

Marine Industry & Submerged Prehistoric Archaeology



**Sharing Data,
Developing Understanding
and Delivering Best Practice**

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Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf (SPLASHCOS) COST Action TD0902

The SPLASHCOS research network includes specialists from over 60 agencies and organisations across 25 countries. Four years of funding from the European Commission under its COST program (Cooperation in Science and Technology) from 2009 to 2013 brought together archaeologists, marine geophysicists, environmental scientists, heritage agencies, and commercial and industrial organisations interested in researching, managing and preserving the archives of archaeological and palaeoclimatic information locked up on the drowned prehistoric landscapes of the continental shelf. The need to bring together such a range of disciplines and sectors for this initiative made it suitable for COST funding which facilitates coordination of research activities and information gathering across national and disciplinary boundaries, and stimulates new ideas and collaborations.

The key SPLASHCOS Objectives are:

- To promote research on the investigation, interpretation and management of the drowned landscapes and prehistoric archaeology of the European continental shelf;
- To create a structure for the development of new interdisciplinary and international research proposals; and
- To provide guidance to heritage professionals, government agencies, commercial organisations, policy makers and a wider public on the relevance of underwater research to a deeper understanding of European history, reconstructions of palaeoclimate and sea-level change, and the social relevance and likely future impact of these changes.

Examining Submerged Archaeology and Cultural Landscapes

The marine zone is a valued cultural and economic resource which human populations have exploited for thousands of years. In modern times the commercial value of marine resources means there are often competing interests between environmental considerations and sustainability.

The archaeological and palaeoenvironmental resource present on and within the seabed provides vital data on past human populations and environmental changes. There is a need to ensure that modern activities do not impact on these traces of evidence without appropriate recording and interpretation. Due to the impact that marine development can have on archaeology there is a need for improved understanding between the developers, marine-environmental and conservation sectors.

This document provides information on submerged archaeology and landscapes, aiming to highlight how marine industry can contribute significantly to understanding of this heritage. The positive benefits this brings for the wider public on a national and international scale are presented.

Prehistoric Archaeology and Landscapes

Archaeological and palaeoenvironmental remains are found within Pleistocene and Holocene sediments of the seabed and reflect past landscapes at times of lower sea level. The precise nature and position of much of this material is currently not well understood.

However, the development of prospection and investigation techniques is enabling increased understanding.

Types of prehistoric evidence from the seabed provide unparalleled evidence of early humans, their environment and the associated flora and fauna. The preservation that is possible in waterlogged environments means a wider range of material types can be discovered than are present in terrestrial areas. Evidence discovered to date is likely to be just a fraction of what could be found in the future.

Defining Marine Cultural Heritage

"It is important to acknowledge the importance of underwater cultural heritage as an integral part of the cultural heritage of humanity and a particularly important element in the history of peoples, nations, and their relations with each other concerning their common heritage"

(UNESCO Convention on the Protection of the Underwater Cultural Heritage)

The archaeological heritage is comprised of "all remains and objects and any other traces of human-kind from past epochs.... The archaeological heritage shall include structures, constructions, groups of buildings, developed sites, moveable objects, monuments of other kinds as well as their context, whether situated on land or under water"

(European Convention on the Protection of the Archaeological Heritage)



Why Prehistoric Archaeology is Important

Data from the marine zone can provide dramatic insights into the nature of past prehistoric landscapes and associated occupation by a wide range of species, including early humans. The archaeological and palaeoenvironmental record form the physical remains of our past, if they are disturbed or lost without recording, then an important piece of our past is destroyed.

Data which helps understand prehistoric remains form an important archive of information. This data allows us to assess and interpret the past. Understanding past human and landscape development provides the long-term perspective through which we articulate our individual and collective, national and international identities.

Prehistoric remains from the marine zone often reflect earlier shorelines and land-masses which are now drowned. Although these remains may lie within waters of a particular country they reflect a time before modern coasts and political boundaries were formed, hence they have international significance. Submerged landscapes can help understand human evolution and dispersal of people across the globe and how this process has been affected by changing sea-level and climate. New archaeological and environmental data from the seabed can improve knowledge of past sea-level change helping refine models of predicted future changes.

