

WORKING ALONGSIDE THE MARINE HISTORIC ENVIRONMENT – AN AGGREGATE DREDGING INDUSTRY PERSPECTIVE

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Abstract: The contribution of terrestrial sand and gravel quarrying to our understanding of the historic environment in the UK is well documented. Some of the most important finds in recent years have been associated with sand and gravel extraction at land-based quarries. As the marine aggregate industry targets similar deposits of sand and gravel, associated with ancient channel terraces and infills, it is reasonable to assume that a similar potential exists for items of archaeological significance to be present – submerged landscapes and artefacts, as well as the more obvious wrecks. Through the extraction of sand and gravel, dredging activity inevitably disturbs the seabed. The potential therefore exists for any features of archaeological interest that may be present to also be disturbed – including submerged landscapes, wrecks and artefacts. By recognising and acknowledging this, the British marine aggregate industry through its trade association the British Marine Aggregate Producers Association has worked to address these issues on a proactive basis. Guidance to provide advice and procedures for every stage of marine aggregate development and operation, from assessment of new licence areas, to mitigating and monitoring sensitive sites and reporting and evaluating finds has been developed in partnership with English Heritage, statutory advisor to the UK Government on England's historic environment, land and sea. This paper provides an industry perspective on marine archaeology, and reflects on how an issue of potential threat can be turned into an opportunity through an open and constructive partnership approach.

Keywords: marine aggregates, heritage, archaeology, guidance

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INTRODUCTION

Britain is an island nation and a trading nation, and the marine aggregate industry is an integral part of this maritime cultural heritage. The industry's origins can be traced back to the 1700's, when sand and gravel was extracted by hand from sand banks at low water for use as ballast in unladen sailing ships. Trinity House licensed this arrangement, and for many years this represented their principle source of income, which in turn funded the development of the nation's network of lighthouses and buoys.

Today, the marine aggregate sector is a modern and technically advanced industry with 27 purpose-built marine aggregate dredging vessels producing 24 million tonnes during 2006 from 70 production licence areas around the coastline of England and Wales. The sand and gravel produced by the industry is used principally by the construction sector – with a third of South East England's construction aggregate coming from marine sources. Aggregate dredged from British waters is also exported to the near Continent – northern France, Belgium and the Netherlands – for use by the construction sector. Beach replenishment and contract fill also represent potential end-uses, with over 4 million tonnes supplied in 2006, although the annual volumes supplied can vary significantly.

The contribution of terrestrial sand and gravel quarrying to the understanding of Britain's historic environment is well documented, and some of the most important finds in recent years have been associated with sand and gravel extraction – for example the Conover mammoth, the Alrewas woolly rhino and the Shardlow log boat. As the marine aggregate industry targets similar deposits of sand and gravel – associated with ancient channel terraces and infills, there is the same potential for items of archaeological significance to be present. The main difference is that the sites are typically submerged under 20m+ of water. Given the difficulties of determining the presence of features of interest in a marine context, let alone assessing their significance, this brings some unique challenges to both industry and to regulators.

MARINE HERITAGE ISSUES

While the terrestrial experience has evolved over more than 30 years, in an offshore setting these issues have only really come to the fore over the last 7-8 years. Consequently, there has been a limited amount of time to develop our level of understanding offshore and the relationship between developer and regulator. Despite these apparent limitations, very significant progress has been made. However, before these developments are examined, it is useful to consider the issues that need to be taken into account.

Wrecks

Wrecks of ships and aircraft are of course the most obvious features of heritage interest that marine aggregate extraction has the potential to interact with. Some of the wreck features the industry maps are already charted, but others are not and through their discovery the industry actively contribute to the national records.

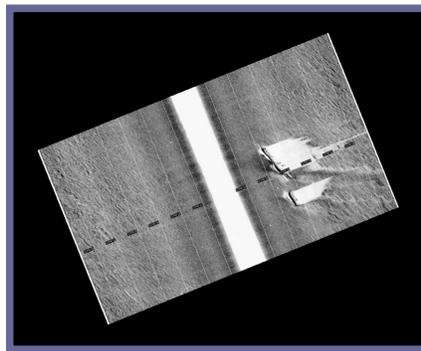


Fig. 1 Side scan sonar image of the wreck of the World War 1 German U-boat U-65, located in a marine aggregate licence area in the East English Channel.

