Arklow Bank Wind Park 2

Environmental Impact Assessment Report

Volume III, Appendix 18.1: Marine Archaeology Technical Report

sse Renewables

Arklow Bank Wind Park 2

Marine Archaeology Technical Report

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Marine Archaeology Technical Report

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1.0	02/05/2024	Final (external)	ADCO	GoBe Consultants	Sure Partners Limited

Statement of Authority

Name	Qualifications	Experience
Niall Brady	Graduate of UCD and Cornell University PhD 1996 HSE Part III diver since 2000	Dr Niall Brady, FSA is founding co-director of ADCO and is the company secretary. With more than two decades of experience in maritime related research and resolution, he is primarily responsible for project management and company growth initiatives. Dr Brady is a medievalist by training. Niall was project director for the Discovery Programme, Ireland's institute for advanced archaeological research, where he designed and implemented the Medieval Rural Settlement Project (2002-10). Niall has extensive project management experience in the consultancy sector, and has carried out a large number of excavations, monitoring projects, and Environmental Impact Assessments on land and underwater.

Contents

Abbreviations

ABWP 1 -	Arklow Bank Wind Park 1
ABWP 2 -	Arklow Bank Wind Park 2
ADCO -	Archaeological Diving Company Ltd
AEZ -	Archaeological Exclusion Zone
AIA -	Archaeological Impact Assessment
AMP -	Archaeology Management Plan
BP -	Before Present
CC -	Cable Corridor
COWRIE -	Collaborative Offshore Wind Research Into the Environment
CPT -	Cone Penetration Test
DAHGI -	Department of Arts, Heritage, Gaeltacht and the Islands
DCCAE -	Department of the Environment, Climate and Communications
DHLGH -	Department of Housing, Local Government and Heritage
E -	Easting
EEZ -	Exclusive Economic Zone
EIAR -	Environmental Impact Assessment Report
EIS -	Environmental Impact Statement
GI -	Geotechnical Investigations
GIS -	Global Information Systems
GR -	Green Rebel
GSI -	Geological Survey of Ireland
ICOMOS -	International Council on Monuments and Sites
ITM -	Irish Transverse Mercator
LAT -	Lowest Astronomical Tide
MSBDL -	Mean Seabed Level
NIS -	Natura Impact Statement
NMI -	National Museum of Ireland
NMS -	National Monuments Service
N -	Northing
NIAH -	National Inventory of Architectural Heritage
OD -	Ordnance Datum
SI -	Site Investigations
SMR -	Sites and Monuments Record
SSS -	Side Scan Sonar
UAIA -	Underwater Archaeological Impact Assessment
UKHO -	United Kingdom Hydrographic Office
UNESCO -	United Nations Educational Scientific and Cultural Organization
UTM -	Universal Transverse Mercator
UXO -	Unexploded Ordnance
WWTP -	Waste Water Treatment Plant
WWI -	World War One
XTF -	eXtended Triton Format

Units

km - kilometre
kHz - kilohertz
m - metre
nT - nanotesla

Glossary

Archaeological Exclusion Zone – Defined protective buffer area around archaeological feature within which no works should take place without the consent of the archaeological regulator

Archaeological Impact Assessment – Archaeological report that sets out the known archaeology based on existing records and/or commissioned studies, and assesses the impacts arising from proposed works and make archaeological recommendations in keeping with the existing archaeological legislation and expectations of the archaeological regulator

Archaeology Management Plan – Document that sets our clear protocols to follow in the course of a project to ensure compliance with archaeological legislation by all parties, and mitigation of works in accordance with existing national monuments legislation

Arklow Bank Wind Park 2 – Offshore Infrastructure – "The Proposed Development", Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements under the existing Maritime Area Consent.

Arklow Bank Wind Park 2 (ABWP2) (The Project) – Arklow Bank Wind Park 2 (ABWP2) (The Project) is the onshore and offshore infrastructure. This EIAR is being prepared for the Offshore Infrastructure. Consents for the Onshore Grid Infrastructure (Planning Reference 310090) and Operations Maintenance Facility (Planning Reference 211316) has been granted on 26th May 2022 and 20th July 2022, respectively.

- Arklow Bank Wind Park 2 Offshore Infrastructure: This includes all elements to be consented in accordance with the Maritime Area Consent. This is the subject of this EIAR and will be referred to as 'the Proposed Development' in the EIAR.
- Arklow Bank Wind Park 2 Onshore Grid Infrastructure: This relates to the onshore grid infrastructure for which planning permission has been granted.
- Arklow Bank Wind Park 2 Operations and Maintenance Facility (OMF): This includes the onshore and nearshore infrastructure at the OMF, for which planning permission has been granted.
- Arklow Bank Wind Park 2 EirGrid Upgrade Works: any non-contestable grid upgrade works, consent to be sought and works to be completed by EirGrid.

Before Present – The date of 1950 AD/CE that is set by the scientific dating community from which measurements are calculated backwards to determine the age of an organic object that is subject to radiocarbon dating analysis

Cone Penetration Test – Marine geotechnical investigation procedure to recover information on the seabed and its surface-level buried strata

Easting – Compass direction set at 90 degrees

Exclusive Economic Zone – International marine boundary

Environmental Impact Assessment Report – Multi-disciplinary report assessing the impacts of a development from the perspective of environmental disciplines that forms part of planning application submissions and includes impact assessments and mitigation strategies that seek to reduce, minimise and/or eliminate impacts from the Proposed Development on the cultural and natural environment

Geotechnical Investigations – Programme of engineering investigations deployed to assess the nature of buried strata

Global Information Systems – International surveying and positioning systems to ensure metrically accurate measurements and projections to enable accurate mapping and recording

Irish Transverse Mercator – Map projection that flattens Ireland into one zone and enables accurate positioning

Lowest Astronomical Tide – Low tide associated with particular lunar cycles

Mean Seabed Level – Average sea level

Mean High Water – Average water level at normal high tides

Northing – Compass direction set at 0/360 degrees

National Grid Reference – older map projection that flattens Ireland into one zone and enables accurate positioning. The projection is being replaced by Irish Transverse Mercator

Ordnance Datum – Defined heights above sea level determined by the Ordnance Survey

Site Investigations – Programme of engineering investigations deployed to assess the nature of buried strata

Side scan sonar – Underwater remote sensing device that captures an image of the seabed surface across the extent of the area over which the device is deployed

The Developer – Sure Partners Ltd.

Underwater Archaeological Impact Assessment – Archaeological report particular to the marine and underwater environments that sets out the known archaeology based on existing records and/or commissioned studies, and assesses the impacts arising from proposed works and make archaeological recommendations in keeping with the existing archaeological legislation and expectations of the archaeological regulator

Universal Transverse Mercator – Map projection that flattens the Earth into 60 zones and enables accurate positioning. Unlike Irish National Grid and Irish Transverse Mercator, Universal Transverse Mercator extends across the marine environment and links seamlessly to neighbouring countries and jurisdictions

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1 Introduction

1.1.1.1 This Marine Archaeology Technical Report, prepared by the Archaeological Diving Company Ltd (ADCO) for GoBe on behalf of Sure Partners Ltd (the Developer), provides an archaeological baseline for the Arklow Bank Wind Park 2 Offshore Infrastructure (hereafter referred to as 'the Proposed Development').

1.1.1.2 The Marine Archaeology Technical Report is based on a desktop review of existing archaeological sources; and archaeological review and interpretation of marine geophysical survey data sets and reporting acquired in 2019 and 2022, and subsequent programmes of survey and geotechnical investigations (GI) conducted in 2020, 2022 and 2023 (Brady 2020; Brady 2023a and b).

2 Study Area

2.1.1.1 The Marine Archaeology Study Area is focused on the footprint of the Proposed Development shown in Figure 18.1.1, which extends in a triangular shape some 20.5 km northeast of Arklow town and 16 km southeast of the town, to reach the north and south sides of Arklow Bank and envelope it. This includes the topographical feature of the Arklow Bank and its immediate sea area that extends west to the adjacent coastline of Co. Wicklow. An additional area that reaches approximately 20 km north and 20 km south of the bank is also considered, to establish the wider context of the seascape by extending to the area within one tidal cycle of the bank (Figure 18.1.2).

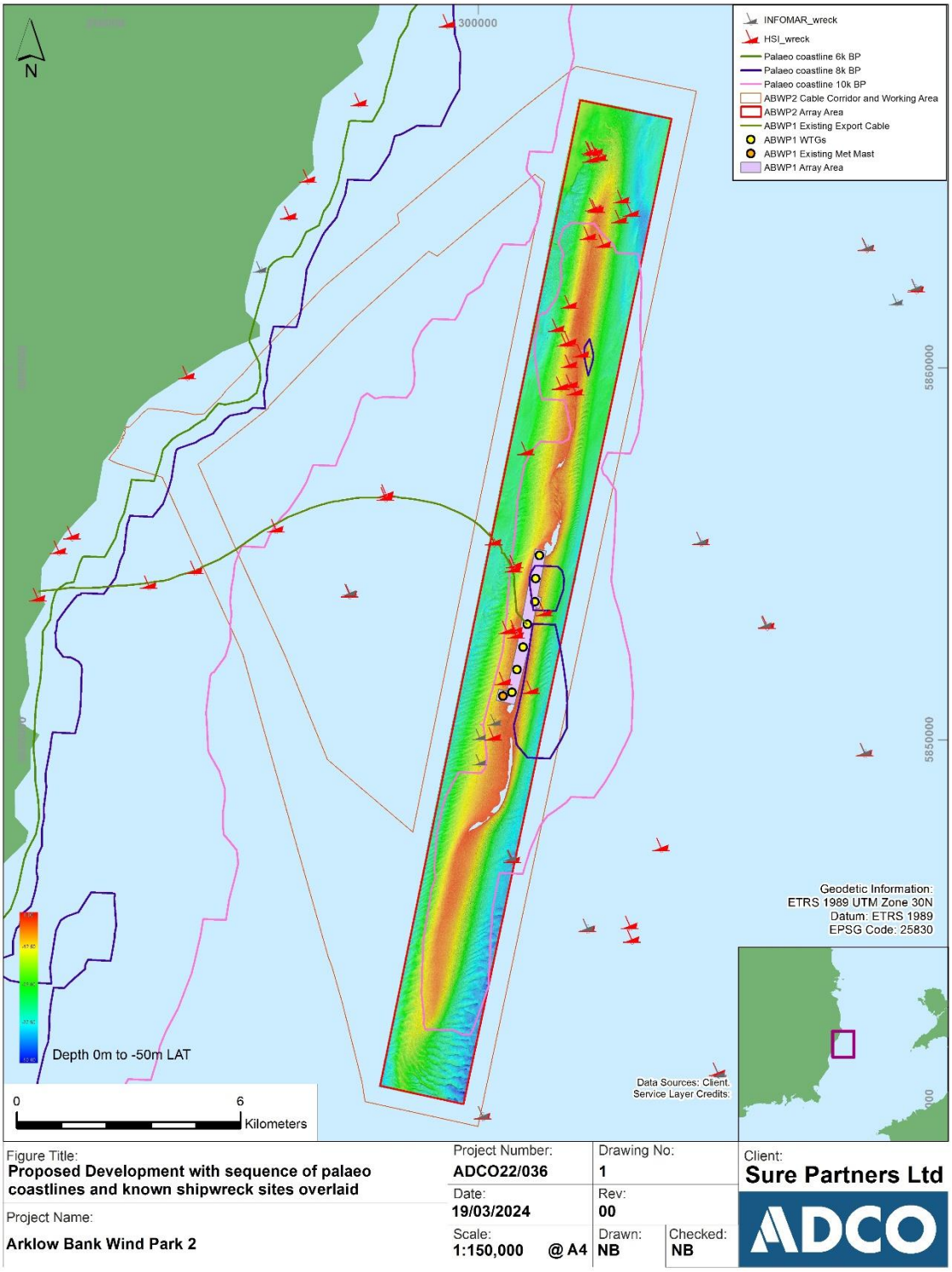


Figure 18.1.1: Proposed Development area with sequence of predicted palaeo coastlines and known shipwreck sites overlaid

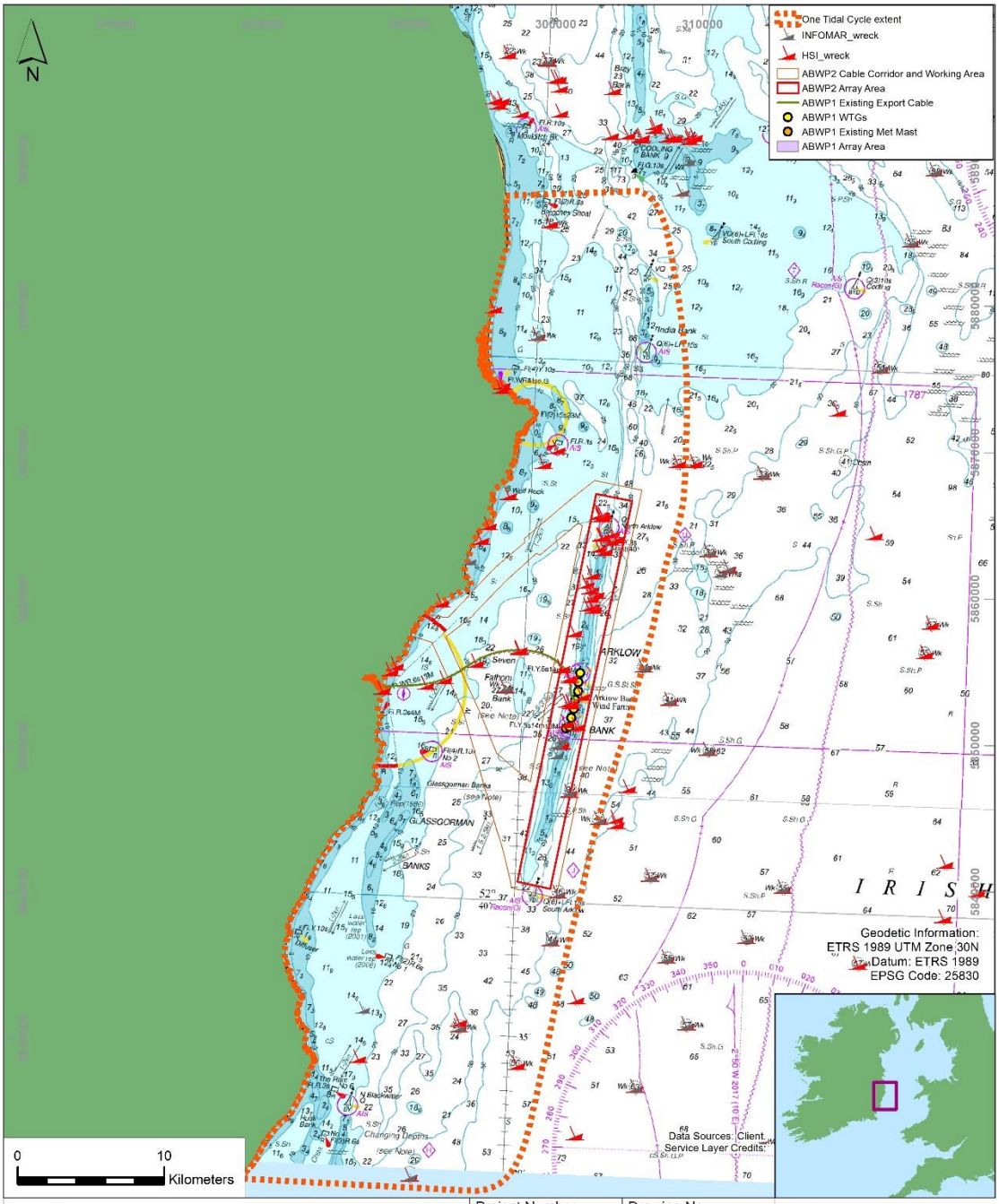


Figure 18.1.2: Marine Archaeology Study Area (one tidal cycle from Proposed Development) and known shipwrecks to include extent of one tidal cycle from Arklow Bank

3 Methodology

3.1 Policy context

3.1.1.1 The principal legislative, guidance and policy context that operates across the marine environment in Ireland is governed archaeologically by the requirements of the National Monuments Act 1930-2004, which is being replaced by the Historic and Archaeological Heritage and Miscellaneous Provisions Act (2023). The assessment is conducted in line with the following legislative procedures and guidelines listed in Table 18.1.1.

Table 18.1.1: Legislation, policy and guidance documents relevant to Marine Archaeology

Legislation / Policy / Guidance	Reference	Geographic Coverage
The National Monuments Act 1930-2004; Historic and Archaeological Heritage and Miscellaneous Provisions Act	Govt. of Ireland, 1930 – 2004; 2023	Ireland, Republic of
Archaeology and Flood Relief Schemes Guidelines	National Monuments Service, 2023	Ireland, Republic of
Advice to the Public on Ireland's Underwater Archaeological Heritage	Government of Ireland, 2023	Ireland, Republic of
Marine Area Planning Act 2021	Govt. of Ireland, 2021	Ireland, Republic of
The Foreshore Act 1933 and 2014	Govt. of Ireland, 1933 updated 2014	Ireland, Republic of
Heritage Act, 1995	Govt. of Ireland, 1995	Ireland, Republic of
European Convention on the Protection of the Archaeological Heritage (Valetta Convention)	EU, 1992	EU
Department of Arts, Heritage, Gaeltacht and the Islands (DAHGI) Framework and Principles for the Protection of the Archaeological Heritage	DAHGI, 1999a	Ireland, Republic of
DAHGI Policy and Guidelines on Archaeological Excavation	DAHGI, 1999b	Ireland, Republic of
Collaborative Offshore Wind Research Into the Environment (COWRIE) Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy	COWRIE, 2007	UK
Guidance on Environmental Impact Statement (EIS) and Natura Impact Statement (NIS) Preparation for Offshore Renewable Energy Projects.	DCCAE, 2017	Ireland, Republic of, including foreshore, Exclusive Economic Zone (EEZ) and Irish Continental Shelf
International Council on Monuments and Sites (ICOMOS) guidance, non-governmental international organisation dedicated to the conservation of the world's monuments and sites	ICOMOS, 2011	Global
United Nations Educational, Scientific and Cultural Organization (UNESCO) guidance, to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity	UNESCO, 1972	Global

3.2 Desktop study

3.2.1.1 Information on marine archaeology and cultural heritage within the study area was collected through a detailed desktop review of existing studies and datasets. The key data sources reviewed are indicated in Table 18.1.2.

Table 18.1.2: Principal sources to inform known Marine Archaeology

Title	Source	Year	Author
Historic Shipwreck Inventory	Shipwreck inventory of Ireland: Louth, Meath, Dublin and Wicklow (Dublin: Stationary Office)	2008	Brady, K.
Marine geophysical survey, Waste Water Treatment Plant (WWTP)	Marine geophysical survey, Arklow Waste Water Marine Outfall, 16R0219', unpublished report of ADCO Ltd	2017	Brady, N.
Historic Shipwreck online portal: Wreck Viewer	https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640	2018	Department of Housing, Local Government and Heritage (DHLGH)
Underwater inspections	Underwater archaeological inspections, Arklow Waste Water Marine Outfall, 17D0078, 17R0197', unpublished report of ADCO Ltd	2019	Brady, N.
Excavations Bulletin	https://excavations.ie/	2020	Isabel Bennett
INFOMAR survey	www.infomar.ie	2020	INFOMAR
Sites and Monuments Record	https://webgis.archaeology.ie/historicenvironment/	2020	DHLGH
Historic Ordnance Survey Maps	http://map.geohive.ie/mapviewer.html	2020	DHLGH

3.2.1.2 The principal archaeological archive relating to the Arklow Bank is the Historic Shipwreck Inventory maintained by the NMS DHLGH. The Inventory for four counties, including Wicklow, was published in 2008 by the NMS (Brady, 2008; pp 448–496). More recent records are contained in the national wreck site database, accessible as an online portal maintained by the NMS and updated to 2023. The Irish National Seabed Survey, INFOMAR, is a further resource that is accessible online. The Sites and Monuments Record archive, also maintained by the NMS and accessible online, was examined for archaeological information relating to the landfall location. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts.

3.3 Site-specific study

3.3.1 Overview

3.3.1.1 A summary of the site-specific surveys used to inform the Marine Archaeology Technical Report is outlined in Table 18.1.3 below. This includes two programmes of comprehensive marine geophysical survey carried out for the Proposed Development, Intertidal Archaeological Survey, and four deployments of GI.

3.3.1.2 In 2019 (hereafter referred to as the '2019 marine geophysical survey') a survey was conducted by Ultrabeam that included the Array Area (referred to in the 2019 survey as the Lease Area) and three export cable route corridors (Ultrabeam, 2019a; Ultrabeam, 2019b). In 2022 an additional survey (hereafter referred to as the '2022 marine geophysical survey') was conducted by Green Rebel (GR) that considered the Cable Corridor and Working Area (Green Rebel, 2023). Both surveys aimed to gather sufficient data for the development of a ground model. The surveys comprised multi-beam bathymetry; side scan sonar (SSS); magnetometry and sub-bottom profile surveys, to inform a detailed understanding of the topography and underlying geological formations of the seabed. An archaeological review of the SSS and magnetometer primary datasets has been carried out to inform the Marine Archaeology Technical Report.

3.3.1.3 An Intertidal Archaeology Survey (Volume III, Appendix 18.3, Intertidal Archaeology Inspection Report) was completed in 2020 to provide baseline information with respect to the landfall location (ADCO, 2020). The surveyed area was extended in 2024 to include the current Cable Corridor and Working Area which extends further north than the area considered in 2020.

3.3.1.4 The four deployments of marine GI included two programmes of borehole investigations completed on Arklow Bank (Geoquip, 2020; Fugro 2022); one programme of nearshore borehole investigations completed in 2023 (IGSL, 2023), and a programme of Cone Penetration Tests (CPT) and Vibrocores completed in 2023 that took place in the Array Area and Cable Corridor (Geo, 2023).

3.3.1.5 The desk-based sources, geophysical survey data, the site survey and geotechnical data examined represent a comprehensive and robust sequence of datasets that allow for a detailed assessment of the archaeological constraints associated with the Cable Corridor and Working Area.