Discovery and Investigation

Prehistoric archaeology and landscape evidence is discovered through a range of activities. These can be targeted research investigations or unexpected through seabed disturbance. A wide range of survey data can inform on submerged prehistoric landscapes:

- Geophysical survey – seismic data: provides data on the sub-surface sediments which reflect past topography and landscape prior to sea level rise. Features such as buried river channels and different sediment units within them can be viewed within the data. Understanding past landscape forms and changes helps determine potential for preserved archaeology and palaeoenvironmental material within them.
- Geophysical survey – side scan and bathymetric data: provide data on the current seabed topography which is used in conjunction with seismic data to help understand landscape changes.
- Borehole or core survey: often undertaken for engineering purposes to help understand the nature of the seabed deposits that may be encountered during a development. These samples can provide significant amounts of information for interpreting the submerged prehistoric landscapes. A range of palaeoenvironmental and dating techniques can be used on deposits to provide high resolution information.

- Grab sampling: taken to characterise seabed sediments. It is possible for prehistoric artefacts to be present within these samples.

Additional targeted work can be undertaken using:

- Diver investigation: when sites or sediments of archaeological interest have been discovered, they can be further investigated through diver survey and excavation. Trained archaeologists make records using a variety of techniques including measured survey, photography, video, sampling or full recovery of objects.
- ROV survey: if conditions are suitable it can be possible to use a Remotely Operated Vehicle to gain photographic and video survey data of archaeological deposits. Some development activities use ROVs for area or linear surveys which can discover material of archaeological importance.

Use of the range of data and sampling outlined above can enable detailed interpretation and reconstruction of past landscapes. With such detailed understanding it is possible to design developments and activities impacting the seabed to minimise impact to archaeological material and reduce risk to developers from unexpected discoveries.

Many of these are frequently undertaken in the process of planning marine development projects. However, the survey datasets acquired can often be spread between a range of companies, archives, developers, government agencies and non-governmental organisations. Some data holders do not realise the important potential of the data to provide evidence of drowned landscapes.

Below: A diver explores a new area of the Pavlopetri site.



Archaeology within Policy, Regulations & Development Process



Balancing modern activities, sustainability and environmental concerns is important for society, today and in the future. Maintaining this balance is regulated through a number of regional, national and international policies and regulations which set out processes through which marine development is licensed.

Effective management of the seabed needs collaboration between developers and researchers to mitigate potential impacts of activities on the environment. This has been recognised in a number of policy and regulation documents which create the framework for management approaches.

Within Europe the Environmental Impact Assessment Directive, in particular, provides the baseline procedures and processes which define the roles and relationship between developers and regulators. When activities which will impact the seabed are proposed the actions required by developers in relation to cultural heritage are set out, without which consents for development will not be approved. Key within this process is consultation and cooperation between developers, regulators and archaeologists.

Legislation, Directives and Guiding Documents

- European Environmental Impact Assessment Directive 97/11/EC
- European Strategic Environmental Assessment Directive 2000/42/EC
- UNESCO Convention on the Protection of Underwater Cultural Heritage
- European Convention on the Protection of the Archaeological Heritage (Valletta Convention) 1992

Definitions: Roles in the Development Process

Within individual countries the precise arrangements for consultation and responsibilities between these various roles may vary.

Developer

A company or organisation proposing or engaged in activities involving construction, alteration or renewal of any works in, on or under the seabed. This may involve the excavation, removal, movement or deposit of materials, substances or articles in, on or under the seabed.

Regulator

An organisation, usually National or Local Government Department or agency, acting to ensure compliance with legislation, directives and established guidance when issuing consents in relation to development.

Curator

An archaeologist or heritage professional advising a statutory or other formal consultee, who provides advice to regulators on archaeological matters relating to development. They provide general guidance to developers and regulators.

Archaeological Consultant / Contractor

Provider of independent archaeological advice or professional archaeological services to guide the developer through, and satisfy the archaeological requirements of, the development process. Curators may be able to provide a list of archaeological consultants and contractors.

European Marine Industry Sectors & Submerged Archaeology

Marine industry and archaeology can offer each other a range of positive benefits. The requirement to ensure heritage is investigated prior to development is embedded within European Directives, however, contact between companies and archaeologists does not always have to be part of the regulatory process. Existing survey data held by companies, developers and organisations can also be used to develop understanding of submerged prehistoric landscapes. Providing access to data can provide wide public and academic benefits through enhancing understanding of past human occupation and environments.