From an industry perspective, there is an obvious incentive to be able to locate wreck features in licensed areas in order that they may be proactively avoided. Irrespective of whether a feature is a medieval trading vessel or a

Second World War aircraft, they have the same potential to cause extensive and expensive damage to a dredgers underwater equipment. Additionally, the wood and coal often associated with older wrecks can contaminate otherwise clean marine sand and gravel deposits, potentially limiting their end use as construction aggregate.

Once potential wreck features are identified, operators are able to avoid obstructions with confidence using exclusion zones, within which operations are prohibited. These zones are then monitored and enforced through a 'black box' electronic monitoring system all aggregate dredgers are required to have.

Landscapes

Figure 2 depicts an impression of the landscape 10,000 years ago, some 10km south of the Isle of Wight in what is now the English Channel. A river flows across a tundra landscape with our prehistoric ancestors inhabiting the banks. If you fast forward to the present day, this environment now lies submerged beneath 30m of water, and forms part of a complex network of palaeovalleys created over many hundreds of thousands of years.



Fig. 2 Artists impression of the landscape 10,000 years ago south of the Isle of Wight, English Channel (image courtesy of Wessex Archaeology).

Just as on land, these ancient river valleys are where commercially viable marine sand and gravel deposits are located. While academics can hypothesise and produce maps to assist in visualising archaeological potential, the marine aggregate industry is in a unique position to contribute through the collection of high resolution seismic survey data. This in turn can be used to fill out the details at a site specific scale, in order to consider the potential significance.

Importantly, what appears to be a potential conflict between extraction operations and features that may be preserved within the sand and gravel deposits does not arise. The industry targets coarse, poorly sorted deposits associated with high energy flows, whereas our ancestors would have favoured quieter, estuarine sites where it was safer to live. These are characterised by peats and muds, which the industry actively avoid.

Artefacts

The dredging process has the potential to recover prehistoric artefacts, ranging from hand axes and flints transported by fluvial processes, to mammoth teeth and bones. There is also the potential to recover more recent items, such as ship and aircraft remains. As well as being potentially archaeologically important, recovered artefacts may also indicate the presence of a previously unidentified obstruction.



Fig. 3 Colt .45 calibre sidearm and .50 calibre machine gun associated with the wreck of a previously unidentified World War II American aircraft.

The weapons shown on Figure 3 were recovered from a cargo dredged from a licence area in the southern North Sea in 2001, along with pieces of airframe. A high resolution side scan sonar survey of the area located the site of a previously un-recorded aircraft – thought to be a World War II American bomber. Since this discovery, an exclusion zone has been implemented to protect the site in accordance with the Protection of Military Remains Act 1986.

AN INDUSTRY-LED SOLUTION

The approach taken by the British marine aggregate industry, through its trade association the British Marine Aggregate Producers Association (BMAPA) has been a primary factor in the way in which marine heritage issues have been identified and managed. Through the extraction of marine aggregate, the industry's activities will have an impact upon the seabed. This in turn has the potential to impact upon any features of interest that may be present – whether these be archaeological, biological or commercial. As a responsible developer and operator, the industry recognises this potential and endeavours to overcome issues by being part of the solution rather than simply part of the problem. The reason for this is simple; the regulatory process under which dredging is permitted is developer-led, and relies upon consensus planning in order to both identify and then resolve potential issues associated with a new application. It is therefore in the industry's interest to proactively contribute towards the timely resolution of issues.

A greater level of generic understanding, knowledge and context allows a more confident assessment of significance to be made. This in turn allows operators to manage, mitigate and monitor their site specific operations more effectively, therefore reducing the potential for adverse effects.