Table 18.1.3: Summary of site-specific survey data

Title	Extent of survey	Overview of survey	Survey contractor	Date
Arklow Bank Wind Park 2	Possible offshore export cable routes	Marine geophysical survey to develop ground model of seabed and seabed features	Ultrabeam for Alpha Marine	2019
Marine geophysical survey	Array Area	Marine geophysical survey to develop ground model of seabed and seabed features	Ultrabeam for Alpha Marine	2019
Intertidal Archaeology Survey	Landfall location	Intertidal Archaeology Survey to provide baseline information of landfall location	ADCO	2020
Geotechnical Investigations	Array Area	Geotechnical investigations on Arklow Bank	Geoquip	2020
Marine Geophysical Survey	Array Area and Cable Corridor and Working Area	Marine geophysical survey to develop ground model of seabed and seabed features	Green Rebel (GR)	2022
Geotechnical Investigations	Array Area	Geotechnical investigations on Arklow Bank	Fugro	2022
Geotechnical Investigations	Nearshore at landfall	Geotechnical investigations on Arklow Bank	GII	2023
Geotechnical Investigations	Array Area and Cable Corridor	Geotechnical investigations on Arklow Bank	Geo	2023
Intertidal Archaeology Survey	Landfall location	Intertidal Archaeology Survey to provide baseline information of landfall location	ADCO	2024

3.3.2 Marine Geophysical Survey methodology

3.3.2.1 The 2019 marine geophysical survey was completed along possible offshore export cable routes in June and July 2019 and at the Array Area in July and August 2019 (Figure 18.1.*3*). The Survey Area was defined as the area covered by SSS and magnetometer survey. It included the Array Area below 10 m Lowest Astronomical Tide (LAT) and three (now redundant) offshore export cable route options. In addition, multi-beam survey included much of the shallow central reserve of Arklow Bank except for a narrow strip that lies above the Low Water Mark. The Survey Area on the bank extended beyond its physical limits to cover a 27 km-long by 2.5 km-wide area. The Survey Area along each offshore export cable route in 2019 extended to *c.* 500 m wide and followed the full route to the landfall, stopping short of the coastline due to shallow-water constraints.

3.3.2.2 The following survey devices were deployed within the Survey Area:

- Multibeam was deployed at 50 m intervals. It captured all but the highest points in the central reserve of the bank;
- An Edgetech 4200 MP (900/300 kHz) SSS was deployed at 50 m intervals and less, with range set at 75 m. Data capture on the high frequency range deteriorated in the outer ranges but the close spacing of lines ensured adequate overlap between lines. Low frequency range data extended the full coverage out to the 75 m range and this dataset was used for mosaicking;
- A Geometrics G882 magnetometer was deployed as a towed device that was either piggy-backed from the SSS with a 11.6 m-layback on the offshore export cable routes and a 10 m-layback at the Array Area or towed directly from the survey vessel with a 30 m-layback; and
- An Applied Acoustics Boomer sub-bottom profiler was deployed at 50 m intervals.

3.3.2.3 The 2022 marine geophysical survey was carried out between August and November 2022 by Green Rebel Ltd, (Green Rebel 2023). The survey focused on the proposed Cable Corridor and Working Area, with some overlap on the 2019 data acquired on the Bank (Figure 18.1.*3*). The survey corridors varied in width from 800 m to 1.6 km.

3.3.2.4 The 2022 survey included a c. 8% overlap with the 2019 survey footprint and included overlap margins between each of the survey blocks (referred to as Lot A, Lot B and Lot E respectively). A similar suite of instruments was deployed in 2022, and line spacing varied from 10 m to 50 m depending on water depth:

- Reason SeaBat T50-R, Multibeam, hull-mounted on survey vessels;
- Edgetech 4205 2 SSS, towed;
- Geometrics G882 magnetometer, towed;
- Innomar Medium 100 parametric sub bottom profiler, vessel-mounted.

3.3.3 Survey data analysis

3.3.3.1 Post-processing of the 2019 data identified SSS targets over 200 mm in size and classified them as: boulder; cable; debris; mound, possible unexploded ordnance (UXO) or wreck.

3.3.3.2 Post-processing of magnetometer data on a line-by-line basis highlighted targets using a minimum amplitude of 5 nT.

3.3.3.3 All target observations were mapped and exported as .xlsx files to allow for mapping and interrogation.

3.3.3.4 Data was mapped according to UTM30N.

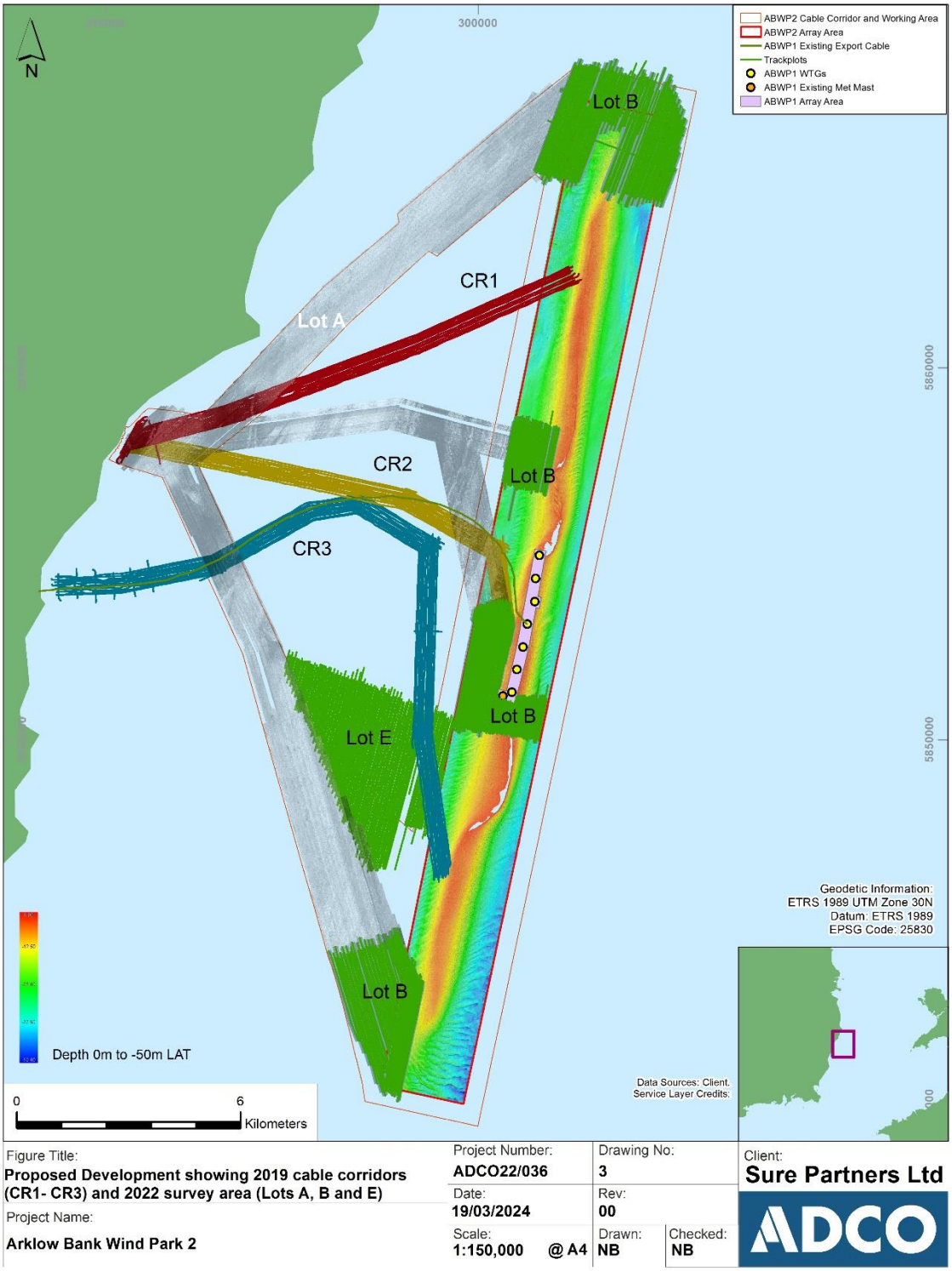


Figure 18.1.3: Proposed Development area showing 2019 cable corridors (CR1–CR3) and 2022 survey areas (Lots A, B and E)

3.3.3.5 Post-processing of the 2022 data identified SSS targets over 300 mm in size and classified them as: boulder; debris; outcrop; pipeline; linear target; sonar target or wreck.

3.3.3.6 Post-processing of magnetometer data on a line-by-line basis highlighted targets using a minimum amplitude of 10nT.

3.3.3.7 All target observations were mapped and exported as .xlsx files to allow for mapping and interrogation.

3.3.3.8 Data was mapped according to UTM30N.

3.3.4 Data limitations

3.3.4.1 Wind conditions, fishing equipment and wave action close to shore impeded the data quality, and this was mitigated where possible with additional survey lines.

3.3.4.2 The only locations that are not included in the 2019 surveyed area are the heights along the centre of the sandbank that are exposed at certain Low Waters, and the immediate shoreline at the landfall. In both instances, the shallow nature of the water cover in these locations mitigated against the deployment of the survey devices and the return of meaningful data. On the bank, this resulted in a zone averaging 320 m wide, expanding to 690 m wide in the central area from which data was not recovered. However, as this zone is above the developable area of below 10 m LAT, it was outside the 2019 required Survey Area. The shortfall at the landfall at Johnstown North extends over a distance of 50 to 100 m, which covers an active surf zone.

3.3.5 Archaeological review of survey data

3.3.5.1 Archaeological review of the datasets has focused on the SSS and magnetometer survey results, in compliance with the NMS recommendations[1].

3.3.5.2 While the SSS mosaics provide useful overview, the High Frequency data files provide clearer imagery for archaeological prospection. The navigation-corrected eXtended Triton Format (XTF) files were examined using Coda Sonar Data Viewer.

3.3.5.3 The 2019 survey tracklines were on average 50 m apart with many more closely-spaced lines at 30 m intervals and sometimes even less. This lends a robustness to the dataset as it ensures that the same areas of seabed were recorded multiple times and from opposing directions. Cross-lines were not employed along the sandbank but were completed along offshore export cable route 2. A series of crosslines at the landfall were taken to address the challenge posed by the surf zone.

3.3.5.4 The survey tracklines of the magnetometer follow those of the SSS as it was towed behind the SSS.

3.3.5.5 The quality of the sonar images varies between being very clear and crisp to those that show blur and distortion. The tracklines along the east side of the sandbank tend to show more distortion and this reflects the turbulent sea state/weather experienced during the survey, as reported in the survey report. The issue was mitigated by taking more closely-spaced survey lines.

3.3.5.6 The 2022 data sets follow the parameters of the 2019 survey, making comparison straightforward. The data quality for SSS also varied from crisp clear imaging to lesser quality but there was sufficient overlap between survey lines to be confident of the coverage and the detail being recorded.

[1] Correspondence DCHG reference M00087/2019 DAU to Marine Planning and Foreshore Unit, item 3.

3.3.6 Intertidal Archaeology Survey methodology

3.3.6.1 The Intertidal Archaeology Surveys in 2020 and 2024 are based on a desktop review of existing archaeological sources and an inspection of the foreshore by a team of two maritime archaeologists that took place at Low Water, in October 2020 and February 2024 respectively. Observations were recorded in writing and visual survey was completed using a camera.

3.3.7 GI programme methodology

3.3.7.1 The GI deployments conducted in 2020 and 2022 completed a series of eleven boreholes on Arklow Bank that provided insight to the stratigraphic profiles at these locations (Figure 18.1.*4*). In 2023, a series of five borehole investigations provided similar insight in the nearshore context approaching the proposed Landfall location at Johnstown North. No archaeological features or strata were observed.

3.3.7.2 The 2023 CPT and vibrocore programme provided a series of additional insights, where the vibrocore data recorded stratigraphy at 32 locations distributed on the bank and also between the bank and the shore. Occasional observations of charcoal were made but no archaeological features or strata were observed.

3.3.7.3 Archaeology Management Plans have informed the GI works, and included the protocols to be followed in the event that such works encountered material of archaeological interest in the course of operations. The data sets arising from the GI programmes have been reviewed archaeologically.

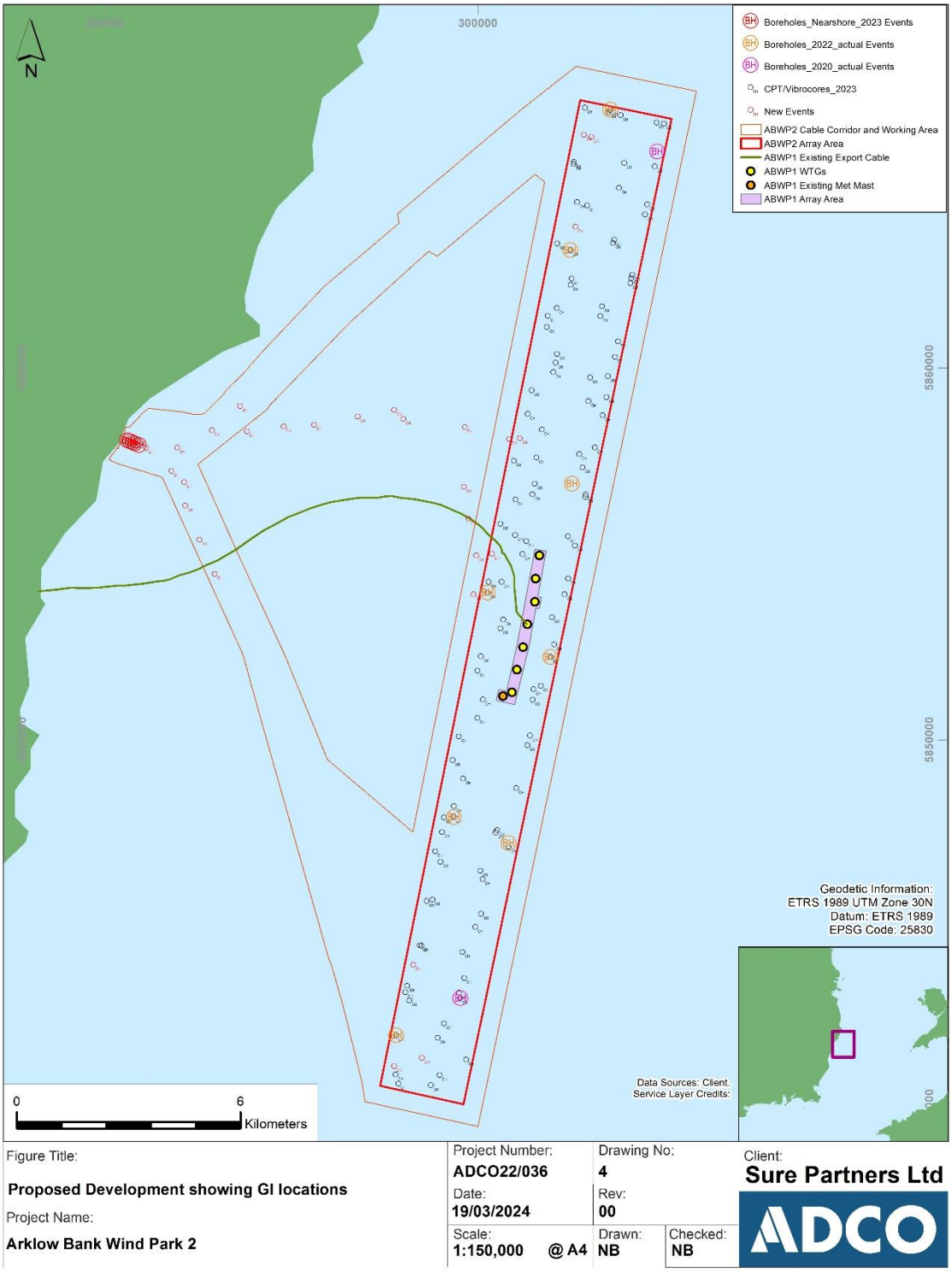


Figure 18.1.4: Proposed Development area showing GI locations

4 Baseline environment

4.1 Desktop review

4.1.1 Seabed topography

4.1.1.1 The Arklow Bank is one of a series of sandbanks that run along the east coast of Ireland from Dublin to Wexford (Figure 18.1.2). A smaller bank, India Bank, lies to the north, and the Money-weights and Blackwater Banks reach southwards from Cahore Point to the south. Arklow Bank runs parallel with the coast and lies off counties Wicklow and Wexford, between 7 km at its north end and 12 km at its middle section and south end. The bank extends continuously for approximately 25 km, is approximately 1.5 km wide at its base and 500 m wide at its top. It is oriented north-northeast/south-southwest. Water depth on the bank varies between 2 m and 25 m (Gavin and Doherty Geosolutions, 2019). To the west of the bank the water depth varies between 22 m and 35 m, being deepest in the southern part (Gavin and Doherty Geosolutions, 2019, p. 24). To the east of the bank is the Irish Sea and St George's Channel, where the water depth varies between 60 m and 100 m.

4.1.1.2 Arklow Bank is situated geographically in an area known as the Irish Platform, which occupies a 20 km to 30 km-wide corridor off Ireland's east coast (Gavin and Doherty Geosolutions, 2019, p. 24). The seabed in the area is dominated by sand and gravel deposited by the abating ice front during the last Glaciation (pre-12,000 Before Present (BP))[2]. The bank exists southeast of the inferred limit of the Delgany Moraine, based on known seabed exposures although this does not discount the possibility of an inferred morainic core at Arklow Bank. The surface sediment is mobile, formed due to reworking following relative sea level rise post-10,000 BP. Areas around the bank are also characterised by mobile sand overlaying glacial clays. To the west of the bank, gravels are exposed on the seabed.

4.1.2 Submerged prehistoric archaeological potential

4.1.2.1 The south coast of Ireland is associated with the potential for prehistoric landscapes to be discovered as submerged lenses in what is a drowned landscape. The southeast coast does not fall into this category. Nevertheless, the potential for earlier remains to be discovered associated with the morainic material remains. This is supported by the recovery of two worked flint nodules during archaeological monitoring of aspects of the Arklow Bank Wind Park 1 (ABWP 1) construction phase adjacent to Turbine No. 5 (Campbell, 2003; Westley and Woodman, 2020, p. 28). The precise context of the flint pieces was not identified. The pieces highlight the potential for prehistoric remains to be associated with the sandbank. Whether such remains indicate activity on the banks in early prehistoric times when sea levels may have been lower and the sandbanks might have been exposed is another matter. The pieces could also represent loss from a coastal craft of the period.

[2] BP refers to Before Present, which is set at 1950.

4.1.3 Historic shipwrecks

4.1.3.1 The offshore sandbanks along Ireland's east coast are hazardous to shipping and historic shipwrecking events are associated with them. Such events start to be recorded systematically after c. 1750, which represents the burgeoning hey-day of pre-modern navigation but does not account for wrecking events that would have occurred earlier. There are 165 historic wrecking events associated with the Arklow Bank and its immediate sea area, which represents a significant number of wreckings over what is a relatively small sea area. This number grows larger when the extent of one tidal cycle is added to complete the Marine Archaeology Study Area. That part of the Marine Archaeology Study Area that is focused on the Arklow Bank and its immediate sea area includes 116 recorded wreckings whose specific locations are not known and 49 known wreck-site and potential wreck-site locations. Annex 1: Recorded shipwreck events on Arklow Bank and adjacent waters presents a list of the 116 recorded shipwrecking events associated with the bank, and Annex 2: Known shipwreck events on Arklow Bank and adjacent waters presents a list of the 49 known wrecks on the bank and in adjacent waters. Annex 3: Known shipwreck events within one tidal cycle of Arklow Bank and adjacent waters presents a list of 15 additional known wrecks that occur within the wider extent of one tidal cycle, nine of which lie to the north of the bank, and six of which lie to the south of the bank. The placing of a lightship at the south end of the bank in 1825, followed by one at the north end in 1867, reflects attempts to mitigate the danger to shipping. The southern lightship was sunk in 1917 by a German submarine (Wreck W02737) (Brady, 2008; p. 474).

4.1.3.2 There are 11 wrecking events associated with the eighteenth century and three additional events located 'Off Arklow Bank'. Twelve wreckings occurred in the twentieth century up to 1939, and the remaining 90 recorded wreckings happened in the nineteenth century. Among the earliest recorded wreckings is that of the *Charming Nancy*, which, in 1766, was travelling from Dublin to Barbados, and wrecked on Arklow Bank (W02668). One life was lost, while the remaining crew were saved by fishermen. The recording of two wrecking events in 1772, within days of each other and both on the same journey, from Baltimore to Dublin, may be duplication of the same event rather than individual instances. This is further suggested by the fact that while one wrecking is named, the *Princess* or *Prince of Wales*, the other is unnamed (W02723 and W02754 respectively). There were occasions when more than one wreck is assigned the same day, but these are few; for example, on 11 November 1819 two brigs were lost, one of which was the *Albion*, travelling from Swansea to Dublin and the other was thought to be an American vessel (W02651 and W02757 respectively). On 5 September 1904, the *Viola*, a 182-ton wooden barquentine, travelling from Glasgow to Cherbourg, with a cargo of coal was lost on the bank 2 miles off the North Arklow Lightship. An unnamed schooner or brigantine was also lost at the same location that day (W02748 and W02772 respectively). The First World War left its mark on the bank. On 19 August 1915, the German submarine U-27 was lost there, and on 21 September 1917 an unnamed submarine may have foundered on the bank (W02746 and W02773 respectively). On 28 March 1917, the South Arklow Lightship, *Guillemot*, a steel-framed vessel measuring 96 feet long, 22.66 feet wide, and 11.75 feet deep was boarded by the crew of the German submarine UC-65 and sunk. The remains of the *Guillemot* lie in 50 m of water at a known location off the bank (see Annex 2: Known shipwreck events on Arklow Bank and adjacent waters, W02737).

4.1.3.3 The wreckings generally occurred during the winter and early spring, with the majority between November and March/April. This is in keeping with expectations for such events to occur during the seasonally foul weather. In nine cases wind direction was recorded. It appears that storm conditions during prevailing south-westerly winds accounted for six wreckings (W02754, W02690, W2770, W02373, W0268 and W02665); north-easterlies for two wreckings (W02661 and W02770); while an east-southeasterly summertime storm resulted in the wrecking of one vessel (W02725). The Irish Sea is particularly treacherous during a northeasterly/easterly and the low numbers of wreckings recorded in such conditions suggests that most captains knew when to seek shelter and had sufficient advance warning to do so. The wreckings that occurred during southwesterlies suggests that despite efforts to hug the coastline inshore, there were many occasions when vessels trying to navigate harsh conditions were blown onto the bank.