Although some data sets may be bound by legal agreements and commercial sensitivity, there is a general move to open the flow of data between industry and the public. The Integrated Marine Policy for the European Union highlights the need for availability and easy access to a wide range of natural and human-activity data on the oceans as the basis for strategic decision-making on maritime policy. The Marine Strategy Framework Directive aims to protect the

marine environment across Europe more effectively. In order to achieve this, there is a need for comprehensive and interoperable digital data to enable effective marine spatial planning.

Within planned development projects there are basic procedures common to all activities which will impact the seabed, these are:

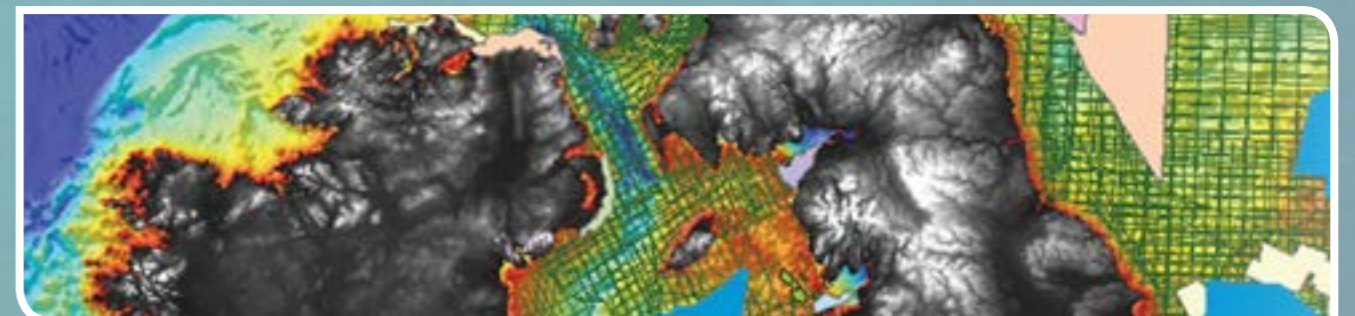
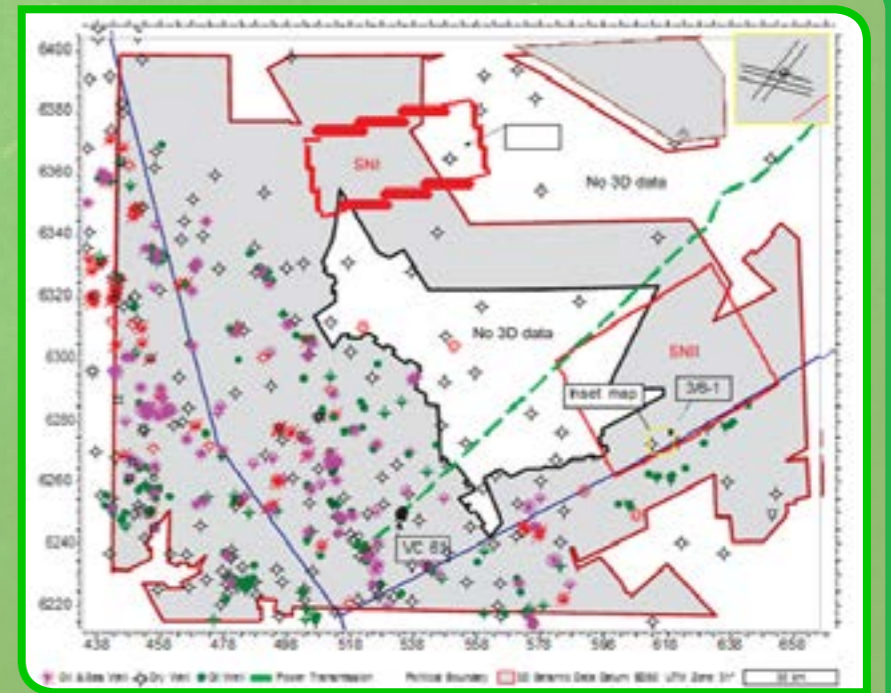
- Study and assessment of areas to be developed must include archaeology and heritage remains. The earlier this is started within the development process, the lower the risk of delays further down the line.
- Unexpected archaeological discoveries encountered during seabed development should be reported promptly to enable appropriate action to be taken.

Identification and positive management of archaeological material can bring cultural rewards nationally and internationally, and positive publicity for developers.