As far as marine heritage issues are concerned, the solution has been for the marine aggregate industry through BMAPA to voluntarily and proactively develop a Guidance Note in partnership with English Heritage, statutory advisor to the UK Government on England's historic environment, land and sea – see Figure 4. This was produced in response to a very real need for guidance to be used by not only developers and regulators, but also wider stakeholders and interested parties. The final Guidance contains a comprehensive review of the issues associated with the marine historic environment, and provides advice and procedures for every stage of marine aggregate development and operation, from assessment of new licence areas, to mitigating and monitoring sensitive sites and reporting and evaluating finds (BMAPA and English Heritage, 2003).

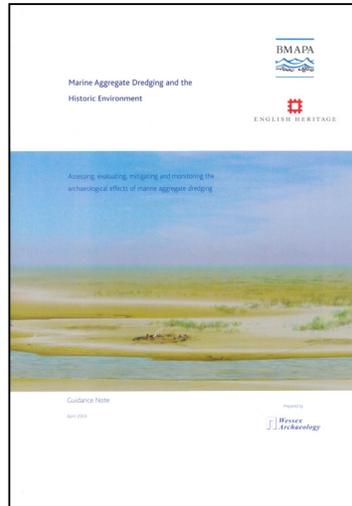


Fig. 4 Marine Aggregates and the Historic Environment Guidance Note published by the British Marine Aggregate Producers Association and English Heritage in 2003

From an industry perspective, this represents a significant step forward in ensuring that the marine historic environment is thoroughly and consistently considered throughout the development process. Furthermore, this approach could also be seen as a blue print for other industries operating offshore. In this respect, it is important to stress that the marine aggregate industry is by no means unique in its potential for adverse effects upon marine archaeological features. The approach that has been developed uses a set of broad guiding principles which have already begun to be applied to other offshore development sectors (JNAPC, 2006; COWRIE, 2007).

GUIDANCE APPLIED IN PRACTICE – HASTINGS SHINGLE BANK

To illustrate some of the processes set out in the guidance document, it is useful to consider a case study.

Hastings Shingle Bank is a production licence area worked by three companies. The licence is located 10km off the East Sussex coast, in the Eastern English Channel. In terms of production, the area provides over 1.5mt/year of sand and gravel for both construction and coast defence purposes.

As part of the original environmental assessment process for this area, interpretation of site survey data revealed several features of potential archaeological interest – including discrete debris believed to have resulted from the demolition of a modern wreck. This resulted in a series of exclusion zones being introduced across the licence which had the effect of sterilising a significant area of potential resource in the south of the area. With the introduction of these exclusion zones, permission to dredge the area was awarded – even though the precise nature of the features was unknown. This represents a good example of the precautionary approach in practice – not necessarily stopping an activity, but identifying key sensitivities within a development, and ensuring measures are in place to protect them.

In this case, the operators opted to examine the southern area in more detail. Very high resolution side scan sonar data was acquired to map the features, culminating in a diving survey by marine archaeologists to confirm the interpretation that the objects were not of archaeological value. In this instance, they were modern hatch covers – see Figure 5. This development of understanding allowed the archaeological exclusion zones to be removed from the planning consent, and the operators were then able to lift and remove the debris from the area. This released a further 1 million tonnes of sand and gravel resource – equivalent to nearly a year's production.

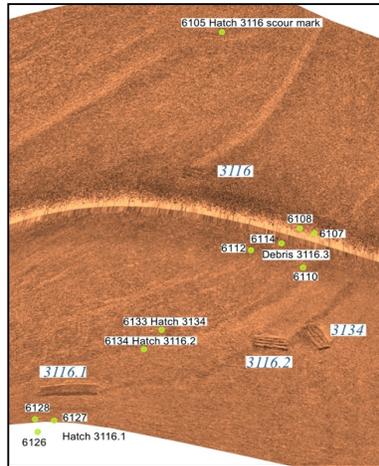


Fig. 5 High resolution side scan sonar image showing large hatch covers from a modern wreck on Hastings Shingle Bank production licence area. After being positively identified as being of no archaeological significance, these have now been removed from the licence area by the operators.