4.1.3.4 The majority of the vessels wrecked appear to have crossed the Irish Sea regularly between Britain and Ireland. The route from Welsh ports (Pembry, Cardiff, Swansea) to Dublin would bring coal (for example, the *Sophia*, which was lost on 5 November 1855). Other vessels would have been travelling up and down the Irish Sea connecting, for instance, Glasgow and Cherbourg (the *Viola* wrecked on 5 September 1904, W02748), or participating in transatlantic journeys. The cargo being carried was also wide-ranging but, from an archaeological perspective, the loss of the 234-ton Sunderland brig *Jemine* or *Gemini* in 1799 is of interest because her manifest included three 3-pounder carriage-mounted guns, and these items could present themselves on the seabed during future marine geophysical and associated surveys. She was travelling from Opporto to Dublin (W02697). In addition, the Thomas, was a 318-ton ship from Sunderland carrying six 4-pounder cannon (W02744). Equally, vessels carrying more mundane cargo, such as iron sheets (the *Selina* W02734), iron (the *Louisa* or *Louise* W02707), pig-iron (the *Calcutta* WW02664, *Sarah* W02732, *Dove* W02675) and ore (the *Parton* W02719 and *Queen* W02724) are of interest in this regard.

4.1.3.5 The wooden frames and steel frames of the wrecked vessels will not survive above the seabed for any length of time as exposed elements will be eroded quickly in the seawater. Only the portions of vessels that are buried by covering sands and silts tend to survive intact over time. The deployment of SSS can identify wreckage and debris that lies proud of the seabed but it requires a magnetometer to detect material that lies buried, and magnetometers detect ferrous metal.

4.1.3.6 The large numbers of recorded wreckings provide a sense of the archaeological potential of the Arklow Bank but it is not possible to deduce from these records where the wreck sites are located. The record would be made by those watchers and reporters of the events taking place from the shore or from one of the lightships who saw and recorded a ship in distress, or have been part of rescue parties dispatched to save crews and passengers and recover cargo. Their records will typically position the ship in relation to the nearest topographic reference point. In the case of the Arklow Bank, this might be as general as being off the north or south ends of the bank. They do not record where on the bank a vessel may have finally foundered, as there are no obvious topographic markers to relate to other than either end of the 25 km-long sandbank. For further insight, it is necessary to consider other sources, including fishermen's records of 'snag points', divers' records of discoveries underwater and marine geophysical survey records. The latter will include official surveys by the UK Hydrographic Survey Office (UKHO), which tend to record only substantial wreckage that causes navigation hazards, and more discrete surveys commissioned for marine development projects or undertaken for research purposes.

4.1.4 Known and Recorded wreck sites within the Marine Archaeology Study Area

4.1.4.1 The results of such work permit the positioning of 64 wreck sites and potential wreck sites in the Marine Archaeology Study Area; 15 of which are associated with the reach of one tidal cycle, and 49 of which are associated with the Arklow Bank and its immediate sea area (Figure 18.1.*2*).

4.1.4.2 To focus on the Arklow Bank and its immediate sea area (Figure 18.1.*5*), the UKHO has recorded ten of these wreck sites (W02432, W02658, W02737, W02774, W02775, W09512, W09566, W10331, W11021, W11475) and can ascribe a vessel's name in five instances (W02432 *Kestrel*, a fishing schooner; W02658 *Armenian*, a Royal Mail steam barque; W02737 *Guillemot* lightship; W09512 *Cameo*, and W09566 *Corona*). The *Armenian* is perhaps the most renowned of the known wreck sites on Arklow Bank. The Royal Mail steam barque was lost on 25 January 1865 while *en route* from Liverpool to Madeira, Tenerife and the coast of West Africa. The vessel struck the bank, caught fire and sank. The crew and passengers were rescued but four of the crew of the Arklow Lightship were drowned during the rescue. The event was recorded in the *Illustrated London News*, which conveys a sense of the turbulent sea conditions present (Plate 1). The wreck site is positioned off the west side of the bank just north of its middle section, some 13 km northeast of Arklow (Figure 18.1.*5*).

4.1.4.3 As will be described below in sections 5.3.2.2–5.3.2.3, the actual location of known wreck sites is subject to updating, as new survey can pinpoint the locations with greater accuracy.

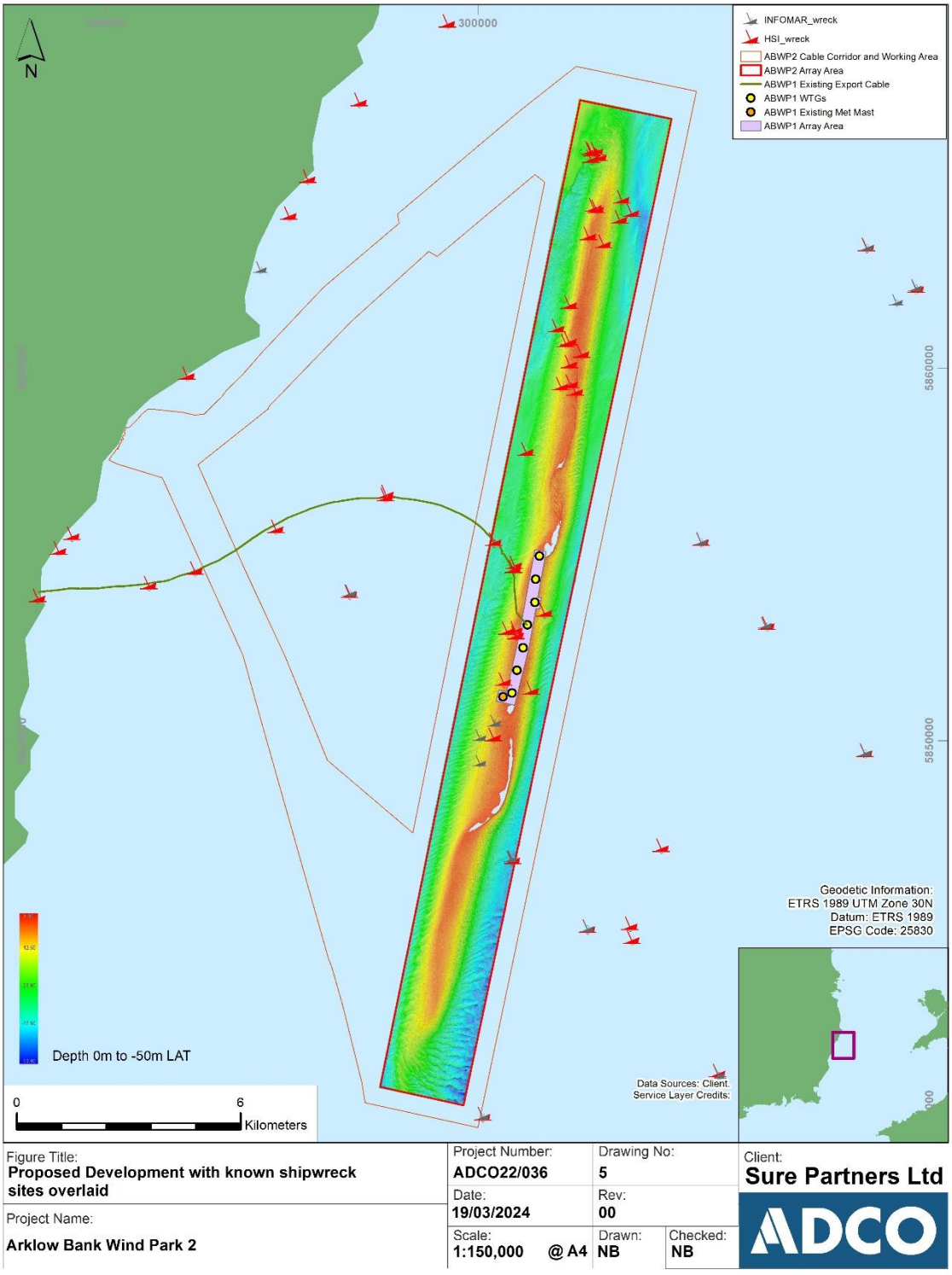


Figure 18.1.5: Project Development area with known shipwreck sites overlaid

4.1.5 Previous archaeological work

4.1.5.1 Construction of the first offshore windfarm in Ireland on the Arklow Bank in 2003, ABWP 1, occasioned a series of marine geophysical surveys, which were carried out in part to identify wreck sites. This work increased significantly the number of sites of wreckage and potential wreckage associated with the bank and the sea area to the west, adding an additional 29 sites to the Historic Shipwreck Inventory. The results are mostly presented in SSS data traces. The remains of actual wreckage was identified in several instances, while in other cases the detail observed was not definitive but was sufficient to include the site as a possible wreck site. Wreck W02776, for example, is based on the interpreted presence of a 2 m-high mound that had a scour hollow extending 59 m from it, with debris spread over an area measuring 22 m by 8.5 m. Wreck W02788 consisted of high backscatter linears, an associated acoustic shadow, a scour mark and a magnetic signature. The magnetometer reading would indicate the presence of ferrous metal, while the SSS elements suggest a cluster of undefined features exposed on the seabed. In contrast, wreck W02775 was revealed clearly in the SSS data as a shipwreck. It was orientated west-northwest/east-southeast and its stern was either missing or buried. The exposed portion measured 44 m long, 6.5 m wide and stood 1.5 m proud of the seabed. It was described as a timber vessel with a copper-sheeted hull. A scour hollow extended 200 m from the wreck.

4.1.5.2 Archaeological monitoring of aspects of the ABWP 1 construction phase also took place (Campbell, 2003). Monitoring focussed on the dredging of a channel measuring 200 m by 50 m by 6.5 m adjacent to the location of Turbine No. 5. The channel was dredged to allow the pontoon pile driver to be manoeuvred to and from the location of the turbine. A small coin and a sherd of white pottery were observed, and two worked flint nodules, 15 sherds of glazed white earthenware dating from the mid-nineteenth to the mid-twentieth century, a clay-pipe stem and two metal conglomerates were recovered.

4.1.6 Other sources

4.1.6.1 The Irish National Seabed Survey (INFOMAR) conducted for the Geological Survey of Ireland has identified four additional sites (W10325, W10326, W17904 and KRY16-02), and has completed the survey of a further site that was identified as a result of diver records (the *Anna Toop*, W18526).

4.1.7 Summary of known and potential shipwrecks on Arklow Bank (desktop study)

4.1.7.1 The distribution of known shipwrecks and locations of potential shipwrecks as indicated on Figure 18.1.*5* within the Marine Archaeology Study Area highlights the northern half of Arklow Bank as an area with the following clusters of shipwrecks:

- The most tightly focussed group of sites lies just off the west side of the northern tip (W02792 to W02796). For the most part, the sites represent relatively small-sized sonar contacts, measuring between 3 m and 5 m in length except for W02794 which is 13.4 m long;
- A second grouping lies 1 km to the south and extends across the north end of the bank (W02785 to W02789, W02791, W02800, W02801, W10331). The features are more defined here and extend over larger areas but only one target could be reported as being ‘vessel-shaped’ (W02800);
- A third grouping lies 1.7 km south and extends over an area that is 2.3 km long, with the sites occurring on the west and the east sides of the bank (W02774, W02784, W02787, W02788, W02790, W02791, W02798, W02799, W02802). Wreck W02774 was identified by the UKHO as a schooner, while the other sites are less definitive, although site W02791 presented as a 23 m-long feature with acoustic shadow and seabed scouring indicative of a partially exposed shipwreck;

- The wreck of the Armenian lies 2 km south of this cluster and some 2.7 km to 3 km north of the next small grouping of targets (W02781 to W02783), the first of which was recorded as a wooden wreck and the second of which as a possible metal wreck;
- Another small cluster occurs 1.3 km to the south, off the west side of the sandbank with one vessel off the east side (W02775 to W02777 and W02780 some 700 m to the northeast on the east side of the bank). W02775 is identified by the UKHO as a schooner and it lies 320 m southwest of one of the ABWP 1 wind turbines. W02776 and W02777 lie in proximity to the schooner (W02775), being some 200 m southwest and 100 m southeast from it respectively. Two isolated targets of possible wreck lie further south, positioned on either side of the sandbank;
- W02778 lies 1.3 km from the previous cluster, while W02779 lies 1.5 km from the cluster;
- The most southerly historic wreck site on the bank is W018526, which lies on the seabed off the east side, some 4.5 km south of W02779. The record is derived from a diver who observed a cargo ship here.

4.1.7.2 Several wrecks are located off the bank, both to the east and to the west. The closest site on the east side is the wreck of the South Arklow Lightship *Guillemot*, purposefully sunk in 1915, which lies 1.3 km from the bank's southern end (W02737). The majority of those off the west side of Arklow Bank, in the sea area between the bank and the coast are SSS anomalies identified as possible wrecks during the surveys completed prior to the cable lay operations for ABWP 1 in 2003; this explains the linear pattern of sites extending from the Arklow Bank towards shore. An exception to this is W17904, which was identified subsequently during the National Seabed Survey in 2011 as a vessel measuring 26 m long, with a maximum width of 10 m that lies at a depth of 27 m.

4.1.7.3 Close inshore is a final series of known wreck sites at Arklow and just to its north, with an outlier further north off Ennereilly Strand, Sallymount. All but the site at Ennereilly were identified by the UKHO.

4.1.7.4 The recovery of artefacts during the construction of ABWP 1 Turbine No 5 supports the view that archaeological remains exist on the bank and are recoverable. Most of the material observed and recovered fits readily with the assemblages associated with early modern and modern shipwreck events. The recovery of the two worked flint nodules, in contrast, highlights the potential for prehistoric remains to be associated with the sandbank. As noted, it is unclear what their find context was and so it is not possible to deduce whether the nodules were associated with settlement activity that might have occurred when sea levels may have been lower, or whether they represent loss from a coastal craft of the period.

4.1.8 Summary of archaeological potential of the landfall location

4.1.8.1 The landfall location for the offshore export cable routes is at Johnstown North townland, 4.5 km north of Arklow. The landfall is in an area of low rocky sea-cliffs where there is a series of small coves. There are no known archaeological sites on the foreshore at Johnstown North. Further detail is provided in Appendix 18.3: Intertidal Archaeological Inspection Report.

5 Site-specific surveys

5.1 Seabed topography

5.1.1.1 The seabed features of the bank were mapped by the 2019 marine geophysical survey, and the detail was repeated in 2022 where the two surveys overlapped. The dominant topography is mobile sediment over sand, which extends along the full length of the sandbank. A swathe of boulder fields occurs off the north end that extends seawards to the east. Lesser expanses of boulder fields also occur in patches down the west side of the bank. Coarse sediment is exposed in small patches down the west side of the bank and across its southerly end. Sand waves occur down the west side of the bank, along its east side and across its south end. The mobile nature of the covering sands creates a dynamic and shifting sequence of features.

5.2 Targets

5.2.1.1 A significant number of targets were recorded in the 2019 and 2022 survey reports. The surveyors in 2019 recorded 3,484 sonar targets in the Array Area, and 3,470 sonar targets on the three offshore export cable routes (Table 18.1.4). In addition, 196 magnetometer targets were recorded in the Array Area, and 468 on the offshore export cable routes. There is overlap between both survey areas, where the offshore export cable route survey extended into the Array Area survey. This ensured further confidence in the resulting data but does result in duplication of targets. Offshore export cable route CR1 reached 1.2 km into the Array Area survey area; offshore export cable route CR2 reached 1.4 km into the Array Area and offshore export cable route CR3 reached 1.6 km inside the Array Area. As a guide, four of 24 wreck sites and potential wreck sites identified on the SSS data traces were identified on both the Array Area survey and the offshore export cable route surveys. This might suggest approximately 16% duplication between the two surveys.

Table 18.1.4: Summary of SSS and magnetometer target numbers identified by the 2019 marine geophysical survey

Title	Array Area	Export Cable Routes
Boulder	2,491	2,953
Mound	2	0
Fishing gear	4	0
Cable	4	9
UXO	0	3
Debris	961	499
Wreck, potential wreck	22	6
Total SSS targets	**3,484**	**3,470**
Magnetometer targets	196	468

5.2.1.2 The majority of the sonar targets recorded were classified as boulders, which account for over 70% of the targets. Boulder clusters are of interest archaeologically as rock was used as ballast in historic ships, and concentrations of boulders on the seabed could indicate the remains of wreckage where other materials associated with a lost vessel have been eroded away or lie buried. With the present dataset, boulders are found widely across the survey area, with concentrations at the north end of Arklow Bank (Plate 2). Being so ubiquitous, it is notable that boulders are fewer towards the south end of the bank and in the sea area immediately west of the bank. The pattern may also reflect the underlying topography, with boulder fields off the north of the bank and coarse sediment down its west side. In contrast, the presence of sand waves across the south end of the bank would serve to conceal any boulders.

5.2.1.3 The next largest group of targets; namely, debris, accounted for just 28% of the targets on the Array Area and under 15% on the Cable Corridor and Working Area (Plate 3). Debris is an inclusive term which, from an archaeological perspective, has the potential to highlight elements of a wrecking event as well as the progressive deterioration of a wreck site over time, when elements of the vessel may have been carried away from it by tides and other sea state conditions. The distribution of debris targets shares some elements in common with that of boulders, in that there are relatively few occurrences of debris recorded in the southern part of the Arklow Bank. In contrast, there are few at the north end where boulders are more densely distributed. The debris targets are most concentrated along the nearshore or west side of the bank in its mid-section. This is where most wreck sites also occur, and the two distributions are inherently linked.

5.2.1.4 There were only four instances where fishing gear was recorded and all are located in the same location, off the northeast side of the bank (Plate 4). A thin line in the sonar trace indicated the presence of abandoned netting. The presence of a series of point marks on the linear might represent weights.

5.2.1.5 The presence of cable is associated with the ABWP 1 export cable, which was recorded in 13 instances in the sonar data (Plate 5).

5.2.1.6 Three instances of possible UXO were recorded in the survey data and these were identified on offshore export cable route CR1 (Plate 6). Given the presence of German submarines during World War I (WWI), it is possible that such ordnance relates to that period.

5.2.1.7 Previous survey had identified mound features as being indicative of wreckage. The 2019 survey recorded two mounds, and both lie off the west side of the bank. They lie 68 m apart and are otherwise isolated features. The mounds do not present themselves as strong features in the sonar traces, and neither was associated with a previously recorded mound feature (Plate 7).

5.2.1.8 The magnetometer targets have a wide distribution across the survey area. Many of the targets can be associated with the ABWP 1 export cable, which accounts for 99 of the 664 targets. A larger number (119) on the offshore export cable routes were associated with underlying geology, while 72 correlated closely with other targets; namely debris and wrecks/wreckage. Those on the bank occur quite widely but tend to reinforce the distribution along the west side of the bank in its northern half.

5.2.1.9 The 2022 marine geophysical survey recorded a similar range of features (Table 18.1.5). The predominance of boulders is repeated, while the number of features that are associated directly with human agency is also small. The 2022 survey also recorded a number of sonar contacts that could not be categorised easily and are simply recorded as ‘sonar contacts’. The recording of eleven wreck sites in 2022 includes the observation of wrecks recorded previously, as well as the observation of new wreck sites. One of the new wreck sites is located within the central cable corridor (2022, Lot A CR2, Wreck GR_SSS_0001). The other new sites are located on the Array Area and some were recorded on both the Lot A and the Lot B surveys where the Lot A surveys overlapped on to the Array Area.

Table 18.1.5: Summary of SSS and magnetometer target numbers identified by the 2022 marine geophysical survey

Title	Array Area (Lot B)	Cable Corridor (Lot A)	(Lot E)
Boulder	1776	3734	995
Debris	12	33	11
Outcrop	0	11	0
Pipeline	0	9	0
Linear contact	3	2	0
Sonar contact	22	100	0
Wreck	6	5	0
Total SSS targets	**1819**	**3894**	**1006**
Magnetometer targets	188	900	56

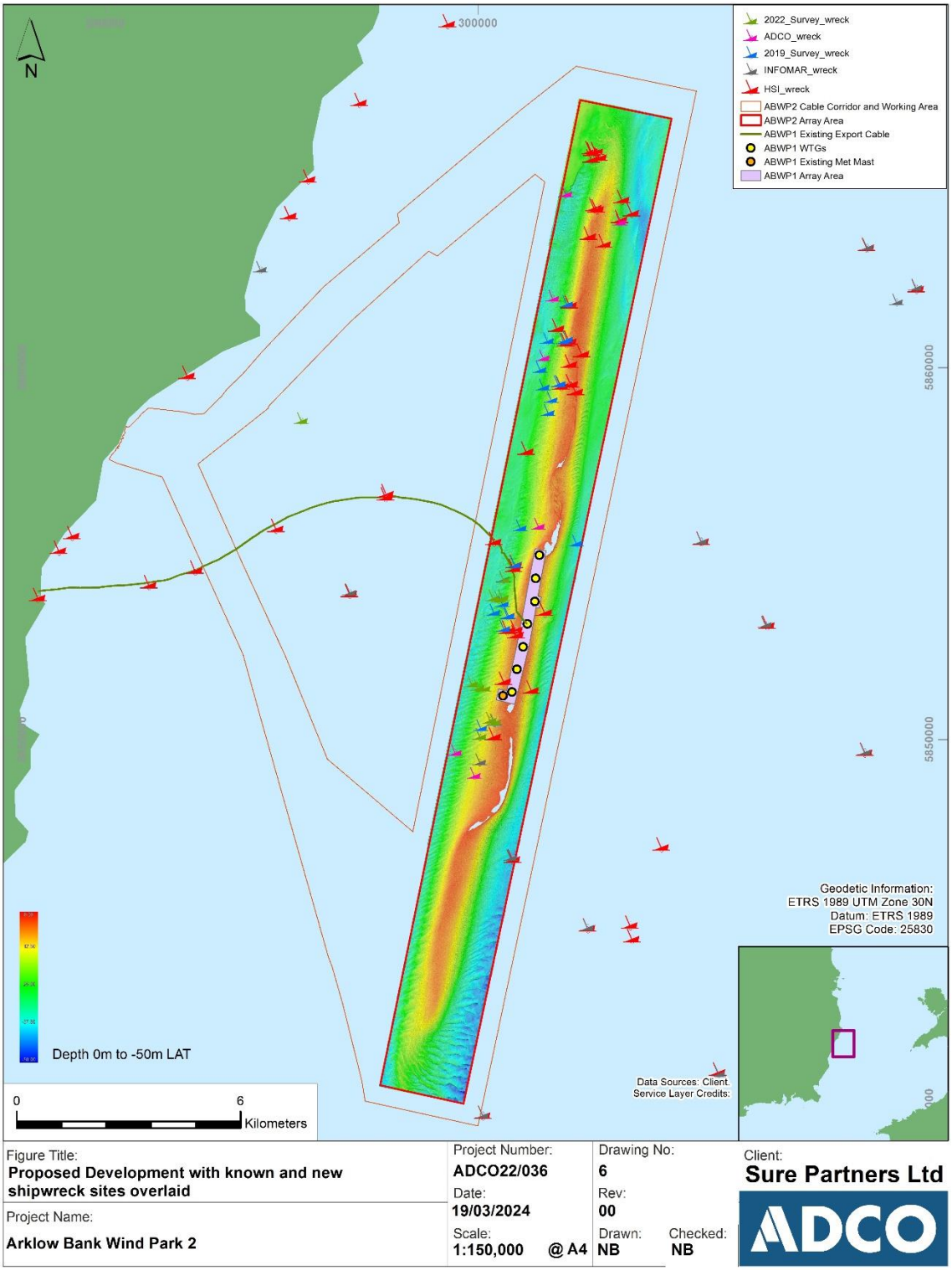


Figure 18.1.6: Project Development area with known and new shipwreck sites overlaid

5.3 Wrecks and potential wrecks

5.3.1.1 The 2019 survey has added significantly to the known wreck sites on Arklow Bank. The 2022 survey has contributed additional information. Both surveys have provided an updated account of the seabed conditions at those known shipwreck sites that lie within the Survey Area and have recorded new sites (Figure 18.1.*6* to Figure 18.1.13). The correlations between the different surveys are noted in Annex 2: Known shipwreck events on Arklow Bank and adjacent waters, while the detail of the wreck sites is presented in Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters, which is a catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and the adjacent waters.

