets out agreed archaeological methodologies. The WSI will be set out based on the mitigation measures included, but not limited to, in this chapter and will be subject to approval by the Archaeological Curators.

In cases where avoidance is either inappropriate or impossible, the damage to archaeological assets should be offset. Any mitigation strategy will be identified through a scheme WSI and any recommended methods will be covered by a specific Method Statement, approved by the Archaeological Curator, should they be implemented.

The geophysical surveys that are to be undertaken in advance of the development, such as an unexploded ordnance (UXO) survey that requires magnetometer data, the data will be assessed by a suitably qualified archaeological contractor. This will allow the identification of any additional ferrous features of archaeological potential within the marine installation corridor, as well as to confirm the presence of ferrous material at the location of features identified during this assessment, particularly around identified wreck sites and debris fields.

#### 12.7.1.3 Palaeogeography

The appraisal of the geophysical data within the marine installation corridor resulted in the identification of a total of 11 features of palaeogeographic interest. These are summarised as follows and listed in Table 12-10:

- a total of two cut and fills and one possible area of dune features were assigned an P1 archaeological rating; and
- a total of six simple cuts and fills, one high amplitude reflector and one infilled depression were assigned an P2 archaeological rating.

Table 12-10: Palaeogeographic features assigned P1 and P2 archaeological rating

ID Number	Classification	Archaeological rating	Depth (mBSB		Nearest KP
			From	То	
7900	Acoustic blanking	P2	3.6	3.9	13
7901	Cut and fill	P2	0.5	3.3	76
7902	Dune features	P1	0.8	7.0	127
7903	Fine-grained deposit	P2	5.5	10.5	142
7904	Cut and fill	P2	2.0	3.5	145
7905	High amplitude reflector	P2	0.1	2.2	170
7906	Infilled depression	P2	0.2	5.1	173

ID Number	Classification	Archaeological rating	Depth Range (mBSB)		Nearest KP
			From	То	
7907	Infilled depression	P2	0.4	4.8	174
7908	Fine-grained deposit	P1	1.2	1.3	174
7909	Fine-grained deposit	P1	1.4	1.6	174
7910	Fine-grained deposit	P1	1.2	1.3	174
7911	Fine-grained deposit	P1	0.1	1.1	174

As terrestrial features interpreted as being deposited during periods of likely human occupation, those features given a P1 archaeological rating are considered of high archaeological potential. Those features with a P2 discrimination are considered of medium archaeological potential, partly due to the uncertainty of features formation and fill.

Should further ground investigation work be undertaken within areas of interest within the marine installation corridor, the archaeological contractor shall be consulted to advise on potential samples to be acquired for archaeological purposes and other identified units of archaeological interest identified within the data. Any geotechnical logs from within the marine installation corridor will be made available for geoarchaeological assessment, such as a stage one assessment of all the core logs or sampling and dating work. This would aid in refining the interpretation and therefore help determine the archaeological potential of the area.

Furthermore, any samples acquired containing material of archaeological potential, particularly those within the interpreted Holocene features, will be made available for geoarchaeological assessment.

## 12.7.1.4 Protocol for Archaeological Discoveries

If previously unknown sites or material are encountered during the different phases of the Marine Scheme, measures will be taken to reduce the level of impact. In order to provide for these unexpected discoveries, as per the WSI, a PAD will be adopted. The PAD is a system for reporting and investigating unexpected archaeological discoveries encountered during installation activities, with a Retained Archaeologist providing guidance and advising industry staff on the implementation of the PAD. The PAD also makes provision for the implementation of temporary exclusion zones around areas of possible archaeological interest, for prompt archaeological advice, and, if necessary, for archaeological inspection of important features prior to further activities in the vicinity. The PAD provides a mechanism to comply with the MSA 1995, including notification of the Receiver of Wreck, and accords with the Code of Practice for Seabed Developers (JNAPC, 2006).

## 12.8 Residual Effects

No significant residual effects are predicted for marine archaeology.

## 12.8.1.1 Installation and Decommissioning Phase

## Significance of residual effect on known and unknown assets from direct impacts

Following the application of appropriate mitigation, as outlined in the mitigation section (12.7), including the implementation of AEZs, further assessment of A2 anomalies, and a PAD, the magnitude would be reduced and the significance reduced to **negligible** which is **not significant** (see Table 12-11).

It should be noted that in some cases, the application of appropriate mitigation, such as an archaeological investigation of seabed anomalies prior to impact of the implementation of a PAD could lead to effects of **minor** to **moderate** beneficial significance. For example, undertaking further geoarchaeological assessment of geotechnical samples and enhancing knowledge of the wider prehistoric landscape or discovery of a wreck of interest, and being able to share information with the wider public.