Case Study: Use of Industry Data to Understand Early Settlement of Norway

The Norwegian Maritime Museum and the Museum of Cultural History at the University of Oslo used seismic data donated by industry to model the submerged palaeolandscapes within the continental shelf. Data from an area over 50,000km² was examined, with two key case study focus areas. This information is vital for understanding the colonisation of Norway after the last Ice Age and for aiding identification of traces of human settlement from this late glacial period.

Right: Location map showing the 3D seismic data coverage, boreholes, and high-resolution data.



Above: There are a large number of available data sources for the UK shelf. The image shows survey transects from such sources, including BGS metadata, windfarm data, and Civil Hydrography Programme data.

The relationship of marine industries with the submerged prehistoric cultural heritage depends on the precise nature of the impacts caused by the activities undertaken. Where actions cause impacts to the seabed the outcome can be significant for any archaeology or environmental information. Through communication and cooperation between industry and heritage there can be positive outcomes for both sectors. There are growing numbers of internationally significant collaborations between industry and heritage which are setting the standards for best practice.

Oil and Gas

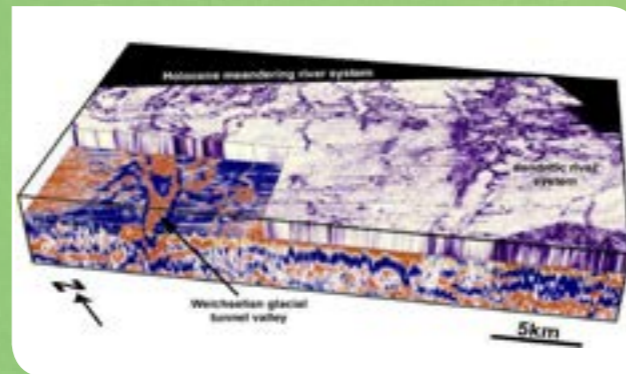
The industry infrastructure of rigs and associated transport pipelines has a direct impact on particular areas of seabed. Prior to the installation of production-related structures a wide range of surveys are carried out over large areas to prospect for the oil and gas resource. This process generates very large amounts of data on the seabed and sub-surface deposits which can illuminate the nature of past landscapes.

Case Study: Large Scale Submerged Prehistoric Landscape Research - North Sea Palaeolandscapes Project (Birmingham University)

The North Sea Palaeolandscape Project, conducted by Birmingham University, undertook the mapping of the submerged landscape known as Doggerland, covering over 23,000km² of the English Sector of the North Sea and utilising petroleum industry 3D seismic data. Well preserved lake beds, rivers and

wetland areas have been interpreted. The data showed that the Dogger Bank formed an emergent plain during the Holocene with complex meandering river systems and associated tributary or distributary channels and lakes dominating the region

(http://www.iaalocal.bham.ac.uk/North_Sea_Palaeolandscapes)



Ports, Harbours and Infrastructure

The ports, harbours and estuaries sector includes operations which vary widely in scale, from very small local rivers to large international ports. Growth in marine transport and offshore industries has resulted in a number of large commercial ports undertaking development which have involved EIAs to understand impacts on heritage. However, smaller scale works also have the potential to impact archaeology and can fall outside of some regulations. Ports and harbours often hold important data from repeat surveys and local knowledge of archaeological discoveries which can benefit understanding of heritage.

Case study: Port of Rotterdam – the Maasvlakte 2 Extension Project

The port development involves dredging 240 million cubic meters of sand from the North Sea floor several kilometres offshore to build the harbour and cutting a new 22m deep canal to connect the new facilities with the existing harbour. From the outset there has been intensive contact between the Port Authority and the Dutch Cultural Heritage Agency about the archaeological work to be undertaken and scheduling this to minimise delays to the project.

The prehistoric landscapes within the proposed development area were known to consist of deposits related to the Pleistocene and early Holocene Rhine-Meuse Delta, which have a high potential for Palaeolithic and Early Mesolithic finds. A research program to investigate these deposits prior to development was designed and has included palaeolandscape reconstruction, palaeontology and archaeology. Results from these investigations have been presented to the public through exhibitions and activities, providing wide access to these exciting discoveries.



Aggregates

The extraction of sand and gravel from the marine zone is undertaken in support of a wide range of construction and development activities. Cultural heritage can be found on and within these aggregate deposits. The sands and gravels can be specifically related to submerged prehistoric landscape features such as former river channels.

The impact of dredging on artefacts and landscape features can be substantial, usually meaning full removal.