5.3.2 Known sites

5.3.2.1 The catalogue includes the 50 known shipwreck sites listed in Annex 2: Known shipwreck events on Arklow Bank and adjacent waters. Eighteen of these sites lie outside the current Survey Area (Table 18.1.6). Multi-beam data was acquired over much of the central area of the bank, and this data has provided the basis for updating the information relating to the ten known wreck sites that lie within the central area of the bank.

5.3.2.2 The remaining 32 known wreck sites are located within the 2019 Survey Area. Of these, the 2019 survey was able to identify eight of the sites:

- W02650 is located close inshore along the existing export cable route. It was recorded in 2003 as a possible wreck comprising a series of SSS targets spread over a 200 m^2 area. In the 2019 dataset, a series of small-scale boulders was recorded at this location, but nothing quite as distinctive as what may be expected to reflect the presence of a wreck;
- W02783 is located in the mid-section of the bank where a wreck measuring 19.5 m long by 6 m wide was recorded in 2004. The 2019 survey recorded a wreck 13 m northwest of the charted location of W02783. Wreck LA_1033 was recorded as being 21.4 m long, 9.6 m wide with remains that stood 1.7 m proud of the seabed. These dimensions are different to those associated with W02783;
- W02788 had no indication of wreckage at the charted location in 2019 but a wreck site was clearly recorded 70 m to the northwest (LA_1605) and this is interpreted as being the location of W02788;
- W02790 had no indication of wreckage at the charted location in 2019 but a wreck site was clearly recorded 78 m to the northwest (LA_1735) and this is interpreted as being the location of W02790;
- W02791 had no indication of wreckage at the charted location in 2019 but a wreck site was clearly recorded 70 m to the northwest (LA_1725) and this is interpreted as being the location of W02791;
- W02798 had no indication of wreckage at the charted location in 2019 but a wreck site was clearly recorded 78 m to the west northwest (LA_1773) and this is interpreted as being the location of W02798;
- The charted location of W09512, MV *Cameo*, lay outside the 2019 area surveyed by SSS and magnetometer, lying in the central reserve of the bank. Multibeam coverage of the location did not reveal any target feature at this location. INFOMAR, however, had previously claimed that the location of the wreck lies . 370 m north, at their site GIS 405. The 2019 survey also records a significant wreck at this location (2019 survey target LA_0428);
- W18526 is located off the east side of the bank in its southern section. It is the wreck of the SS *Anna Toop* cargo ship that was lost in 1958. Measuring 47.1 m long and standing 3.9 m above the sands, the vessel is a striking site (LA_3638).

5.3.2.3 In three instances, the record of wreckage identified in the 2019 survey is close enough to that identified previously to be confident that these are the same sites (Geological Survey of Ireland [GSI] 405 correlates with LA_0428; W02650 was ill-defined in 2003 and remains an area of potential defined by boulders; W02783 correlates with LA_1033). The remaining five instances show a disparity between the charted location of the known wreck and the location recorded in 2019. The disparity reflects a legacy issue in the mapping of sites. Positioning data captured in earlier records sometimes experienced an offset value when it was transposed to GIS platforms, which has resulted in location corrections in order of 60 to 70 m northwest.[3] It is suggested that this situation applies to: W02788, which correlates with LA_1605; W02790, which correlates with LA_1735; W02791, which correlates with LA_1725; W02798, which correlates with LA_1773; and W18526, which correlates with LA_3638. In conclusion, it is possible to correct the charted positions of known wreck sites in six instances (Table 18.1.6).

Table 18.1.6: Summary of wreck site locations on Arklow Bank and in adjacent waters

Item	Known sites	2019 survey sites	Additional sites identified by ADCO	Additional sites identified by GR	Totals	Corrected positions
Outside survey area	18	0	0	0	18	18
Within survey area	32	24	7	6	69	64
Totals	50	24	7	6	87	82

5.3.2.4 There are six instances within the 2019 dataset that did not record wreckage at the charted locations of wreck sites but did record features relatively close by. However, the features recorded were not visually striking or clearly indicative of wreck. In these cases, the evidence speaks to the dynamic environment of the Arklow Bank, where shifting sands will routinely expose and alternatively bury sites of archaeological interest:

- W02776: debris was recorded 27 m northwest of the charted location;
- W02781: a boulder is recorded 23 m northwest;
- W02785: a sonar feature is observed 70 m south southeast;
- W02794: a boulder is recorded 15 m northwest;
- W2801: a line of boulders is recorded 80 m west;
- W18524: debris is recorded 40 m east.

5.3.2.5 Two final observations are merited from the 2019 survey in relation to the known shipwreck sites:

- The location of the Royal Mail steam barque *Armenian* (W02658) did not return a strong indication of wreckage. No anomaly was indicated at the charted location. A boulder (target LA_1450) was recorded 9 m north, and a second boulder 20 m northwest. A magnetometer trackline ran 3.8 m to the east and did not register any anomaly, while a magnetometer trackline 67 m to the east registered an anomaly (target MAG LA_0060).

[3] Information provided by the NMS in a *pers. comm.*, 22/07/2020

- The location of W02782, identified previously as a metal wreck, was not recorded in the 2019 survey. The charted location is directly overlying/underlying the ABWP 1 export cable, and it was discovered while the cable was being laid.

5.3.2.6 The 2022 marine geophysical survey also reached across locations of known shipwreck sites. Of the ten wreck sites recorded in 2022, two are known locations that were formally recorded by the INFOMAR surveys: the MV *Cameo* location for W09512 (GSI 405, LA_0428) and the 67 m-long steamship SS *Hellenis*, W02690 (GSI 403, LA_0390).

5.3.3 New wreck sites

5.3.3.1 The 2019 survey also recorded five new wrecks that are well-defined and present striking features in the datasets (LA_0390, LA_0738, LA_1553, LA_1602, LA_1724, Figure 18.1.*6* to Figure 18.1.13. The entire stern section of LA_0390, for instance, is fully exposed on the seabed, standing 1.3 m proud of the surrounding sands. The magnetometer survey did not pass directly overhead, but it was detected by survey lines on either side of the wreck site, 50 m and 60 m away respectively, indicating the scale of the vessel's large steel structure. LA_0738, in contrast, appears to be less well preserved above the sands but it has a cluster of debris targets recorded close to it, extending 20 m north and 20 m south of the wreck's centrepoint. This effectively indicates the probable extent of the buried structure.

5.3.3.2 ADCO's review of the 2019 sonar traces suggested that a further seven wreck sites and sites of potential wrecks can be added to the catalogue (Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters, ADCO_1–ADCO_7). The identifications are made on the basis of observing features in the sonar traces that are recognizable as wreck or potential wreck. In five instances, the 2019 survey recorded targets at these locations but did not consider the targets to represent wreck sites. In three instances, the 2019 did not identify a target at the location proposed by ADCO (ADCO_4, ADCO_5, ADCO_7, Figure 18.1.*6* to Figure 18.1.13).

5.3.3.3 The 2022 marine geophysical survey contributed additional insight which is described in the Green Rebel report (2023, pp 129-131). The overlap in survey areas between 2022 and 2019 permitted a correlation between existing data and fresh survey. Table 18.1.7 correlates the observations relating to known and new shipwreck sites, and these details are included in the catalogue of sites (Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters). The table lists 22 instances of correlation between the 2022 survey data and the 2019 survey.

5.3.3.4 There are 11 instances where the 2022 survey did not record shipwreck at locations that are associated with charted shipwreck sites. In five of these cases, the charted wreck is an entry recorded only in the Historic Shipwreck Inventory and was not recorded in the 2019 survey; such may indicate that the charted location is inaccurate. In the six other occasions where the 2022 survey did not record wreckage at charted locations, it suggests the dynamic nature of the surface sediments on the bank, where shifting sands will serve to bury and conceal sites.

5.3.3.5 The dynamic nature of the sediments will also expose new sites. The 2022 survey recorded shipwreck at six new locations, five of which lie on Arklow Bank and one of which lies in the Cable Corridor and Working Area. The new sites on the bank are referenced GR_SSS_4455; 4457; 0121; 0133; 0137. The new site on the Cable Corridor and Working Area is referenced GR_SSS_0001, and was recorded in multibeam, SSS and magnetometer. It measures 8 m long, 2 m wide and stands 4.5 m high.

Table 18.1.7: Correlation of shipwreck observations between 2022 and 2019 survey areas

2022 Survey Area	Historic Shipwreck Inventory	2019 Survey reference	2022 Survey reference	New Shipwreck (✓/×)
Lot A	×	×	GR_SSS_0001	✓
Lot A	×	LA_0855 / R2_1014	GR_SSS_4454	×
Lot A	×	×	GR_SSS_4455	✓
Lot A	×	LA_0958 / R2_0961	GR_SSS_4456	×
Lot A	×	×	GR_SSS_4457	✓
Lot B4	W02786	×	×	×
Lot B4	W02792	×	×	×
Lot B4	W02793	×	×	×
Lot B3	W02658	×	×	×
Lot B2	×	R2_1035	×	×
Lot B2	×	R2_1061	×	×
Lot B2	×	LA_0738	×	×
Lot B2	×	LA_0761 / R2_0991	×	×
Lot B2	×	R2_1070	×	×
Lot B2	W02776	×	×	×
Lot B2	×	×	GR_SSS_0121	✓
Lot B2	×	×	GR_SSS_ 0133	✓
Lot B2	×	×	GR_SSS_0137	✓
Lot B2	×	LA_0434	GR_SSS_1462	×
Lot B2	GSI 405	LA_0428	GR_SSS_1211	×
Lot B2	×	LA_0421	×	×
Lot B2	×	LA_0390	GR_SSS_0138	×

5.3.4 Distribution of wreck sites

5.3.4.1 One new site has been recorded on the Cable Corridor and Working Area. The new wreck site (GR_SSS_0001) is located 2.6 km offshore. The majority of the new wreck sites are located along the west side of the bank.

5.3.4.2 The new additions of wreck sites identified in the 2019 and 2022 datasets (Figure 18.1.*6*) reinforce those areas of the bank where wreck has been recorded previously. The sense of clustering that was evident in the pattern of known wrecks (see section 4.1.7.1–4.1.7.3) is repeated and intensified as follows, and no new cluster areas are highlighted:

- The 2019 and 2022 surveys did not identify any new sites at the north end of Arklow Bank, but two additional sites are located there; namely ADCO_2 and ADCO_3;
- The next cluster occurs 1.6 km to the south. Here the 2019 survey has added ten sites, and ADCO has added a further two sites from its review of the 2019 geophysical survey data. This cluster now comprises 21 sites over a 3.3 km long stretch of the sandbank, and most of the wrecks occur on its west side;
- The next cluster begins 2.7 km south, in the middle section of the bank, and continues for some 7 km, within which there are 19 wreck sites that tend to be recorded on the west side of the bank;
- A final grouping of 8 sites lies 2 km south and occurs over 1.6 km, again mostly on the west side of the bank.

- With the exception of the wreck of the South Arklow Light ship, *Guillemot*, located 1.2 km off the southeast tip of the bank, there are no wreck sites identified at the south end of the Arklow Bank.

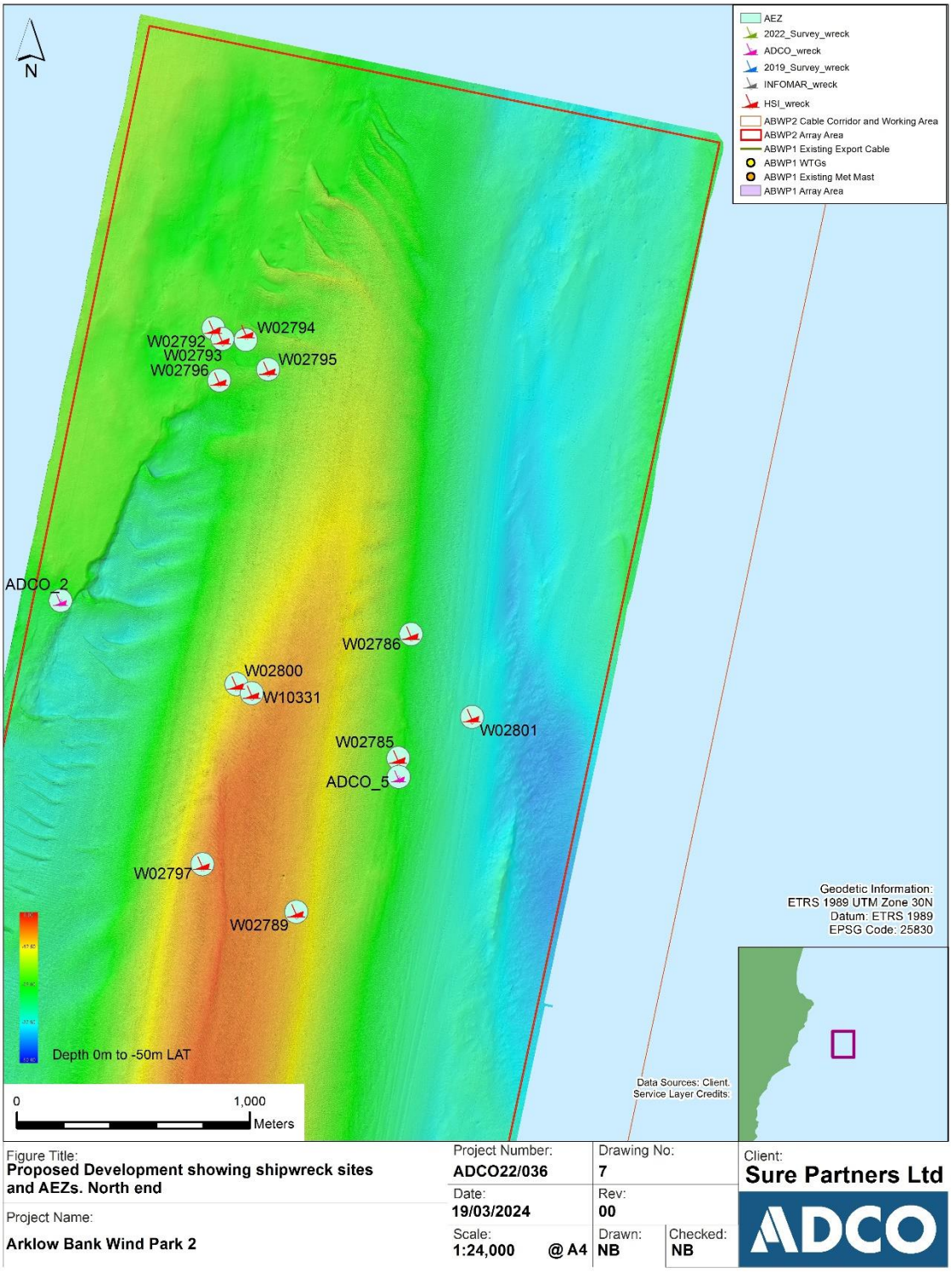


Figure 18.1.7: Proposed Development area with known and new shipwreck sites overlaid, North end

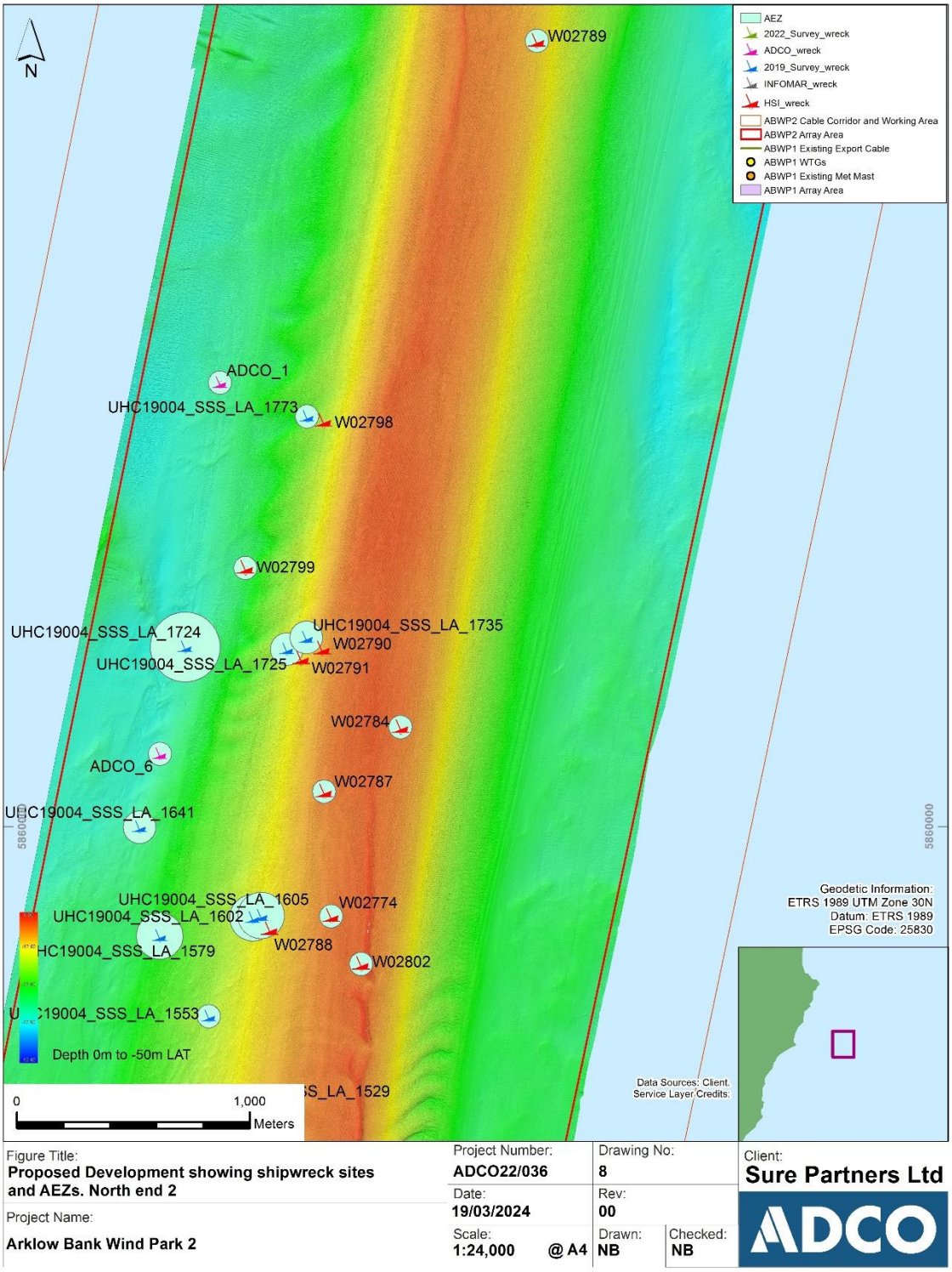


Figure 18.1.8: Proposed Development area with known and new shipwreck sites overlaid, North end 2

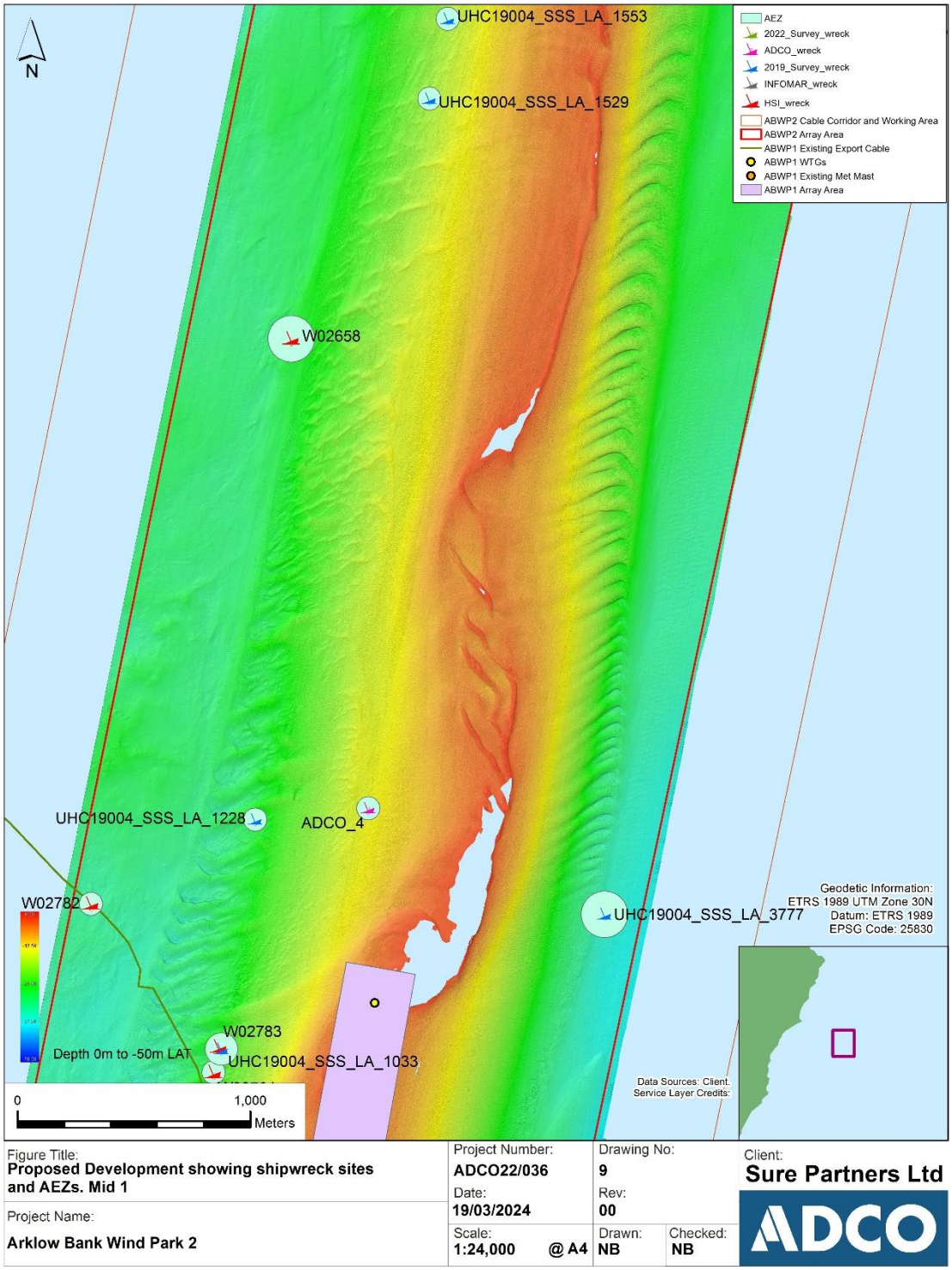


Figure 18.1.9: Project Development area with known and new shipwreck sites overlaid, Mid 1