Overall, the emphasis of the Guidance Note is on reaching pragmatic solutions once features of potential archaeological significance are encountered. The developer has the choice – to accept the exclusion zones and the associated monitoring that may go with it for the duration of the licence term, or to commit further studies to develop the level of understanding and permit a re-assessment of significance. This in turn may result in the exclusion zone being able to be removed – equally of course, it may not!

ARCHAEOLOGICAL FINDS REPORTING PROTOCOL

The latest development in the industry’s evolving approach to addressing heritage issues has been an industry-wide reporting protocol for any artefacts discovered during the dredging process, published in August 2005. Protocols for reporting archaeological finds emerged as a key mitigation option once it became clear that watching briefs by archaeologists either onboard vessels or at the receiving wharves were unlikely to be effective given the scale of production operations. The protocol provides a safety net to allow finds to be reported once dredging is underway and is additional to the measures taken to avoid areas of archaeological sensitivity identified through desk-based assessment and field evaluation.

Rather than develop protocols on a site-by-site basis, the industry recognised that it would be more consistent and effective to develop a single unifying protocol. The protocol was once more developed by BMAPA in partnership with English Heritage, and covers the whole extraction process from dredging at sea to receiving and processing material at the wharf. Furthermore, BMAPA members took the decision to voluntarily apply the protocol to all vessels, licence areas and wharves on the grounds of best practice.

The protocol directly involves around 1,000 of the industry’s employees who either work at sea on the dredgers or at the wharves that process the delivered aggregate. Clear guidance has been prepared, including information posters, and a programme of training and awareness for all wharf and ship staff has been funded through the Aggregate Levy Sustainability Fund – see Figure 6 (BMAPA and English Heritage, 2005).

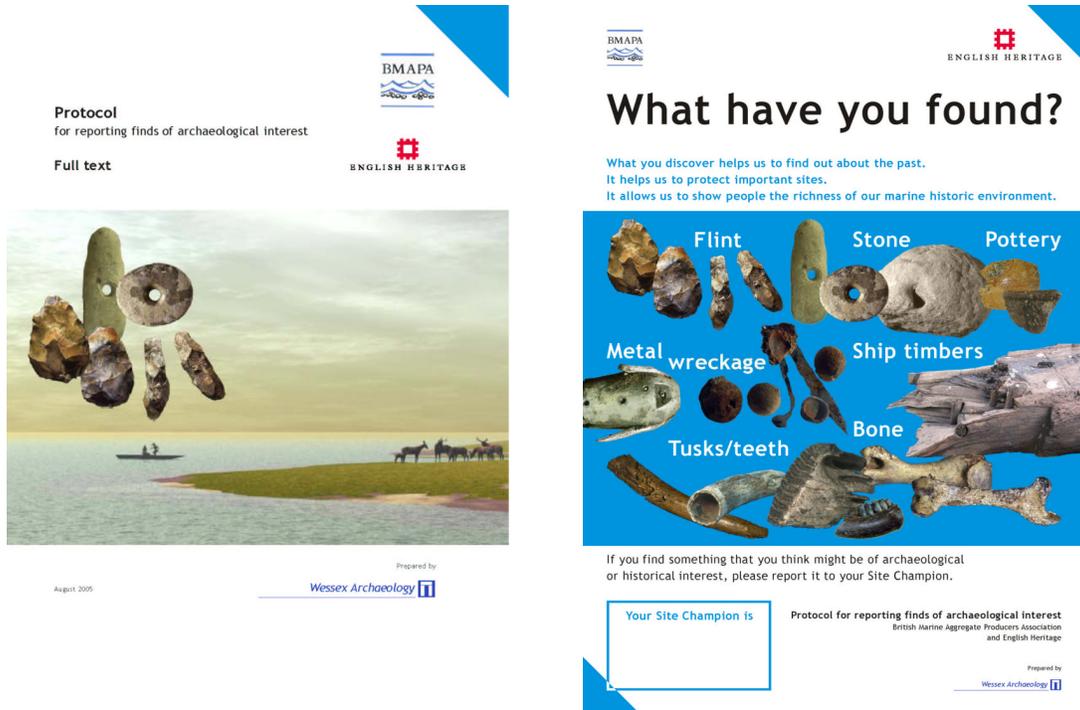


Fig. 6 (Right) Protocol for reporting finds of archaeological interest produced by BMAPA and English Heritage in 2005. The protocol has been implemented by BMAPA member companies across 25 dredging vessels and over 60 marine aggregate wharves. (Left) This process has been assisted by information posters displayed at all sites that show staff examples of artefacts that may be encountered.