Case study: British Marine Aggregate Producers Protocol for Reporting Discoveries of Archaeological Interest

In addition to undertaking appropriate Environmental Impact Assessments prior to dredging aggregates, within the UK, a scheme for reporting any unexpected discoveries of archaeological interest has been in place since 2005. Artefacts are reported by site or vessel 'champions' to an archaeological consultancy who provide advice and guidance on the handling of the artefacts, undertake further research and ensure the data is distributed to relevant heritage

databases. The protocol has had a positive impact on understanding of cultural heritage within areas of aggregate extraction with around 900 finds having been reported.

One of the most significant reports has been the discovery of 28 Palaeolithic hand axes and associated faunal remains from the Southern North Sea. These exceptional finds are demonstrating the archaeological potential of these prehistoric drowned landscapes.



Renewables

A rapidly growing marine sector is renewable energy, particularly wind farms and tidal power generation. The installation of turbines or generators involves piling into the seabed. This is associated with networks of cables between installations and cables running to shore. Cables are usually trenched into the seabed, requiring disturbance of seabed material and potentially of archaeological material.

Case Study: Historic Environment Guidance for Offshore Renewables around the UK

Due to the expansion of offshore wind farms around

the UK a suite of guidance and best practice documents have been developed. Approaches to the historic environment impacted by wind farm development follow established best practice for all marine developments, the guidance documents provide further detail tailored to the type of scoping, survey, assessment and mitigation work related to wind farms. These ensure that industry, archaeologists, consenting authorities and regulators understand the detailed requirements for the historic environment within the Environmental Impact Assessment process.



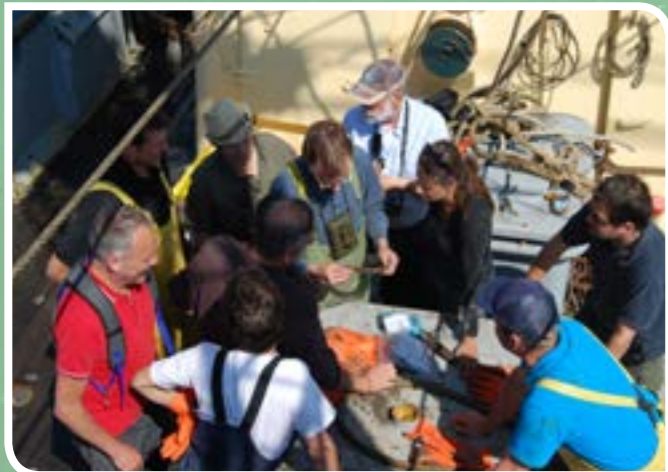
Beneficial Relations between Industry and Archaeology

Fishing

Methods of fishing which trawl the seabed come into contact with a range of seabed deposits. While fishermen aim to avoid large structures such as shipwrecks as these tangle in gear and risk losing it, trawls in high potential areas can encounter archaeological remains such as flint tools and large amounts of animal bone from prehistoric species.

Case Study : Pilot scheme Fishing Industry Protocol for Archaeological Discoveries

The UK is currently trialling a voluntary reporting scheme within the Sussex Inshore Fisheries Area. This scheme recognises the extent that fishing activities interact with seabed heritage, and provides a mechanism for reporting archaeological discoveries (<http://fipad.org>).



Cables & pipelines

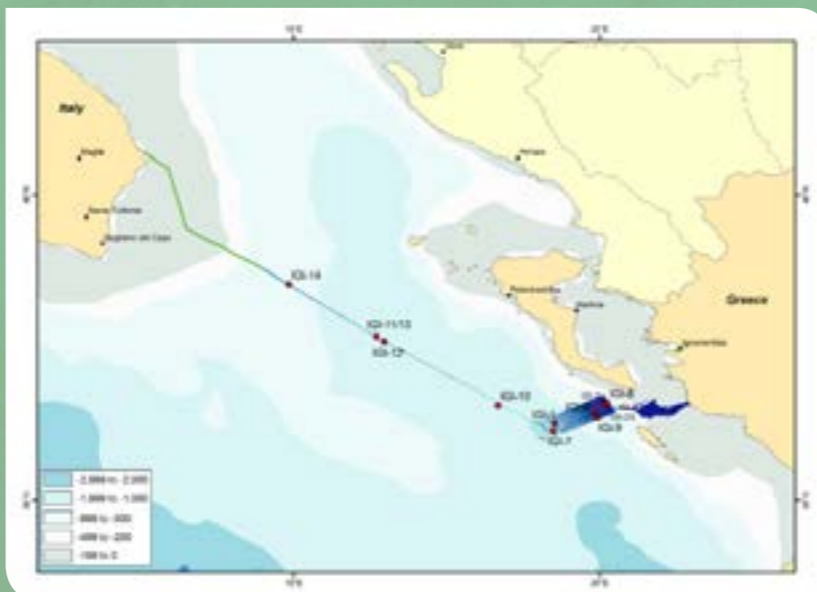
Pipes and cables are installed across and within the seabed, these can be relatively short across estuaries, or can cross seas and oceans. Where these are trenched within the seabed there is potential for impacts, and the process of installation may also disturb seabed deposits. Linear developments can often cross between two or more different countries, which means differing regulatory and consenting regimes. A consistent approach to heritage assessment and mitigation in line with EIA regulations can help gain licences for these developments.