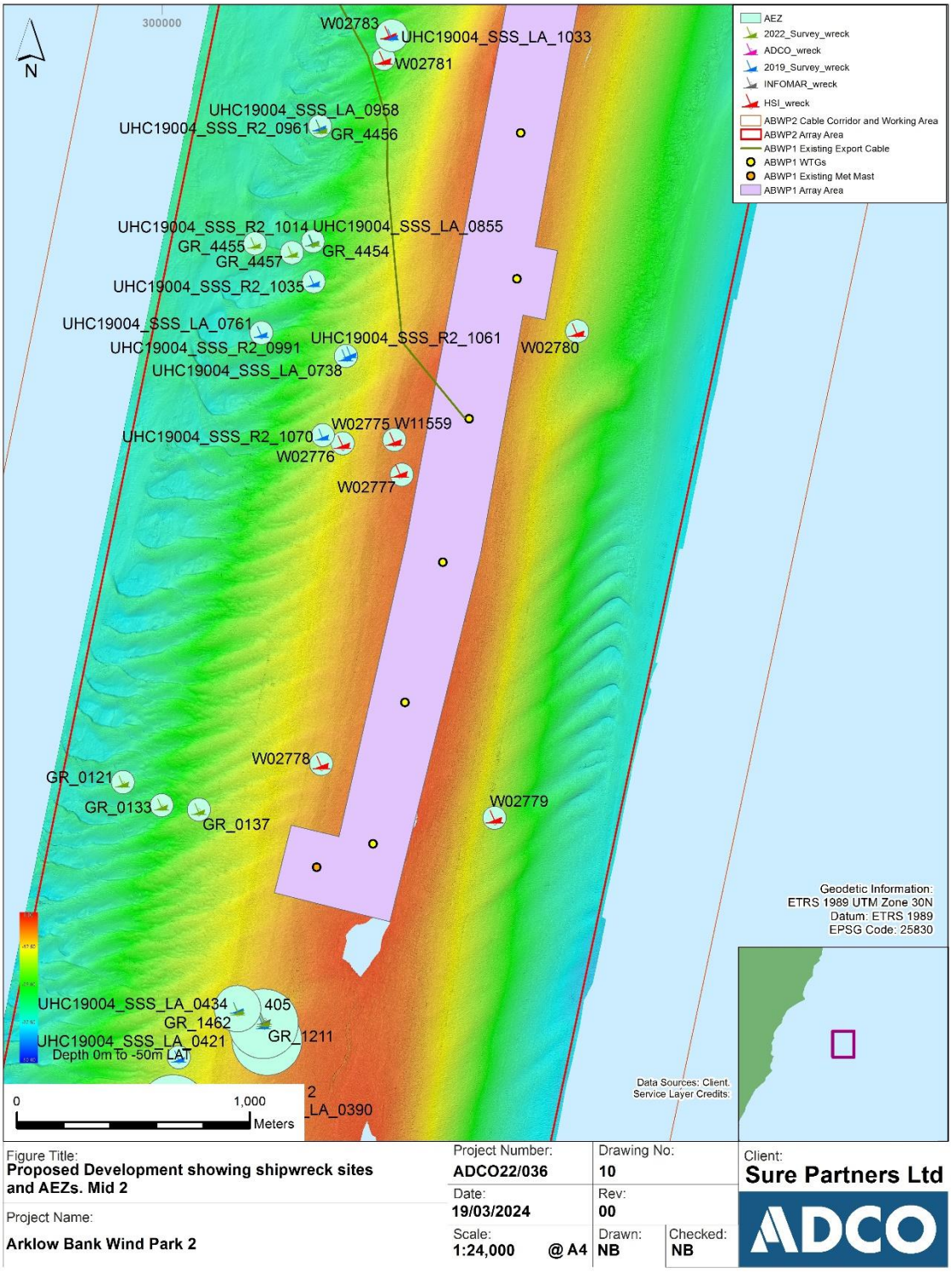


Figure 18.1.10: Proposed Development area with known and new shipwreck sites overlaid, Mid 2

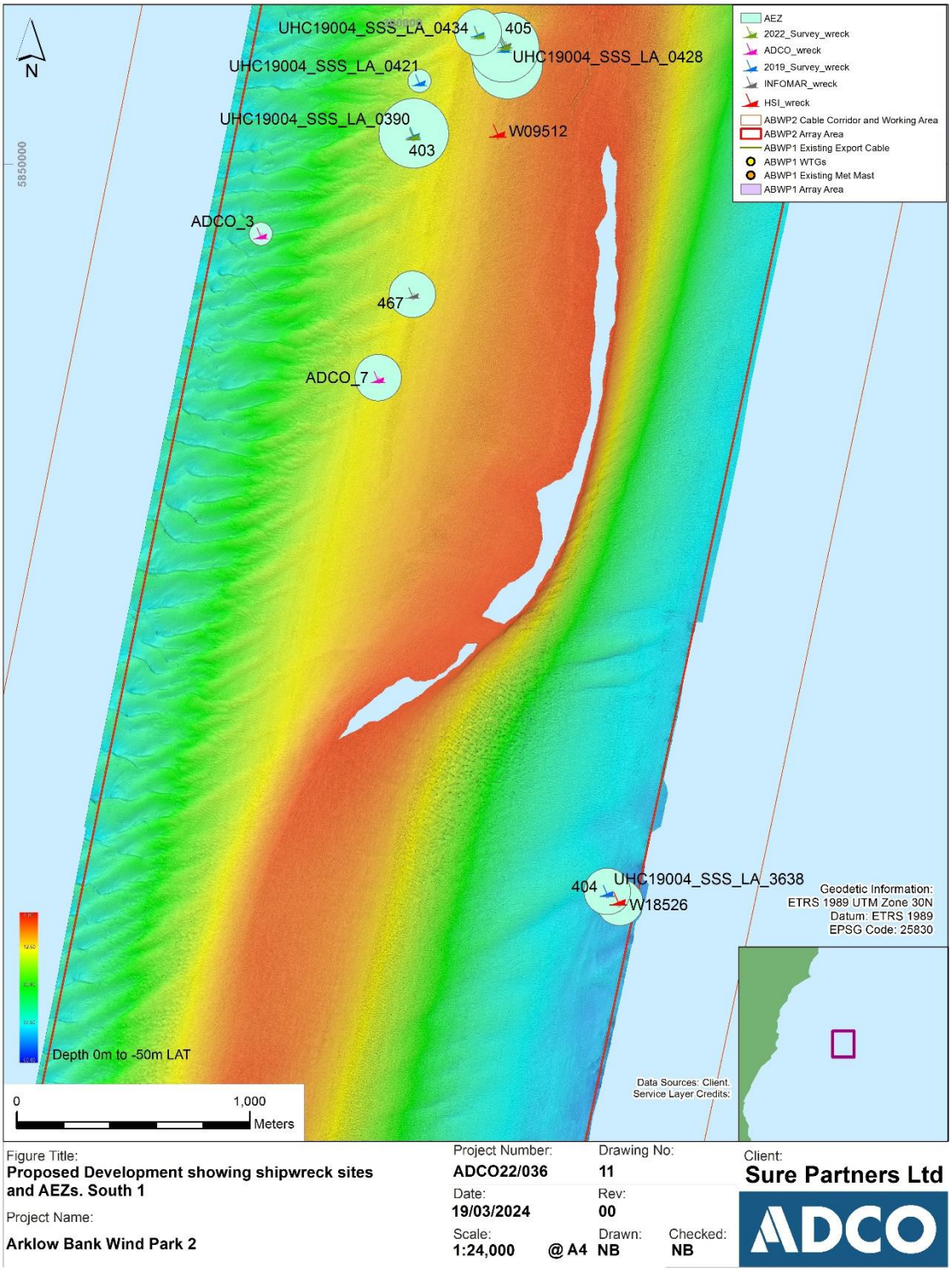


Figure 18.1.11: Proposed Development area with known and new shipwreck sites overlaid, Mid 3

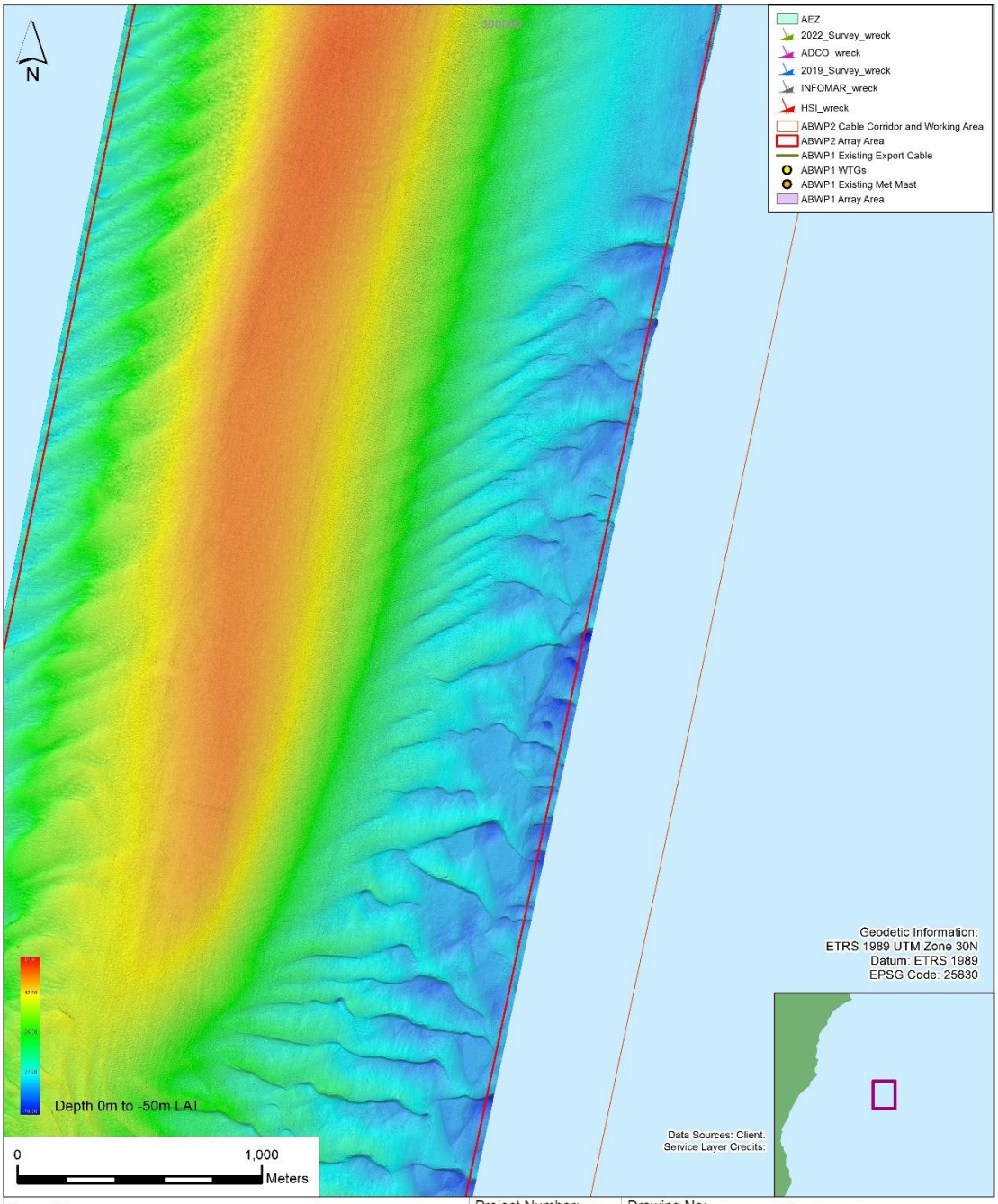


Figure 18.1.12: Proposed Development area with known and new shipwreck sites overlaid, South 1

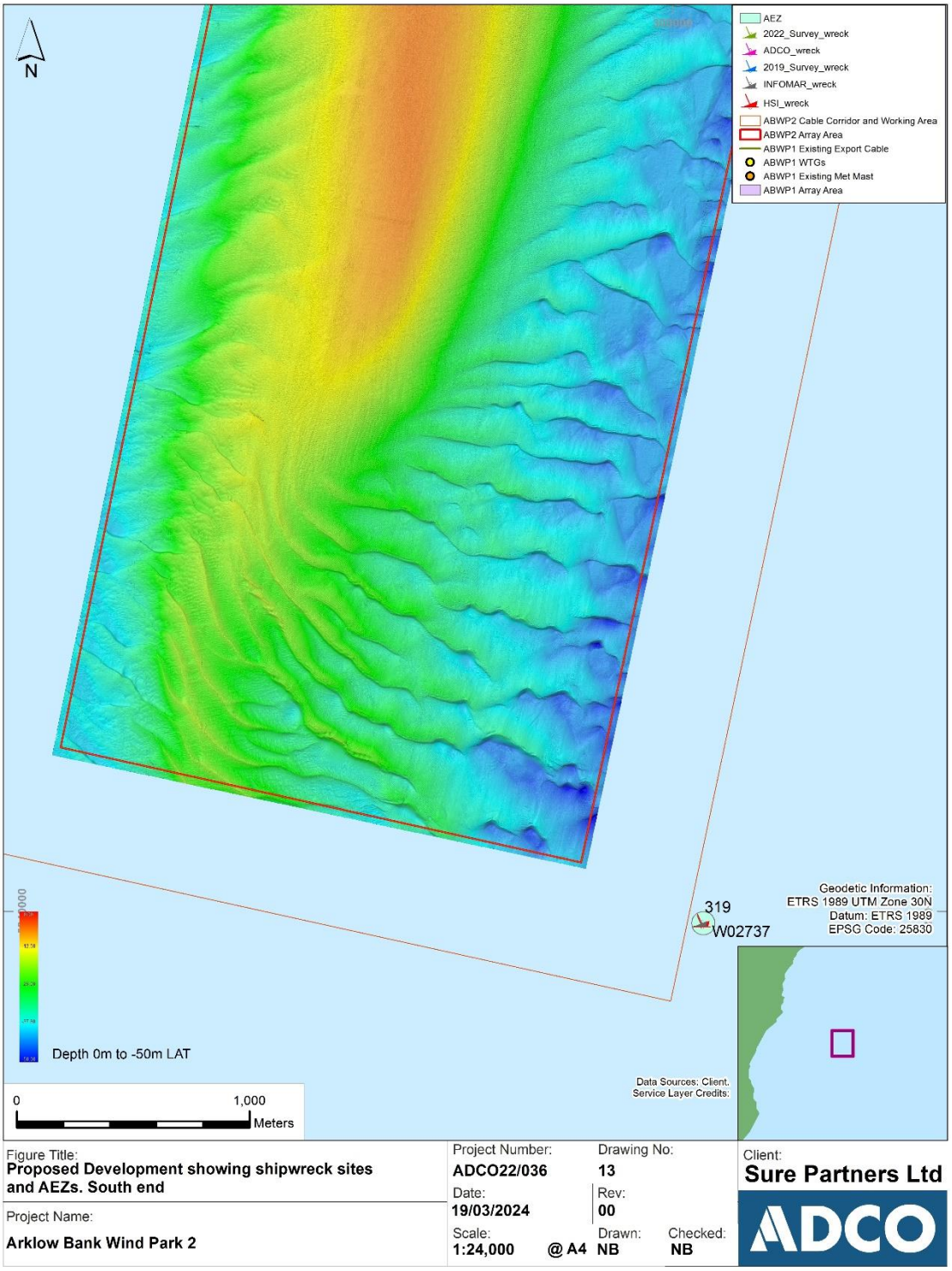


Figure 18.1.13: Proposed Development area with known and new shipwreck sites overlaid, South end

5.4 Summary of known and potential archaeology and shipwrecks on Arklow Bank (site-specific surveys)

5.4.1.1 This Marine Archaeology Technical Report accepts the record as reported in the 2019 and 2022 marine geophysical surveys and believes the record to be very robust and comprehensive. The 2019 survey established a new standard for survey on Arklow Bank and it corrects the charted location of five sites.

5.4.1.2 The survey data examined, which focused on SSS and magnetometry data sets, did not reveal an indication of submerged prehistoric material.

5.4.1.3 Wreck sites and potential wreck sites identified in previous surveys were not all observed in the 2019 and 2022 surveys, while both surveys identified new sites in areas surveyed previously. This speaks to the dynamic environment of the Arklow Bank, where shifting sands will routinely expose and alternatively bury sites of archaeological interest.

5.4.1.4 Archaeological review of the datasets concurs with the principal observations and identifies seven additional potential wreck sites.

5.4.1.5 To include the uncorrected charted locations of historic wreck sites, there are 87 sites associated with Arklow Bank and its associated sea areas (Table 18.1.6). This number reduces to 82 when the corrected locations are accepted. The corrected locations, described in section 5.3.2.2 refer to: W02788; W02790; W02791; W02798; W09512.

5.4.1.6 The distribution of historic wrecks on Arklow Bank and that of the sites recorded in 2019 and 2022 suggest that wreckings are focused in particular locations on the bank, and this can inform studies that might anticipate the locations of other wreck sites on the sandbank. There are more wreck sites recorded on the west side of the bank than on its eastern side. This accords with the pattern of historic wreckings as recorded in contemporary sources, where more vessels appear to have been lost during prevailing southwesterly storms than on other occasions.

5.5 Geotechnical Investigations

5.5.1.1 GIs have been carried in 2020, 2022 and 2023 (Figure 18.1.*4*).

5.5.1 GI, 2020

5.5.1.1 GeoQuip carried out a programme of boreholes in October-November 2020 supported by the dynamically positioned vessel, *Saentis* (Geoquip Marine, 2020). Two boreholes were completed, achieving depths of 13.7 m and 16.5 m below seabed (BH02 and BH14 respectively). The strata recorded comprised alternating layers of sand and clay for the most part.

5.5.2 GI, 2022

5.5.2.1 DEME *Neptune*, jack-up barge facilitated works by Fugro in 2022 (Fugro, 2022). Nine boreholes were drilled during the site investigation that took place in June and July. The boreholes achieved deep depths, of between 51.5 m (BH13) and 75 m (BH01) below seabed. Generally, the strata recorded were alternating layers of sand, silt, gravel and clay, indicative of the anticipated morainic core to the sandbank. Rock was only observed in two occasions: sandstone was encountered in BH10 at a depth of 17.41 m below seabed, and weak tillite sedimentary rock was encountered in BH28 at a depth of 13.59 m. There was no observation of organic levels or peat in the strata that might suggested submerged land surfaces.

5.5.3 GI, 2023

5.5.3.1 A series of five boreholes were progressed by GII in 2023 from a jack-up barge, approaching landfall in Johnstown North (GII, 2023; Brady, 2023a). The proposed locations were extended over a distance of approximately 350 m, and the closest borehole to shore was located 75 m from the Low Water Mark. The boreholes would be progressed to a maximum depth of 25 m below seabed level (msbdl). The nearshore borehole data record a natural soil profile of sands, gravel and clay overlying rock. The depth of the surface deposits varies between 4.3 m and 6.2 m. The sand content is in keeping with marine surface deposits, while the gravel and clay indicate the presence of a boulder clay till that is in keeping with the soil profiles observed above the waterline along this stretch of retreating coastline. While onshore the bedrock exposures form low cliffs, it appears that the bedrock has a gentler inclination seaward but retains some undulation. There was no record of organic material observed, such as peat deposits or the presence of land shells, which could suggest the presence of submerged landscape that retains human activity horizons. There was no record of more clearly indicative archaeological remains, such as worked timber, ceramic or other artefactual remains.

5.5.3.2 A campaign of CPTs and vibrocores was also completed in in July-August 2023, by Geo aboard the synamically-positoned vessel, *Connector* (Geo, 2023 Brady, 2023b). The vibrocores reached a maximum depth of 6.1 m below seabed, were completed at 32 locations and recovered material for examination. The vibrocore data did not record peat layers. However, in five instances there was some indication of organic clay and charcoal (VC05, VC07, VC08, VC17 and VC19). Neither observation is out of place in such a marine environment and both observations occurred in only a handful of the vibrocore locations, all of which are located between Arklow Bank and the shore.

5.5.4 GI, conclusion

5.5.4.1 The GI data provide robust ground-truthing data on the underlying strata of Arklow Bank and the sea area to the west. The morainic core of the sand bank is clearly evident, with alternating layers of sand, clay and gravel extending to depth. Nearshore, bedrock rises closer to the surface. While charcoal and organic clay deposits are evident in some of the vibrocore profiles west of the bank, no peat layers have been recorded indicative of submerged landscape. The results nevertheless support the consideration that direct impacts on the seabed associated with ABWP2, be they turbine installation or cable installation works, will encounter material at depth below the surface deposits that has the potential to be of archaeological interest.

6 Recommendations

6.1.1.1 It is recommended that the 82 locations of the wreck sites and potential wreck sites based on the national shipwreck inventory and the additional locations recorded in the 2019 and 2022 datasets are avoided by the Proposed Development infrastructure. An archaeological exclusion zone (AEZ) is identified for each location, within which installation activities can only take place with the prior approval of the NMS. The size of the AEZs vary according to the recorded extent of the wreck site or potential wreck site and in some instances extends to include areas that may be related to debris fields associated with the wrecking event. In the five instances where the 2019 survey has corrected the position of the wreck recorded in the Historic Shipwreck Inventory, the Inventory entry is given an AEZ value of ‘none’, meaning that there is no AEZ required in these five instances.