As well as being genuinely interesting, there are important reasons why finds need to be reported and evaluated. Firstly, operators have a legal requirement under UK Merchant Shipping legislation to report any items of potential wreck. Secondly, artefacts – particularly wooden wreckage – may highlight a more significant find on the seabed which has not been identified, and which should be avoided – both to protect the archaeological importance, but also to prevent damage to dredge gear and contamination of cargoes.

To date, the reporting protocol has been incredibly successful with an ever increasing number and frequency of finds being reported. During the first full year of the protocols operation, 19 full reports were submitted relating to over 80 separate finds ranging from aircraft remains and cannon balls, to whale and mammoth bone fragments. The most archaeologically significant find has been a mammoth tusk recovered from a wharf in London after being dredged from a licence area 100km east of the Humber estuary, in the Southern North Sea – see Figure 7. The tusk, which has been radiocarbon dated to 44,000 years BP, is one of the most northerly examples of *Mammuthus primigenius* for which good positional data is available, and may have significant implications for understanding of the distribution of this species during the last ice age (BMAPA and English Heritage, 2006).



Fig. 7 Tusk from a mammoth (*Mammuthus primigenius*) recovered in 2006 from a wharf processing marine aggregate from a licence area in the Southern North Sea. The tusk, which has been radiocarbon dated to 44,000 years BP, is one of the most northerly examples of this species for which good positional data is available (image courtesy of Wessex Archaeology).

FURTHER UNDERSTANDING THROUGH RESEARCH

Alongside the development of best practice guidance, the industry also contributes towards new research into the archaeological potential of marine aggregate deposits – once more in partnership with English Heritage.

In 2002, British Government introduced a levy of £1.60 per tonne on all primary aggregate production to reflect the environmental costs of winning these materials – including marine dredged sand and gravel. A proportion of the revenue generated has been used to provide a source of funding for research aimed at minimising the effects of aggregate production, through the Aggregate Levy Sustainability Fund (ALSF). Research funded under the marine ALSF programme and coordinated by English Heritage has made a significant contribution to the development in understanding of a wide range of marine archaeological issues, and industry has contributed to this process through both collaboration and the contribution of data (Newell and Garner, 2007).

Research themes have included:

- identification of marine historic resources
- impacts of aggregate extraction
- management of aggregate extraction
- coordination, dissemination and outreach

CONCLUSION

The marine aggregate industry firmly believes that the approach taken in response to marine archaeological issues represents a good example of sustainable development in practice. By viewing the need to respond to these issues as an opportunity and by adopting a proactive and constructive attitude, the industry have been able to work in partnership with their regulator to deliver pragmatic evidence based solutions which result in more effective assessment and protection of marine heritage features.

There are three elements which have been central to the success of the approach as a whole:

Knowledge

Increased knowledge and increased understanding results in greater confidence for everyone involved, but data collection is an incredibly expensive exercise – particularly offshore. For this reason it is important to derive the

best value from whatever data may already be held, and also from any information that may be collected in the future.

Confidence

While confidence is related to knowledge, it is also linked to the relationship between developer, stakeholders and regulators. This takes time, and relies upon openness, transparency and honesty.

Innovation and partnership

It is important to stress that no one party could have made the significant progress achieved to date in isolation. Industry, regulators and stakeholders have all had to be part of the solution.

The various outputs from the partnership projects developed by BMAPA and English Heritage arguably represent world-leading initiatives for the consideration of marine heritage issues during marine development activity. Furthermore, this process has not yet stopped and will continue to evolve.

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All the outputs from this initiative are available from www.wessexarch.co.uk/projects/marine/bmapa/index.html

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