Case Study: Deep Water Gas Pipeline Route "POSEIDON" - Interconnection Greece-Italy

This project involved collaboration between industry and research organisations. Commercial survey companies gathered detailed marine data along the 180 kilometre pipeline route, this was

then interpreted by the Hellenic Centre for Marine Research. 12 sonar targets and 3 shipwrecks were discovered along the narrow survey route lying at depths beyond 1000metres.

Below: Greece to Italy Pipeline route, surveyed area and archaeological targets.



The positive benefits that can be gained through collaboration between marine industry and archaeology are numerous. These can include:

- Greater social awareness of modern use of the seabed and how this relates to past humans and landscapes.
- Scientific contribution to the understanding of past human history which is relevant on an international scale.
- Appropriate assessment and mitigation of archaeology and cultural heritage, which helps fulfil social responsibilities of companies to minimise environmental impact.
- Taking a responsible approach to cultural heritage can provide positive public relations opportunities. These cultural rewards can be national and international in scale due to the special trans-national nature of submerged cultural heritage.
- Understanding archaeology and heritage within a development allows for cultural and financial risk management, ensuring fewer delays to construction schedules.
- There is a significant cost benefit to developers through identifying early in the development process if there is potential to encounter archaeological remains.
- Planning for cultural heritage assessment alongside other environmental, geotechnical and engineering considerations will reduce the risk of duplication of effort in data gathering, potential delays in works and unforeseen costs.
- Cooperation with heritage curators and archaeologists can help guide developers and companies to ensure their obligations are met through appropriate standards of work, helping to smooth agreements for licences.

Increased understanding and knowledge of past humans and landscapes is relevant to wider society. This information can be used for:

- Formal education* – within schools through packs and associated activities. Prehistoric archaeology and landscapes have links to a wide range of subjects – history, maths, geography, environment, science etc.
- Informal education* – afterschool clubs, site visits, guided walks.
- Adult learning for all ages* – special interest groups, local residents, tourists and visitors.
- Educating future professionals* – providing information on submerged prehistory to a wide range of professions related to the marine environment – planners, engineers, surveyors, conservation, politicians etc – raises awareness and understanding.
- Integrated marine research* – providing data at University and specialist laboratory level for advance research into the marine environment.



Sharing Data and Information: Contacting Archaeologists

On and within the seabed lies a wealth of information on prehistoric humans and past landscapes. Changing climate and sea level over hundreds of thousands of years have resulted in dramatic changes to available territory within which early humans and associated flora and fauna would have existed. Rising waters and deposits of sediments over these landscapes have ensured important traces of the prehistoric past have been preserved.

Activities which impact the seabed have the potential to disturb and destroy prehistoric evidence. Research, survey and sampling which are associated with development and construction activities also have the potential to provide important data to enhance understanding of early humans and their environments. Increased understanding brings wide public and social benefits for modern society.

Contact between archaeologists and industry is often stimulated through the regulatory requirements of the development process and associated licensing. Companies can make large public contributions by offering data gathered from the seabed to scientists and archaeologists for research, analysis and publication. These results can be used for a wide range of education and learning initiatives.

Companies, industries, organisations or agencies holding or gathering seabed data that may contribute to research are encouraged to contact heritage curators or archaeologists. The precise point of contact may vary depending on regional or national management structures for culture, however, initial contact with the national heritage agency is advised. The heritage agency should have a maritime or marine specialist or team of specialists who would be interested in seabed data and could advise on other contacts with research teams working within the area.



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