Table 18.1.8: Archaeological exclusion zones identified for each known wreck site location

Reference	UTM_E	UTM_N	AEZ Radius from centrepoint
W02373	295415	5865095	50 m
W02432	294913	5864142	50 m
W02647	297514	5856582	50 m
W02648	294672	5855713	50 m
W02649	292399	5854609	50 m
W02650	291160	5854208	50 m
W02658	301286	5857808	100 m
W02690; GSI 403	300450	5850432	150 m
W02737	300236	5839999	50 m
W02774	302484	5859615	50 m
W02775	300997	5853014	50 m
W02776	300775	5852999	50 m
W02777	301024	5852907	50 m
W02778	300683	5851621	50 m
W02779	301427	5851389	50 m
W02780	301782	5853481	50 m
W02781	300952	5854652	50 m
W02782	300425	5855377	50 m
W02783	300975	5854761	50 m
W02784	302782	5860428	50 m
W02785	303806	5864039	50 m
W02786	303861	5864572	50 m
W02787	302454	5860151	50 m
W02788	302221	5859559	None
W02789	303368	5863378	50 m
W02790	302446	5860764	None
W02791	302356	5860723	None
W02792	303012	5865887	50 m
W02793	303051	5865841	50 m
W02794	303151	5865837	50 m
W02795	303247	5865710	50 m
W02796	303037	5865663	50 m
W02797	302965	5863583	50 m
W02798	302452	5861744	None
W02799	302116	5861112	50 m
W02800	303111	5864357	50 m
W02801	304123	5864216	50 m
W02802	302613	5859410	50 m
W09512	300408	5850140	None
W09566	289099	5855539	50 m
W10325	307756	5853129	50 m
W10326	305990	5855386	50 m
W10331	303177	5864318	50 m

Reference	UTM_E	UTM_N	AEZ Radius from centrepoint
W11021	288744	5855146	50 m
W11475	288198	5853863	50 m
W11721	292189	5859792	50 m
W17904	296550	5853980	50 m
W18524	297533	5856664	50 m
W18526	300926	5846368	100 m
GSI 467	300041	5849442	100 m
UHC19004_SSS_LA_0390; GSI 403	300047.0	5850134.2	150 m
UHC19004_SSS_LA_0421	300071.0	5850359.6	50 m
UHC19004_SSS_LA_0428; GSI 405	300434.8	5850503.6	150 m
UHC19004_SSS_LA_0434	300323.5	5850568.9	100 m
UHC19004_SSS_LA_0738; UHC19004_SSS_R2_1061	300789.0	5853374.6	50 m
UHC19004_SSS_LA_0761; UHC19004_SSS_R2_0991	300425.8	5853474.3	50 m
UHC19004_SSS_LA_0855; UHC19004_SSS_R2_1014	300647.5	5853867.7	50 m
UHC19004_SSS_LA_0958; UHC19004_SSS_R2_0961	300677.9	5854362.6	50 m
UHC19004_SSS_LA_1033	300985.8	5854752.4	70 m
UHC19004_SSS_LA_1228	301131.0	5855739.7	50 m
UHC19004_SSS_LA_1529	301879.8	5858841.5	50 m
UHC19004_SSS_LA_1553	301958.7	5859184.7	50 m
UHC19004_SSS_LA_1579	301747.9	5859529.9	100 m
UHC19004_SSS_LA_1602	302148.4	5859608.3	100 m
UHC19004_SSS_LA_1605	302183.5	5859618.1	100 m
UHC19004_SSS_LA_1641	301661.6	5859997.5	70 m
UHC19004_SSS_LA_1724	301857.7	5860772.1	150 m
UHC19004_SSS_LA_1725	302293.6	5860762.7	70 m
UHC19004_SSS_LA_1735	302377.6	5860813.4	70 m
UHC19004_SSS_LA_1773	302380.4	5861763.2	50 m
UHC19004_SSS_LA_3638	300877.7	5846874.9	100 m
UHC19004_SSS_LA_3777	302632.6	5855331.7	100 m
UHC19004_SSS_R2_1035	300650.4	5853694.1	50 m
UHC19004_SSS_R2_1070	300689.7	5853034.1	50 m
ADCO_1	302006.8	5861908.6	50 m
ADCO_2	302356.0	5864716.0	50 m
ADCO_3	299390.0	5849702.0	50 m
ADCO_4	301617.0	5855788.0	50 m
ADCO_5	303808.0	5863958.0	50 m
ADCO_6	301749.0	5860313.0	50 m
ADCO_7	299894.0	5849084.0	100 m
GR_SSS_0001	295252.0	5858624.0	50 m
GR_SSS_0121	299831.4	5851542	50 m
GR_SSS_0133	299997.7	5851443	50 m

Reference	UTM_E	UTM_N	AEZ Radius from centrepoint
GR_SSS_0137	300157.6	5851424	50 m
GR_SSS_4455	300397.9	5853858	50 m
GR_SSS_4457	300557.1	5853819	50 m

6.1.1.2 An Archaeological Management Plan (AMP) has been prepared to inform the installation works, to facilitate the discovery and reporting of archaeological material during installation works should this occur (see Appendix 25.9).

6.1.1.3 In the event that installation activities are unable to avoid impacts within an AEZ, the works can only proceed with the consent of the NMS. This applies to the landfall location as well as at sea. In this context, it is likely that additional archaeological mitigation and monitoring will be required.

6.1.1.4 The recommendations contained in this Technical Report are subject to the approval of the NMS at the DHLGH.

7 Summary

7.1.1.1 This Marine Archaeology Technical Report provides the archaeological baseline for the Proposed Development which is located on the Arklow Bank, some 6 to 15km off the Co. Wicklow coast, centred at UTM30N 301648E 5855291N (ITM 738663E 675303N, WGS84 52.810864 Latitude -5.943113 Longitude).

7.1.1.2 The Marine Archaeology Technical Report is based on a desktop review of existing archaeological sources, and a review of marine geophysical survey datasets and reporting acquired in 2019 and 2022, Intertidal Archaeology Survey completed in 2020 and 2023, and marine Geotechnical Investigations carried out in 2020 and 2023.

7.1.1.3 The potential to uncover submerged prehistoric material is low.

7.1.1.4 The Arklow Bank has been hazardous to shipping, and 165 historic wrecking events are associated with Arklow Bank and in the waters close to it. This includes 116 recorded wreckings whose specific locations are not known, as well as 49 known wreck-site and potential wreck-site locations, which have been identified through previous marine geophysical and related site surveys. A smaller number of 15 known wreck sites is known from the area extending one tidal cycle from the bank.

7.1.1.5 Desktop review indicates the presence of no known features on the foreshore at the landfall location.

7.1.1.6 A new and comprehensive marine geophysical survey was completed in 2019 by Ultrabeam for Alpha Marine that focussed on the Arklow Bank and three possible offshore export cable routes to shore. The 2019 survey comprised multi-beam bathymetry; SSS; magnetometry and sub-bottom profile surveys, to inform a detailed understanding of the topography and underlying geological formations of the seabed. The data of the 2019 survey was made available and has been reviewed archaeologically. Archaeological review focused on the SSS and magnetometry data sets and has included the landfall location.

7.1.1.7 The 2019 survey recorded 24 wreck sites and potential wreck sites, some of which have been identified previously and some of which are newly identified. In addition, three possible unexploded ordnance targets were identified, four possible fishing gear targets, over 1,200 debris targets and more than 5,000 boulder targets. The 2019 marine geophysical survey set is very robust and establishes a new standard for survey on Arklow Bank.

7.1.1.8 Archaeological review of the dataset concurs with the principal observations and identifies seven additional potential wreck sites.

7.1.1.9 Additional survey conducted by GR in 2022 extended the survey area along the proposed Cable Corridor and working area. The survey deployed a similar array of devices to that in 2019 and observed comparable seabed conditions and features. The 2022 survey recorded six previously unrecorded wreck sites, five of which lie on the bank and one lies inshore.

7.1.1.10 The total number of wreck sites and potential wreck sites associated with the Arklow Bank currently stands at 87. It is likely that in five cases survey is able to correct the location of the charted wreck. This reduces the number of known actual wreck sites locations on the bank and in adjacent waters to 82. To include the 15 sites located further away within one tidal cycle of the bank brings the number to 97.

7.1.1.11 Wreck sites and potential wreck sites identified in previous surveys were not all observed in the 2019 and 2022 surveys, while both surveys identified new sites in areas surveyed previously. This speaks to the dynamic environment of the Arklow Bank, where shifting sands will routinely expose and alternatively bury sites of archaeological interest. This report accepts the record as reported in the 2019 and 2022 surveys and believes the record to be very robust and comprehensive.

7.1.1.12 The landfall site has been inspected archaeologically by means of an intertidal assessment and this is reported in Volume III, Appendix 18.3: Intertidal Archaeology Inspection Report.

7.1.1.13 Installation and related works will avoid direct impacts on the locations of the known wreck sites and potential wreck sites by observing the AEZs that are identified for each site.

7.1.1.14 The AMP includes a protocol to facilitate the discovery and reporting of archaeological material during installation and related works should this occur (Appendix 25.9).

7.1.1.15 In the event that related works are unable to avoid impacts within an AEZ, the works can only proceed with the consent of the NMS. This applies to the landfall location as well as at sea. In this context, it is likely that additional archaeological mitigation will be required before the relevant work is permitted, and that archaeological monitoring of the works will be required.

7.1.1.16 The recommendations contained in this report are subject to the approval of the NMS at the DHLGH.

8 References

Boland, D. (no date) Licence 02R093 (www.excavations.ie) (accessed 30/04/2020).

Brady, K. (2008) Shipwreck inventory of Ireland: Louth, Meath, Dublin and Wicklow, Dublin, Stationary Office.

Brady, N. (2017) Marine geophysical survey, Arklow Waste Water Marine Outfall, 16R0219, The Archaeological Diving Company Ltd.

Brady, N. (2018) Underwater archaeological inspections, Arklow Water Water Marine Outfall, 17D0078, 17R0197', The Archaeological Diving Company Ltd.

Brady, N. (2020) 'Underwater Archaeological Impact Assessment, Arklow Bank Wind Park, Lease Area and Cable Routes', The Archaeological Diving Company Ltd,

Brady, N. (2023a) Underwater Archaeological Impact Assessment. Arklow Bank Wind Park. GI Campaign 2023, Boreholes. The Archaeological Diving Company Ltd.

Brady, N. (2023b) 'Underwater Archaeological Impact Assessment. Arklow Bank Wind Park. GI Campaign 2023, CPT/Vibrocores. The Archaeological Diving Company Ltd.

Campbell. K. Arklow Bank Windpark, 03E1101. In Isabel Bennett (ed.), Excavations 2003, p. 541. (www.excavations.ie) (accessed 30/04/2020).

Fugro (2022) Arklow Bank Wind Park – Geotechnical Borehole Survey 2022. Field Operations. Document reference F186642-C 02.

Gavin and Doherty Geosolutions (2019) Arklow Bank Windpark- foreshore licence application, supporting document, Gavin and Doherty Geosolutions.

Geo (2023) 'Arklow Bank Phase 2 Geotechnical Site Investigation 2023 Field Report';

Geoquip (2020) Arklow Bank Interim Geotechnical Survey, 2020. Field Operations and Results, 2020. Document reference GMOP20-G-007-FLD-01.

GII (2023) 'Appendix 2 – Borehole Records', report by Ground Investigations Ireland for Sure Partners, 2023. Job ref. 12715-04-23.

Gregory, N. Licence 97E0252 (www.excavations.ie) (accessed 30/04/2020).

Lynch, P. Licence 97E0207(www.excavations.ie) (accessed 30/04/2020).

Ultrabeam (2019a) Arklow Bank Wind Park: Lease Area. 2 volumes, Ultrabeam.

Ultrabeam (2019b) Arklow Bank Wind Park: Export Cable Routes. 2 volumes, Ultrabeam.

Westley, K. and Woodman, P. 'Ireland. Submerged prehistoric sites and landscapes', in G. Bailey et al (eds), The archaeology of Europe's drowned landscapes, Coastal Research Library 35 https://doi.org/10.1007/978-3-030-37367-2_11

Annex 1: Recorded shipwreck events on Arklow Bank and adjacent waters

Source: Brady, *Shipwreck Inventory of Ireland*

Reference	Date of Loss	Vessel Name	Place of Loss	Description
W02651	11/11/1819	*Albion*	Arklow Bank	Cardigan Brig
W02652	13/04/1870	*Alphonse & Corinne*	Arklow Bank	Of Nante, coal cargo
W02653	04/06/1858	*Amazon*	Arklow Bank	237 ton brig. General cargo
W02654	03/04/1847	*Amicitia*	Arklow Bank	71 ton sailing vessel
W02655	03/10/1872	*Ann & Mary*	Arklow Bank	Of Cardigan, barley cargo
W02656	30/01/1860	*Ann Mitchell*	Arklow Bank	items recovered by diver
W02657	15/06/1776	*Anna Maria*	Mizen Bank	Of Straslund, struck bank, wrecked
W02659	26/02/1858	*Avondale*	Arklow Bank, N end	Of Baltimore
W02660	12/12/1794	*Beautiful Mary*	Arklow Banks	*en route* Dungavan to Bristol
W02661	28/05/1860	*Breeze*	Arklow Light, near	95 tone brigantine, NE Force 12
W02662	14/08/1840	*British Tar*	Arklow Bank, off	264-ton Whitby brig. Stranded, floated off, went to pieces
W02663	27/05/1748	*Bucephalus*	Arklow Sands	*en route* Limington to Dublin
W02664	11/05/1860	*Calcutta*	Arklow Bank	527 ton iron screw steamer, pig-iron & general cargo
W02665	06/01/1873	*Charles*	Arklow Bank	81-ton Wexford wooden schooner *en route* from Dundalk to Wexford, SSW 9 force Gale
W02666	04/05/1778	*Charlotte*	Arklow Bank	*en route* London to Dublin
W02667	1778	*Charlotte*	Arklow Bank	lost, 1778
W02668	22/11/1766	*Charming Nancy*	Arklow Bank	*en route* Dublin to Barbados
W02669	03/12/1863	*Comet*	Arklow Bank	74-tone Arklow schooner, NW force 12, coal cargo
W02670	01/11/1818	*Conquestador*	Arklow Bank	*en route* St Ubes to Dublin
W02671	19/10/1865	*Constantina*	Arklow Bank	463-ton Liverpool barque, vessel abandoned
W02672	16/01/1862	*Crisis*	Arklow Bank	426-ton Liverpool barque, wrecked
W02674	19/01/1804	*Demerara*	Arklow Bank	409-ton Lancaster/Liverpool vessel *en route* from Demerara to Glasgow

Reference	Date of Loss	Vessel Name	Place of Loss	Description
W02675	01/09/1870	*Dove*	Arklow Bank	143-tone wooden schooner of Barrow *en route* from Morcombe to Newport with pig iron, SSW gale.
W02676	09/12/1833	*Earl of Kilmorey*	Arklow Bank, near	106-ton Liverpool brig *en route* from Dundalk to Bristol
W02677	11/12/1851	*Ebenezer*	Arklow Bank	59-ton Salcombe schooner *en route* from Lisbon to Dublin
W02678	14/02/1812	*Eliza*	Arklow Bank	*en route* from Liverpool to Waterford
W02679	30/04/1846	*Erin*	Arklow Bank	*en route* from Liverpool tp Barbados
W02680	21/01/1834	*Eton/Etton*	Arklow Banks	*en route* from Cadiz to Dublin
W02681	28/03/1897	*Express*	Arklow Bank	78-ton Wexford wooden schooner, *en route* Dublin to Wexford, SW force 5.
W02682	09/05/1903	*Fair Fanny*	Arklow Bank	59-ton Bideford ketch, *en route* from Burry Port to Dublin, coal
W02683	10/01/1816	*Fame*	Arklow Banks	*en route* from New York to Newry
W02684	16/02/1817	*Fame*	Arklow Banks	248-ton wooden snow *en route* from Berbice to Clyde
W02685	01/02/1935	*Fleck*	Arklow Bank, N end, near Buoy 2	99-ton steel steam Milford ketch
W02686	08/08/1869	*Gazelle*	Arklow Bank	Whitehaven schooner *en route* Newport to Dublin with coal.
W02687	29/12/1807	*Generous Friends*	Arklow Bank	*en route* Liverpool to Waterford
W02688	06/06/1915	*Gertrude*	Arklow Lightship, off	353-ton steel Liverpool steamship, 43.28 m long, 7.64 m wide, 32 m deep, *en route* from Ellesmere Port to Waterford, coal.
W02689	02/09/1858	*Harriet Francis*	Arklow Bank	450-ton USA ship *en route* Liverpool to Baltimore
W02690	15/09/1869	*Hellenis*	Arklow Bank	603-ton Dublin steamship, clipper screw steamer. Built 1861 by Richardson, Duck & Co Ltd, Stockton on Tees. Owned by Anglo-Ionian Steam Navigation Company. Believed to have run aground and wrecked. WSW/WNW winds.
W02691	07/03/1821	*Higson*	Mizen Head, sandbanks off	308-ton Liverpool brig *en route* Liverpool to Buenos Aires
W02692	28/02/1894	*Hondeklip*	Arklow Bank	240-ton Swansea brigantine, 106 feet long, 24.6 wide, 14.5 deep.
W02693	18/01/1856	*Horizon*	Arklow Bank?	*en route* Liverpool to New Orleans
W02694	09/01/1849	*Integrity*	Arklow Bank	66-ton Portmadog vessel *en route* Hartlepool to Dublin
W02695	28/07/1864	*Jane*	Arklow Bank	*en route* Liverpool to Waterford, sank off the bank
W02696	12/07/1939	*Java*	Arklow Bank, inside	French crabber, grounded
W02697	29/01/1799	*Jemine/Gemini*	Arklow Bank	234-ton Sunderland brig, carrying three 3-pounder carraige-mounted guns, Opporto to Dublin
W02698	01/10/1837	*Jessie*	Arklow Bank	*en route* from Wick to Cork

Reference	Date of Loss	Vessel Name	Place of Loss	Description
W02699	17/12/1855	*John*	Arklow Bank	Troon brigantine *en route* from Llanelli to Drogheda
W02700	19/02/1931	*Julia*	Arklow Bank	184-ton three-masted wooden schooner, 106.5 feet long, 25.5 wide, 12.4 deep, *en route* from Glasgow to Newhaven, cargo of iron
W02701	1862	*Kate*	Arklow Bank	wrecked, 1862
W02702	18/01/1840	*Kilvington*	Arklow Bank	Schooner *en route* Liverpool to Wexford
W02703	01/09/1882	*Lake Nepigon*	North Arklow Bank	Steamer *en route* Liverpool to Queenstown to Montreal
W02704	23/03/1849	*Laurel*	Arklow Bank	Wrecked, cargo of coal
W02705	30/07/1864	*Lauriston*	Arklow Bank	131-ton brigantine *en route* Cardiff to Dublin, cargo of coal
W02706	24/03/1822	*Linen/Linen Hall*	Arklow Bank	80-ton Bristol schooner *en route* Dublin to London. Cargo included 23,000 guineas
W02707	01/03/1859	*Louisa/Louise*	Arklow Bank	*en route* from Liverpool to Mediterranean, cargo of iron and coal
W02708	03/10/1817	*Maria*	Arklow Bank	*en route* Chester to Pictou
W02709	16/04/1875	*Maria & Elizabeth*	Arklow Bank, near South Lightship, off Tara Hill	65-ton Newry wooden schooner, sank in 16 fathoms
W02710	05/02/1851	*Maria Terpithea*	Arklow Bank	358-ton Greek brig, *en route* Liverpool to Alexandria
W02711	31/07/1826	*Martha*	Arklow Bank	*en route* Whitehaven to Cardiff
W02712	03/02/1875	*Minnie*	Arklow Bank	49-tone Dublin wooden schooner, NE wind
W02713	12/08/1834	*Nandi/Naudi*	Arklow Bank	315-ton *en route* Liverpool to Rio de Janeiro
W02714	09/05/1858	*Nandi*	Arklow Bank	wrecked
W02715	14/12/1825	*Neptune*	Arklow Bank	*en route* from St Ubes
W02716	26/05/1811	*New Union*	Arklow Bank	80-ton wooden sloop *en route* Cardiff to Dublin
W02717	15/06/1809	*Olive Branch*	Arklow Bank	*en route* Quebec to Dublin
W02718	01/06/1834	*Opheffing/Oppeffnung*	Arklow Bank	*en route* Liverpool to Rotterdam
W02719	02/02/1861	*Parton*	Arklow? (Carlow) Bank	*en route* Whitehaven to Swansea, cargo of ore
W02720	29/03/1880	*Pater*	Arklow Bank and Wicklow Roads	587-ton wooden barque, *en route* Liverpool to New York, SW wind
W02722	10/04/1833	*President*	Arklow Bank	*en route* Alicante to Londonderry
W02723	25/09/1772	*Princess/Prince of Wales*	Arklow Bank	*en route* Baltimore to Dublin
W02724	02/02/1873	*Queen*	Arklow Lightship, off	102-ton wooden brig *en route* Liverpool to Newport, 188 tonnes of burnt copper ore

Reference	Date of Loss	Vessel Name	Place of Loss	Description
W02725	06/06/1856	*Racer*	Arklow Bank	1,669-tonne vessel, ESE wind
W02726	27/04/1897	*Reaper*	Arklow Bank, N of Jack's Hole	40-ton wooden ketch *en route* Port Dinorwic to Cork, cargo of slates
W02727	16/05/1891	*Ribble*	Arklow Lightshp, .25 mile off	100-ton iron steamship *en route* Swansea to Newry
W02729	28/12/1921	*Sannox*	Arklow Bank 4 Miles S of North Arklow Lightship	154-tone wooden brigantine 90.6 feet long, 22.5 wide, 12.4 deep
W02730	15/02/1818	*Sarah*	Arklow Bank	*en route* Liverpool to Boston
W02731	03/01/1843	*Sarah*	Arklow Bank	72-ton schooner
W02732	15/11/1862	*Sarah*	Arklow Bank	cargo of pig iron
W02733	31/12/1885	*Scotia Queen*	Arklow Bank	423-tone barque, 130 feet long
W02734	24/09/1822	*Selina*	Arklow Bank	*en route* Newport to Liverpool, cargo of iron sheets
W02735	02/04/1776	*Shaw*	Arklow Bank	*en route* Rotterdam to Newry
W02736	05/11/1855	*Sophia*	Arklow Bank	Brigantine, *en route* Cardiff to Dublin, cargo of coal
W02738	08/04/1875	*Statesman*	Arklow Bank, N end	Belfast barque
W02739	17/12/1822	*Success*	Arklow Bank, Kilmichael	Stranded
W02740	09/10/1853	*Syren*	Arklow Bank	80/104-ton Dublin brigantine, *en route* from Pembry to Dublin, cargo of coal
W02741	18/12/1853	*Temened*	Arklow Bank, opposite Arklow Head	Liverpool barque
W02742	25/12/1865	*Tenasserin*	Arklow Bank	1,002-ton ship, 195 feet long, 35 wide, 23 deep, *en route* Liverpool to Calcutta
W02743	14/12/1798	*Thetis*	Arklow Bank	87-ton Saltcoats sloop, *en route* London to Dublin
W02744	18/11/1806	*Thomas*	Arklow Bank	318-ton Sunderland ship with six 4-pounder cannon
W02745	24/10/1873	*Times*	Arklow Bank	Newport/Bristol smack, *en route* Wicklow to Rotterdam
W02746	19/08/1915	*U-27*	Arklow Bank	German Uboat
W02747	17/05/1773	*Unity*	Arklow Bank, off	*en route* Rotterdam to Dublin
W02748	05/09/1904	*Viola*	Arklow Bank, 2 miles off North Arklow Lightship	182-ton wooden barquentine, *en route* Glasgow to Cherbourg, cargo of coal
W02749	24/02/1784	*Wasp*	Arklow Bank, off	Dublin sloop, *en route* Wexford to Dublin
W02750	24/12/1838	*Watson*	Arklow Bank	*en route* Whitehaven to Cardiff