## 12.8.1.2 Operational Phase

## Significance of residual effects on known and unknown assets from direct impacts

Following the application of appropriate mitigation, as outlined in Section 12.7, including retaining AEZs and implementing a PAD, the magnitude of impact would be reduced leading to a **negligible adverse** effect, which is **not significant**.

In some cases, the application of appropriate mitigation, such as archaeological investigation of seabed anomalies prior to impact could lead to effects of **moderate beneficial** significance. For example, discovering a wreck of interest and being able to share it (via Virtual Reality/publications/outreach events etc.) with the wider public.

## 12.9 Cumulative and In-Combination effects

The full cumulative and in-combination effects appraisal is presented in Chapter 16: Cumulative and In-Combination Effects.

This includes a matrix (Table 16-11) to identify potential marine archaeology impact pathway interactions between the Marine Scheme and the English and Scottish Onshore Schemes and no interaction is anticipated because of the proposed HDD use at the landfalls.

In-combination effects are where receptors could be affected by more than one environmental impact. Where a receptor has been identified as only experiencing one effect or where only one topic has identified effects on that receptor, there is no potential for in-combination effects. The receptor groups within this chapter do not interact between chapters, therefore receptors have been wholly appraised within this respective topic chapter.

## 12.10 Summary of Appraisal

This chapter has considered the potential effects of the Marine Scheme on marine archaeology receptors. A summary of the effects is presented in Table 12-11.

No significant effects are predicted during installation, operation (including maintenance and repair), and decommissioning of the Marine Scheme.

Scotland England Green Link 1/ Eastern Link 1
Environmental Appraisal Report
Marine Scheme
Chapter 12: Marine Archaeology

Table 12-11: Summary of environmental appraisal

Project Phase	Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Project Specific Mitigation	Magnitude after Mitigation	Significance of Residual Effect
Installation	Direct disturbance to seabed causing damage to receptors	Known and potential seabed prehistory receptors	High	Low	Moderate	Further investigation by means of geoarchaeological assessment of geotechnical samples	Negligible	Not significant (major positive as long as samples are retained, analyzed and reported on by a qualified geo- archaeologist)
		Known and recorded maritime receptors and aviation receptors (A1s)	High	High	Major	Implementation of AEZs	Negligible	Not significant
		Geophysical anomalies of possible anthropogenic origin (A2s)	High	High	Major	Micro-siting of cable route; further investigation through potential opportunities, where possible, for diver or ROV survey; archaeological watching briefs during clearance of A2s	Negligible	Not significant
		Currently unknown archaeological	High	High	Major	Implementation of AEZs; WSI (and any supporting	Negligible	Not significant

Project Phase	Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Project Specific Mitigation	Magnitude after Mitigation	Significance of Residual Effect
		sites and artefacts				activity Method Statements), and PAD		
	Use of anchors by vessels (spread mooring anchoring systems or spud cans)	Direct impacts to known and potential seabed prehistory receptors; maritime and aviation receptors	High	Medium	Major	Implementation of AEZs; WSI (and any supporting activity Method Statements), and PAD	Negligible	Not significant
	Indirect disturbance to receptors	Known and potential seabed prehistory receptors; maritime and aviation receptors (caused by changes to the hydrodynamic and sedimentary regimes due to spoil removal and sediment redistribution)	High	Negligible	Negligible / minor	No mitigation is recommended as a result of negligible / minor adverse significance of impact.	Negligible	Not significant
Operation (including maintenance and repair)	Direct disturbance to seabed causing damage to receptors	Known and potential seabed prehistory receptors; maritime and	High	High	Major	Implementation of AEZs; WSI (and any supporting activity Method Statements), and PAD	Negligible	Not significant

Project Phase	Potential Impact	Receptor	Sensitivity	Magnitude	Significance	Project Specific Mitigation	Magnitude after Mitigation	Significance of Residual Effect
		aviation receptors						
	Use of anchors by vessels	Direct impacts to known and potential seabed prehistory receptors; maritime and aviation receptors	High	High	Major	Implementation of AEZs; WSI (and any supporting activity Method Statements), and PAD	Negligible	Not significant
	Indirect disturbance to receptors	Known and potential seabed prehistory receptors; maritime and aviation receptors (caused by potential scour and plume effects resulting in increased protection to, or deterioration through erosion)	High	Negligible	Negligible / minor	No mitigation is recommended as a result of negligible / minor adverse significance of impact.	Negligible	Not significant
Decommissioning	Potential effe	cts of decommission	oning the same	as installation.				

## 12.11 References

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