Reference	Date of Loss	Vessel Name	Place of Loss	Description
W02751	17/10/1838	*Wave*	Arklow Bank, off	*en route* London to Liverpool
W02752	29/10/1832	*William Appleton*	Arklow Bank	*en route* Liverpool to Jamaica
W02753	24/11/1833	*Young Messenger*	Arklow Bank	*en route* to Dublin
W02754	01/10/1772	Unknown	Arklow Bank	*en route* Baltimore to Dublin, SSW gale
W02755	07/02/1776	Unknown	Arklow Bank	*en route* Bordeaux to Belfast
W02756	26/11/1786	Unknown	Arklow Bank, off	Vessel sank, crew drowned
W02757	11/11/1819	Unknown	Arklow Bank	Brig
W02758	16/06/1826	Unknown	Arklow Bank, off	80-ton schooner
W02759	17/12/1833	Unknown	Arklow Bank, near	Brig *en route* Derry to Bristol
W02761	17/11/1852	Unknown	Arklow Bank	Schooner
W02762	08/02/1853	Unknown	Arklow Bank	Brig *en route* Liverpool to Constantinople
W02763	01/12/1857	Unknown	Arklow Bank?	Copper fastened and hulled wreckage ashore in Wexford
W02764	17/02/1860	Unknown	Arklow Bank, outside	100-120-ton schooner, in 4 fathoms
W02765	02/02/1861	Unknown	Arklow Bank	Brig
W02766	12/02/1861	Unknown	Arklow Bank	Steamer
W02768	04/08/1871	Unknown	Arklow Bank	Brigantine
W02769	04/10/1872	Unknown	Arklow Bank, N end	Smack
W02770	25/04/1878	Unknown	North Arklow Bank	Large vessel
W02771	14/11/1895	Unknown	Arklow Bank, S end	Full-rigged ship
W02772	05/09/1904	Unknown	Arklow Bank, 2 miles S of North Arklow Lightship	Schooner/brigantine
W02773	21/09/1917	Unknown	Arklow Bank	Submarine may have foundered

Annex 2: Known shipwreck events on Arklow Bank and adjacent waters

Source: Brady, *Shipwreck inventory of Ireland*; Wreck Viewer, https://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=89e50518e5f4437abfa6284ff39fd640

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W02373	26/06/1883	199000	5864888	52.89679	-6.04142	SS *Kestrel*	Brittas Bay	55-ton iron steamship *en route* Hamburg to Dublin, SSW force 5.
W02432	unknown	698576	5863867	52.88778	-6.04833	*Venturer*	Brittas Bay	UKHO 010400904, schooner, fishing vessel
W02647	unknown	297514	5856582	52.82167	-6.00492	Unknown	Arklow Bay	Possible wreck, 16 m long, 4.9 m wide, 0.8 m high, in 15-16 m of water.
W02648	unknown	294672	5855713	52.812213	-6.04821	Unknown	Arklow Bay	Possible wreck, 11 m long 0.4 m wide, 0.4 m high, in 15-16 m of water
W02649	unknown	292399	5854609	52.80126	-6.07969	Unknown		Possible wreck, SSS target rectangular in shape, 8 m long by 4.7 m wide, it lies in 12-14 m of water
W02650	unknown	291160	5854208	52.79720	-6.09778	Unknown	Arklow Bay	Possible wreck, the 2003 survey recorded a series of SSS targets spread over a 200 m² area. The 2019 survey recorded boulders here but nothing distinctly indicative of a shipwreck. The water depth at the site is in the order of 12-16 m.
W02658	25/01/1865	301286	5857808	52 50 00N	05 57 00W	*Armenian*	Arklow Bank	UKHO919591484. 763 ton Royal Mail steam barque of London, 239 ft long, 29 ft wide 20 ft deep. *En route* from Liverpool to Madeira to Tenerife to West Coast of Africa. Struck bank, caught fire, sank. Arklow Lightship involved in the rescue but capsized, 4 dea
W02690	15/09/1869	300450	5850432	52 46 00.50N	05 57 28.40W	SS *Hellenis*	Arklow Bank	While the HSI does not present a location for W02690, INFOMAR claims their site GSI 403 is the wreck of the *Hellenis* (W02690). Correlates with 2019 survey LA_0390. See Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W02737	28/03/1917	300236	5839999	52 40 23N	05 57 17W	South Arklow Light Vessel, *Guillemot*	Arklow, 10 miles SE by S	UKHO 010501289, steel frame, 96 feet long, 22.66 wide, 11.75 deep. Boarded by Uboat UC65 and sunk. Lies in 50 m of water
W02774	unknown	302484	5859615	52 51 00	05 56 00W	Unknown	Arklow Bank	UKHO 010501514, schooner
W02775	unknown	300997	5853014	52 47 24.654N	05 57 04.922W	Unknown	Arklow Bank	UKHO 010501514, schooner. 44 m long, 16.5 m wide, 1.5 m high, in 10-12 m of water. The stern is either missing or is buried in sand. Constructed of wood with copper-sheathed hull. Scour hole extends for 200 m to the NNE
W02776	unknown	300775	5852999	52 47 23.887N	05 57 16.701W	Unknown	Arklow Bank	Possible wreck, 2 m high mound in 18 m of water, with possible debris extending 22 m long, 8.5 m wide. Scour hole extends 59 m to NNE in
W02777	unknown	301024	5852907	52 47 21.261N	05 57 3.266W	Unknown	Arklow Bank	Possible wreck, 0.5 m high mound in 10-12 m of water, with possible debris extending 7.3 m long, 5.4 m wide. Scour hole extends 25 m to NNE
W02778	unknown	300683	5851621	52 46 39.247N	05 57 18.581W	Unknown	Arklow Bank	Possible wreck, four mounds over an area 20.7 m by 4.6 m, in 11-1 m of water. The mounds vary in height from 0.18 m to 2 m. Scour hole extends for 20 m from the mounds
W02779	unknown	301427	5851389	52 46 32.730N	05 56 38.440W	Unknown	Arklow Bank	Possible wreck, in 4-6 m of water, 5.1 m long, 3.3 m wide
W02780	unknown	301782	5853481	52 47 40.816N	05 57 24.108W	Unknown	Arklow Bank	Possible wreck, comprising two sub-parallel linears extending 14.5 m from a common point, in 18-20 m of water
W02781	unknown	300952	5854652	52 48 17.549N	05 57 10.925W	Unknown	Arklow Bank	Wooden wreck, in 10 m of water. Average beam measures 200 m wide and deep. Some strakes at 1.3 m long.
W02782	unknown	300425	5855377	52 48 40.3N	05 57 40.6W	Unknown	Arklow Bank	Possible metal wreck in 32 m of water
W02783	unknown	300975	5854761	52 48 21.1N	05 57 9.90W	Unknown	Arklow Bank	Wreck in 15 m of water, 19.5 m long by 6 m wide, orientated NW-SE. Correlates with 2019 Survey LA_1033 m which recorded a wreck 13 m NW of the charted location. See Annex 4: Catalogue of shipwreck sites and sites

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
								of potential wreckage on Arklow Bank and in adjacent waters.
W02784	unknown	302782	5860428	52 51 26.64N	05 55 45.84W	Unknown	Arklow Bank	Possible wreck, SSS target 7.7 m by 7.5 m
W02785	unknown	303806	5864039	52 53 24.72N	05 54 59.04W	Unknown	Arklow Bank	Possible wreck, three SSS targets 21 m by 12 m
W02786	unknown	303861	5864572	52 53 42N	05 54 57.24W	Unknown	Arklow Bank	Possible wreck, four regularly spaced backscatter targets and a probably man-made object, 4.5 m by 4.5 m
W02787	unknown	302454	5860151	52 51 17.28N	05 56 2.76W	Unknown	Arklow Bank	Possible wreck, SSS target, linear anomaly among sand ripples, 20.7 m by 0.5 m
W02788	unknown	302221	5859559	52 50 57.84N	05 56 13.92W	Unknown	Arklow Bank	Possible wreck, backscatter linears, acoustic shadow, scour mark and magnetic signature. 23 m by 8.5 m. Correlates with 2019 Survey LA_1605, which recorded a wreck 70 m NW. See Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
W02789	unknown	303368	5863378	52 53 2.76N	05 55 21W	Unknown	Arklow Bank	Possible wreck, comprising high back scatter anomaly among sand ripples. 11.7 m by 4.6 m
W02790	unknown	302446	5860764	52 51 37.08N	05 56 4.56W	Unknown	Arklow Bank	Possible wreck, SSS target, 8 m by 5.8 m. Correlates with 2019 Survey LA_1735, 78 m to NW; see Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
W02791	unknown	302356	5860723	52 51 35.64N	05 569.24W	Unknown	Arklow Bank	Possible wreck, SSS target, acoustic shadows and seabed scouring. Correlates with 2019 Survey LA_1725 70 m to NW; see Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
W02792	unknown	303012	5865887	52 54 23.4N	05 55 45.48W	Unknown	Arklow Bank	Possible wreck, SSS target, 3.3 m by 2.7 m
W02793	unknown	303051	5865841	52 54 21.96N	05 55 43.32W	Unknown	Arklow Bank	Possible wreck, SSS target, 5.1 m by 2.8 m
W02794	unknown	303151	5865837	52 54 21.96N	05 55 37.92W	Unknown	Arklow Bank	Possible wreck, SSS target, 13.4 m by 2.4 m
W02795	unknown	303247	5865710	52 54 18N	05 55 32.52W	Unknown	Arklow Bank	Possible wreck, SSS target, 3.4 m by 1 m

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W02796	unknown	303037	5865663	52 54 16.2N	05 55 43.68W	Unknown	Arklow Bank	Possible wreck, SSS target, 5.8 m by 2.6 m
W02797	unknown	302965	5863583	52 53 8.88N	05 55 42.96W	Unknown	Arklow Bank	Possible wreck, SSS target, debris over 14 m by 6 m area
W02798	unknown	302452	5861744	52 52 8.76N	05 56 6.36W	Unknown	Arklow Bank	Possible wreck, SSS target, 12.8 m by 4.9 m. Correlates with 2019 Survey LA_1773, 78 m NW; see Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
W02799	unknown	302116	5861112	52 51 47.88N	05 56 22.92W	Unknown	Arklow Bank	Possible wreck, SSS target, 13.5 m by 2.3 m
W02800	unknown	303111	5864357	52 53 34.08N	05 55 36.84W	Unknown	Arklow Bank	Possible wreck, SSS target, vessel shaped, 22.6 m by 3.8 m
W02801	unknown	304123	5864216	52 53 30.84N	05 54 42.48W	Unknown	Arklow Bank	Possible wreck, SSS target, 14.9 m by 6.2 m
W02802	unknown	302613	5859410	52 50 53.52N	05 55 52.68W	Unknown	Arklow Bank	Possible wreck, SSS target, 11.2 m by 4.2 m
W09512	10/09/1950	300408	5850140	52.95833	-5.95833	MV *Cameo*	Arklow Bank	UKHO. The HSI presents a location based on the UKHO coordinate. The location lies outside the area surveyed by SSS and magnetometer in 20219, and the multibeam data set did not show any irregularity on the seabed surface. However, INFOMAR claims their site GSI 405 is the wreck of the *Cameo* (W09512), located some 370 m N. Correlates with 2019 survey LA_0428. See Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
W09566	unknown	2899099	585553	52.80833	-6.12917	*Corona*	Unknown	UKHO
W10325	unknown	307756	5853129	52.79367	-5.85133	Unknown	Arklow Bank, approximately 5 km east of	Wreck surveyed by the *Celtic Voyager* in 2012 as part of the INFOMAR seabed mapping programme. Wreck measures 51 m long, 6.3 m in maximum width and lies in 58 m of water. GSI Wreck No_316.
W10326	unknown	305990	5855386	52.8133	-5.87883	Unknown	Arklow Bank, approximately 3.5 km east	Wreck surveyed by the *Celtic Voyager* in 2012 as part of the INFOMAR seabed mapping programme. Wreck measures 68 m long, 9.6 m in maximum width and lies in 34 m of water. GSI Wreck No_315.

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W10331	unknown	303177	5864318	52.89247	-5.9259	Unknown	Arklow Bank	UKHO
W11021	unknown	288744	5855146	52.80467	-6.13417	Unknown	Arklow Port, 1.3 km north	UKHO
W11475	unknown	288198	5853863	52.79305	-6.14167	Unknown	Arklow Port	UKHO
W11721	Unknown	292189	5859792	52.84819	-6.08611	Unknown	Ennereilly Strand, Sallymount	Unknown
W17904	unknown	2965504	5853980	52.7972	-6.01783	Unknown	Arklow, Wicklow. 8.1 km east of	Wreck surveyed by the *Celtic Voyager* in 2011 as part of the INFOMAR seabed mapping programme. Wreck measures 26 m long, 10 m in maximum width and lies in 27 m of water. GSI Wreck No_297.
W18524	unknown	297533	5856643	52.82167	-6.00492	Unknown	Arklow Bay, Co Wicklow, just N of the Seven Fathoms Bank, 52 49 18.019N, 006 00 17.716W	Possible wreck, SSS target in 15-16 m of water. 80 from W02647.
W18526	22/01/1958	300926	5846368	52.735316	-5.949641	*Anna Toop*	Arklow Bank, west side. Approximately 13 km east of Kilmichael Point.	*SS Anna Toop* was a 478 ton British Cargo Steamer built in 1893 at Troon, Scotland. She struck South Arklow Bank whilst *en route* from Port Talbot for Derry carrying a cargo of steel plates. She managed to get off the sandbank on the 22/01 but filled with water and sank the next day. The vessel measures in at 49 m in length, 7 m in width and 3 m height. c/o Roy Stokes. Correlates with 2019 Survey LA_3638; see Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters.
GSI 467	unknown	300041	5849442	52.757778	-5.963333	Unknown		Recorded by INFOMAR during cruise GEO16_03 as a metal wreck measuring 67 m, 12 m wide, at a depth of 15 m. The wreck site is not yet absorbed into the Historic Shipwreck Inventory.

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
								It lay outside the area surveyed by SSS and magnetometry in 2019.

Annex 3: Known shipwreck events within one tidal cycle of Arklow Bank and adjacent waters

The known wreck sites in this annex are arranged from north to south as they are positioned offshore.

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W02367	17/12/1925	299533	5885635	53.08333N	-5.99167W	John Morrison	Wicklow Head, 7 miles N	202-ton steam barquentine, *en route* from Waterford to Liverpool with cargo of pit props and timber. 1,056 ft long, 25 ft wide, 12.4 ft deep. UKHO 009100076. In 10 fathoms of water.
W02313	10/01/1804	295792	5879891	53.02973N	-6.04506W	Aid	Killoughter Strand	149-ton brig built in Quebec in 1802, classed A1 by Lloyd's. Owned by Beatson & Company, master was William Cranetch/Crantick/Cranick. En route from Leghorn to Dublin via Bristol, laden with a valuable cargo of Roman, Greek and Egyptian antiquities.
W09652	Unknown	298769	5878083	53.01400N	-6.000000W	Unknown	Wicklow, 4.3 km NNE	INFOMAR GSI 267.
W11326	Unknown	296399	5874727	52.98065N	-6.03457W	Unknown	Mouth of River Leitrim, Wicklow town	Unknown.
W10651	Unknown	296278	5874423	52.98333N	-6.03333W	Unknown	Unknown	UKHO record.
W02834	Unknown	308368	5869350	52.93972N	-5.85222W	Howe	North Arklow Light Vessel, 4 miles NE	UKHO record.
W11140	Unknown	300075	5870322	52.94500N	-5.97500W	Unknown	Wicklow Head, 2.7 km SE of	Unknown.
W10095	09/10/1933	299164	5869289	52.93569N	-5.98833W	Thorn	Unknown	UKHO record.
W02397	27/07/1932	296794	5867193	52.91583N	-6.02222W	Pacific	Wolf Rock, near South side, Ardmore Point	UKHO 010400916.
W18387	Unknown	299646	5836620	52.64330N	-5.96133W	Unknown	Courtown, 17.8km E	INFOMAR survey 2012, GSI 320.
W04529	Unknown	293399	5831220	52.59167N	-6.05000W	Unknown	Wexford	UKHO record 1996.

Reference	Date of Loss	UTM_E	UTM_N	Latitude	Longitude	Vessel Name	Place of Loss	Description
W11447	Unknown	293399	5830797	52.5882N	-6.005025W	Unknown	Off Cahore Point	37.5 m long, 11 m maximum width, lying in 28 m depth of water. INFOMAR survey 2005, GSI 157
W02871	28/03/1917	297370	5828150	52.56667N	-5.99000W	Wychwood	South Arklow Light Vessel, 4 miles SSW of	1,985-ton, 10-year-old steel steamship of London. Measured L. 85.11 m by B. 12.24 m by D. 5.51 m. Built by Osbourne, Graham & Co. Ltd. in Sunderland. Owned by Fenwick & Co. Ltd., France, master was G.D. Fowle. Torpedoed without warning by German submarine.
W09609	Unknown	286571	5828785	52.56667N	-6.15000W	El Alemain	Unknown	UKHO record.
W17798	Unknown	290011	5820580	52.49550N	-6.09317W	Unknown	Cahore Point, 9.9 km SE	INFOMAR survey 2012, GSI 325.

Annex 4: Catalogue of shipwreck sites and sites of potential wreckage on Arklow Bank and in adjacent waters

The catalogue is based on the information collated from the Shipwreck Inventory of Ireland, INFOMAR, the 2019 marine geophysical survey conducted by Ultrabeam and Alpha Marine for SSE, and the 2022 marine geophysical survey of the Cable Corridor and Working Area conducted by Green Rebel for SSE.

The locations of the wreck sites are indicated on Figure 18.1.5 to Figure 18.1.13.

The depth profile is that employed in the 2019 survey to indicate depth variations in the georeferenced multibeam tiles as used for the Array Area.

Key/Legend

- Historic Shipwreck Inventory Wreck
- 2019 Survey Wreck
- ADCO wreck
- UHC19004_LA_UTM30N_MAG_ANOMALY_REV01
- Debris
- UXO_possible
- Boulder
- Mound
- Fishing Gear
- Cable
- Side-scan sonar trackline
- Magnetometer trackline

Depth m LAT

8.1 Shipwreck Inventory of Ireland, known shipwreck

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02373	295415	5865095	52.89679	-6.04142	n/a	50 m radius from centrepoint

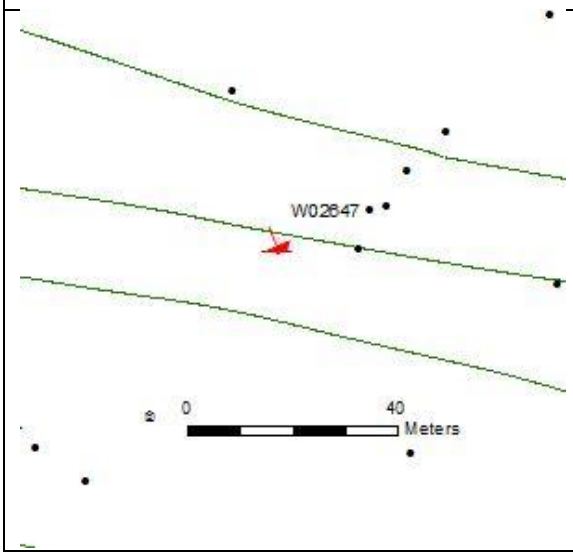
Description and comment	Length	Width	Height
Kestrel (SS), 55-ton iron steamship *en route* Hamburg to Dublin, SSW force 5. 4.8 km N of survey area.	n/a	n/a	n/a

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02432	294913	5864142	52.88778	-6.04833	n/a	50 m radius from centrepoint

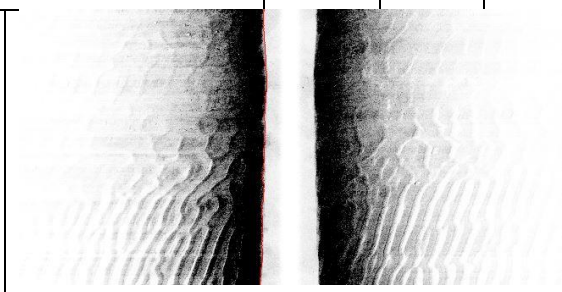
Description and comment	Length	Width	Height
Venturer, UKHO 010400904, schooner, fishing vessel. 4.1 km N of survey area.	n/a	n/a	n/a

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02647	unknown	297538	5856562	52.82167	R2B205.002	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible wreck in 15-16 m of water. No anomaly is indicated at the charted location in the 2019 data set.	16.0	4.9	



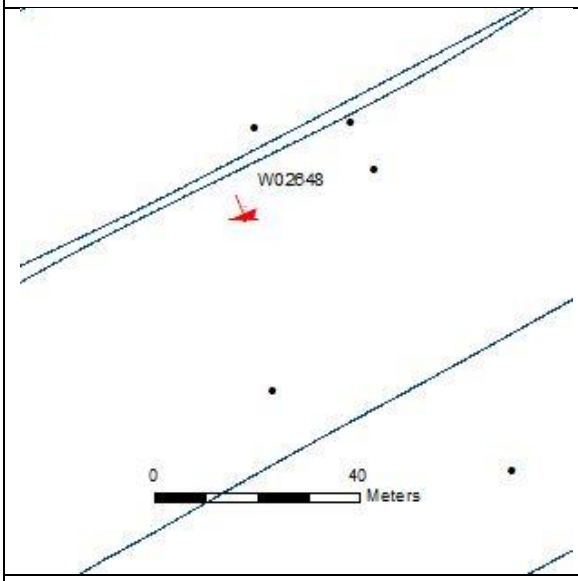
2019 survey summary of seabed at charted location



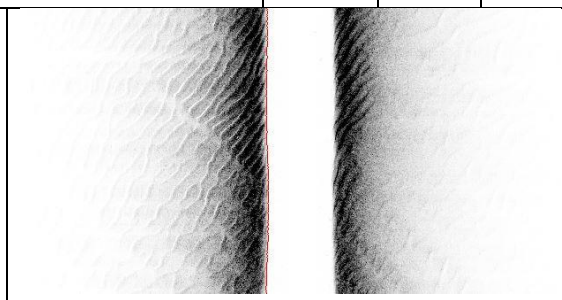
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02648	294672	5855713	52.812213	-6.04821	R3B407; R£B407_A	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible wreck in 15-16 m of water. No anomaly is indicated at the charted location in the 2019 data set.	11	0.4	



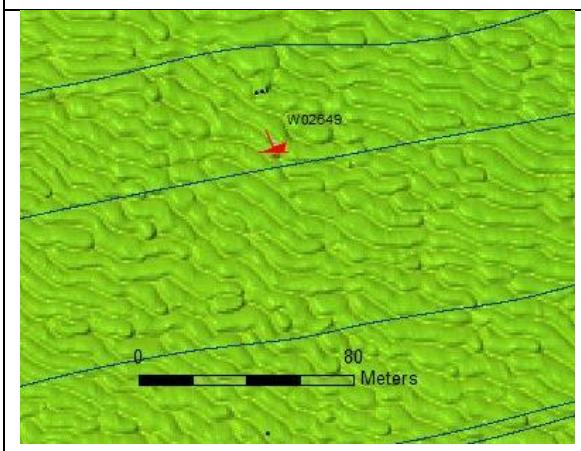
2019 survey summary of seabed at charted location



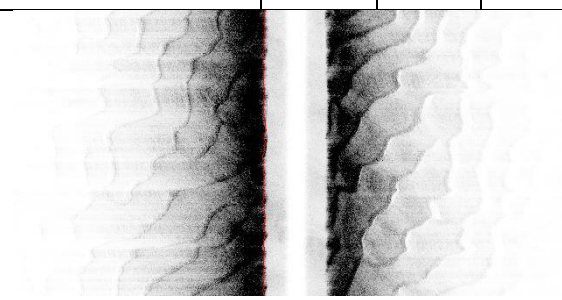
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02649	696858	5854160	52.80126	-6.07969	R3B506	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible wreck, SSS target rectangular in shape, lies in 12-14 m of water. No anomaly is indicated at the charted location in the 2019 data set.	8.0	4.7	



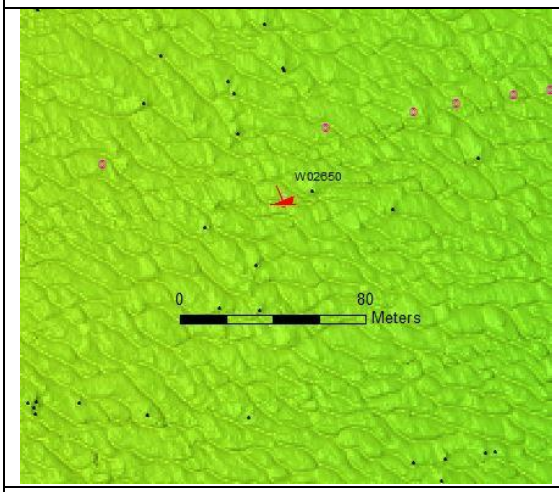
2019 survey summary of seabed at charted location



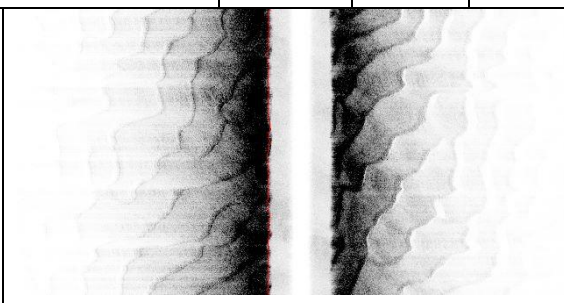
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02650	291160	5854208	52.79720	-6.09778	R3B503.001	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible wreck, SSS targets spread over a 200 m² area. They lie in approximately 12-16 m of water. Series of small-scale boulders only recorded in charted location in the 2019 data set.	n/a	n/a	n/a



2019 survey summary of seabed at charted location



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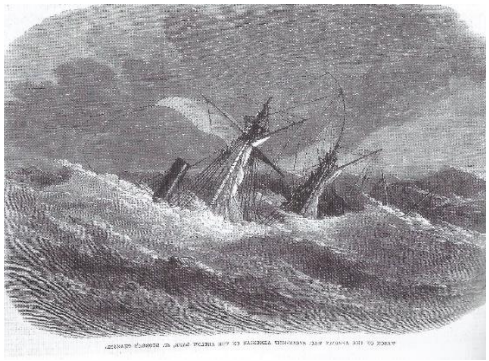
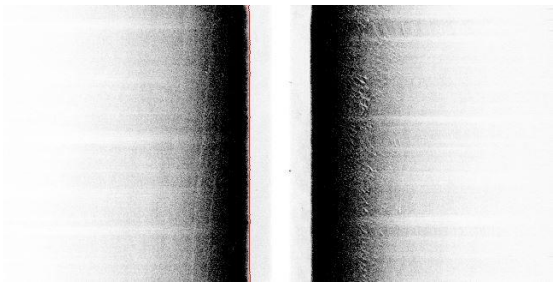
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02658	301286	5857808	52 50 00N	05 57 00W	LA_W_010A.001; L0056_LA_W_010a_0004	100 m from centrepoint

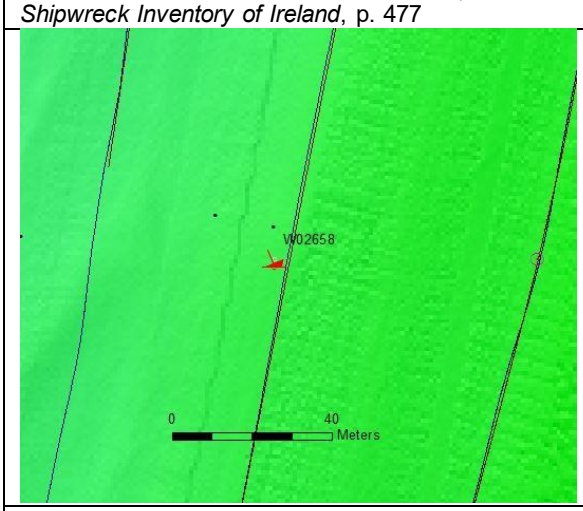
Description and comment	Length	Width	Height
Armenian. UKHO919591484, 763-ton Royal Mail steam barque of London, 239 ft long, 29 ft wide 20 ft deep. *En route* from Liverpool to Madeira to Tenerife to West Coast of Africa. Struck bank, caught fire, sank. No anomaly is indicated at the charted location in the 2019 data set. A boulder (Target 1450) is located 9 m N, and boulder 1451 is 20 m NW. A magnetometer trackline ran 3.8 m to the east and did not register any anomaly, while a magnetometer trackline 67 m to the east registered an anomaly (Target MAG LA 0060). No anomaly was detected at the location in 2022. The 2022 survey recorded a boulder 185 m to the NW, which was also recorded in 2019.	72.8	8.83	6



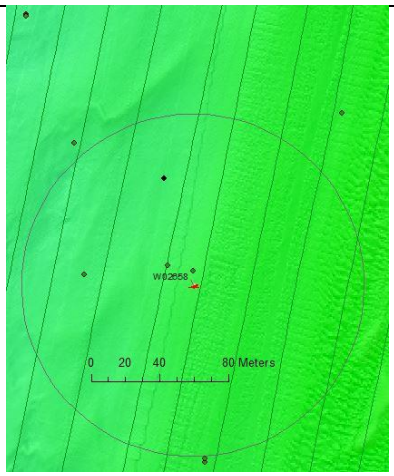
The wrecking of the Armenian *as recorded in the* Illustrated London News. Source: K. Brady, *Shipwreck Inventory of Ireland*, p. 477



2019 SSS trace of the seabed at the charted location



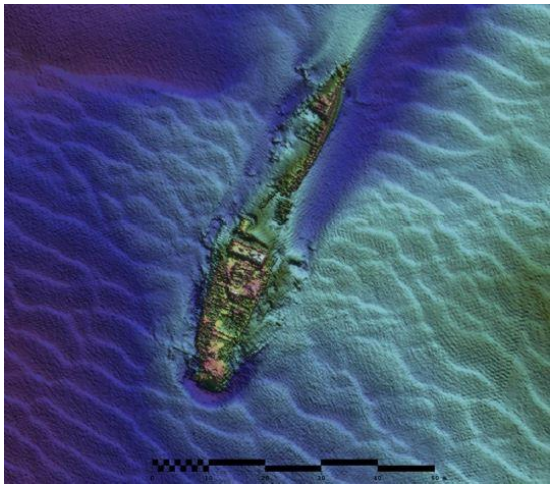
2019 survey summary of seabed at charted location



2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines, and 2022 targets (in red) and 2019 targets (green and black)

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02690; GSI 403	300450	5850432	52 46 00.50N	05 57 28.40W	LA_W_022_Ext.002	100 m from centrepoint

Description and comment	Length	Width	Height
Recorded by INFOMAR who suggested this could be the steam ship *Hellenis* (W02690), a clipper screw steamer That was built in 1861 by Richardson, Duck & Co Ltd, Stockton on Tees and owned by Anglo-Ionian Steam Navigation Company, and was believed to have run aground and wrecked. However, Karl Brady of the UAU (*pers. comm.*) does not feel this is the *Hellenis* but rather a casualty of one the World Wars. No anomaly is indicated at the charted location in the 2019 data set but this location is within 50 m of LA_0390 and is judged to be the same site.	72.8	8.83	6



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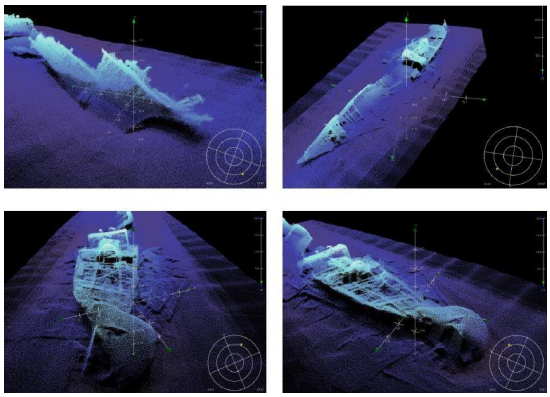

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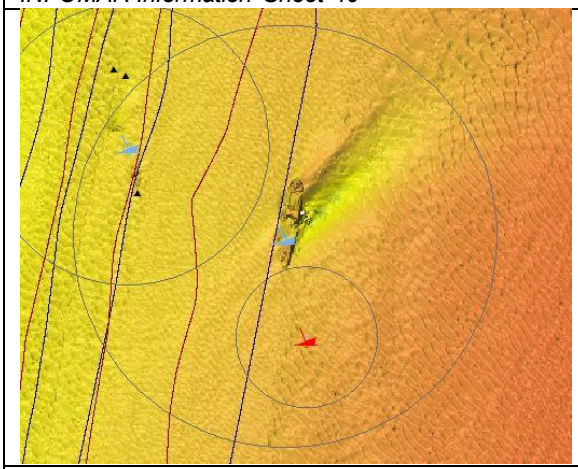


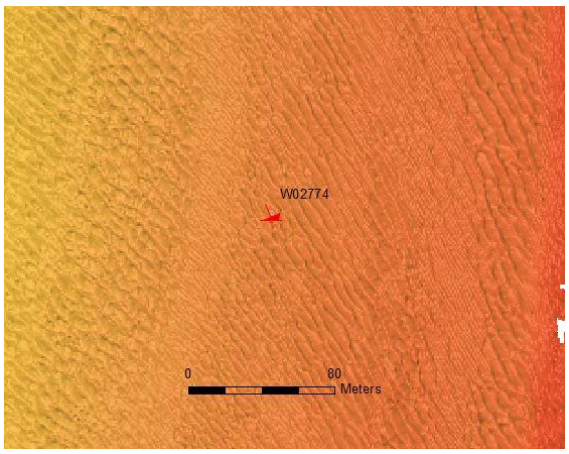
2019 survey summary of seabed at charted location (in red), showing proposed exclusion zones

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02737	300236	5839999	52 40 23N	05 57 17W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
South Arklow Light Vessel, *Guillemot*. UKHO 010501289, steel frame, 96 feet long, 22.66 wide, 11.75 deep. Boarded by Uboat UC65 and sunk. Lies in 50 m of water. 700 m outside and SE of survey area.	20.2	6.9	3.58

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02774	302484	5859615	52 51 00	05 56 00W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown. UKHO 010501514, schooner. 160 m outside survey area, located on central area of Arklow Bank, 160 m E of nearest survey line.	n/a	n/s	n/a

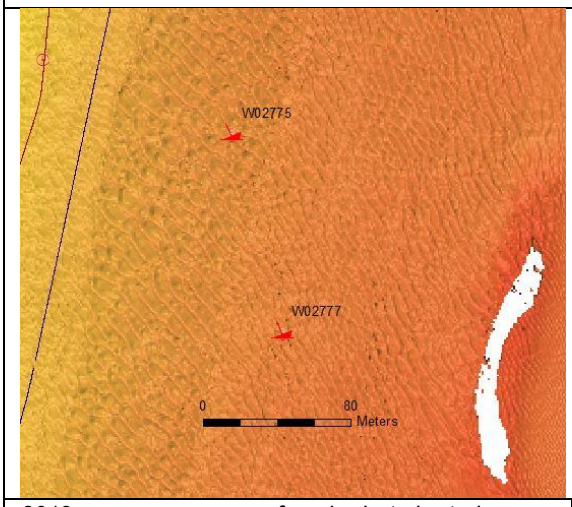


2019 survey summary of seabed at charted location

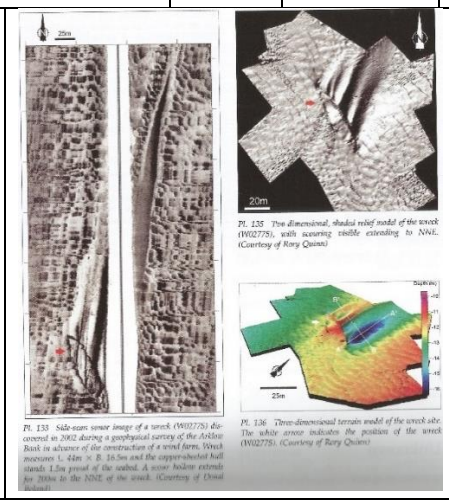
The location lay outside the 2019 survey area.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02775	300997	5853014	52 47 24.654N	05 57 04.922W	n/a	100 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, UKHO 010501514, schooner, in 10-12 m of water. The stern is either missing or is buried in sand. Constructed of wood with copper-sheathed hull. Scour hole. 80 m outside survey area, located on central area of Arklow Bank, 80 m E of nearest survey line.	44	16.5	1.5



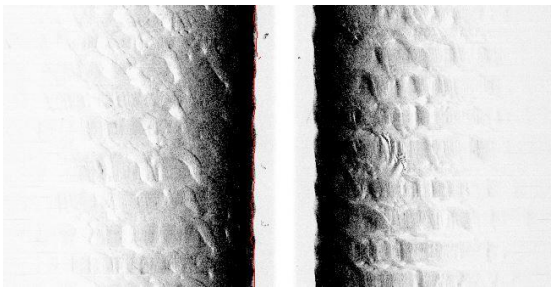
2019 survey summary of seabed at charted location



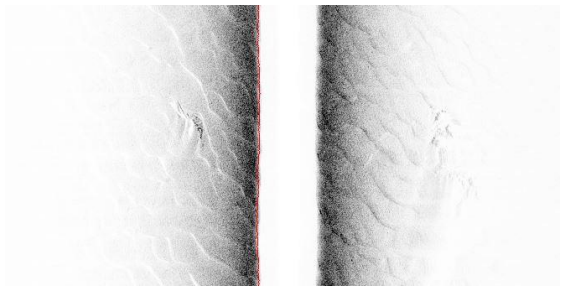
Previous marine geophysical survey records of W02775. Source: K Brady Shipwreck Inventory of Ireland, *p. 492*

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02776	300775	5852999	52 47 23.887N	05 57 16.701W	LA_W_019a.003; LA_W_018A_i4	50 m radius from centrepoint

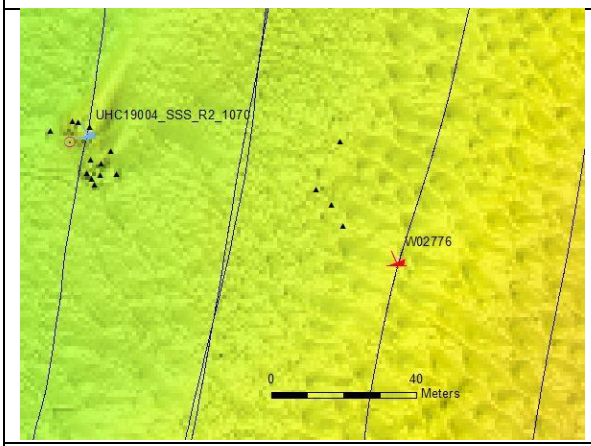
Description and comment	Length	Width	Height
Unknown, Possible wreck, 2 m high mound in 18 m of water, with possible debris extending 22 m long, 8.5 m wide. Scour hole extends 59 m to NNE. No anomaly is indicated at the charted location in the 2019 data set, but debris (targets LA_0654, LA_0656) is recorded 27 m NW, and a wreck site, target LA_1070, was recorded 90 m NW of the charted location of W02776.	n/a	n/a	n/a



2019 sonar trace of seabed at charted location (top of image). Anomaly in lower right is 27 m NW.



2019 sonar trace Line LA_W_018A_i4 showing debris 27 m NW of the charted location on left side, and wreck Target 1070 on right



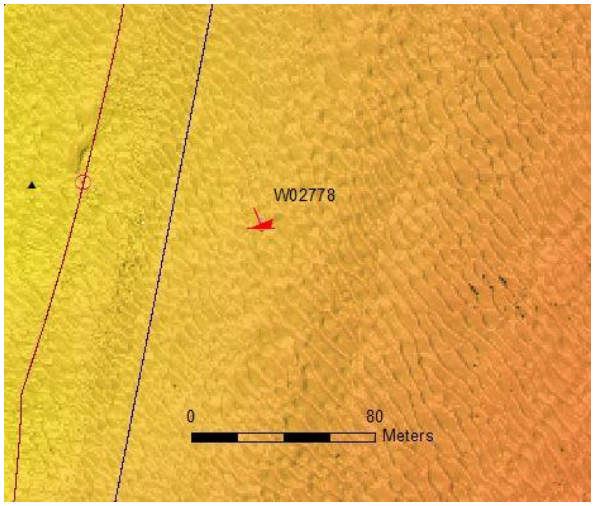
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02777	301024	5852907	52 47 21.261N	05 57 3.266W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, 0.5 m high mound in 10-12 m of water, with possible debris extending 7.3 m long, 5.4 m wide. Scour hole extends 25 m to NNE. 130 m outside survey area, located on central area of Arklow Bank, 130 m E of nearest survey line.	n/a	n/a	n/a

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02778	300683	5851621	52 46 39.247N	05 57 18.581W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, four mounds over an area 20.7 m by 4.6 m, in 11-12 m of water. The mounds vary in height from 0.18 m to 2 m. Scour hole extends for 20 m from the mounds. 40 m outside survey area, located on central area of Arklow Bank, 40 m E of nearest survey line. However, a feature is indicated on the multibeam traces 80 m W, which corresponds with a magnetometer anomaly (MAG_LA_0142), and a boulder was recorded 20 m further W (target LA_0551).	n/a	n/a	n/a

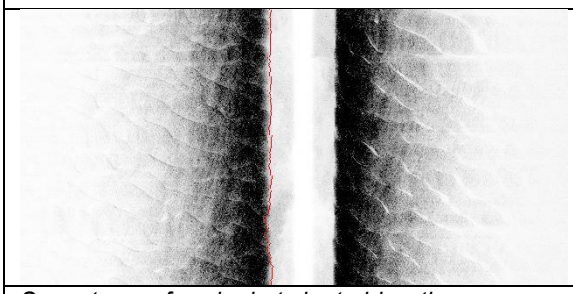


2019 survey summary of seabed at charted location

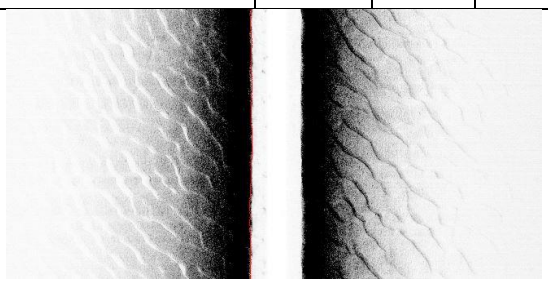
The location lay outside the 2019 survey area.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02779	301427	5851389	52 46 32.730N	05 56 38.440W	LA_E_009.006	50 m radius from centrepoint

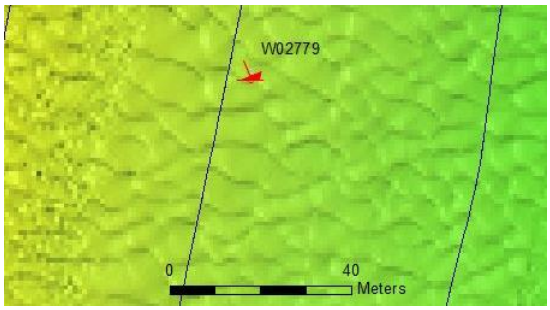
Description and comment	Length	Width	Height
Unknown, Possible wreck, in 4-6 m of water. No anomaly is indicated at the charted location in the 2019 data set.	5.1	3.3	



Sonar trace of seabed at charted location



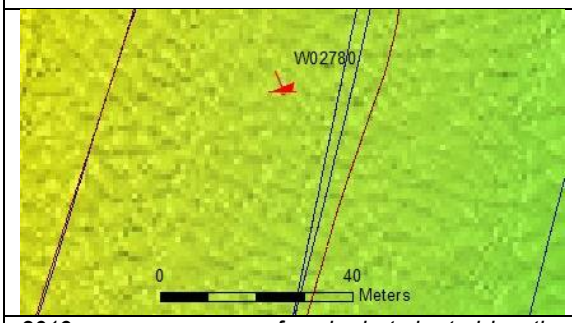
Sonar trace of seabed at charted location from line LA_W_022_Ext.001



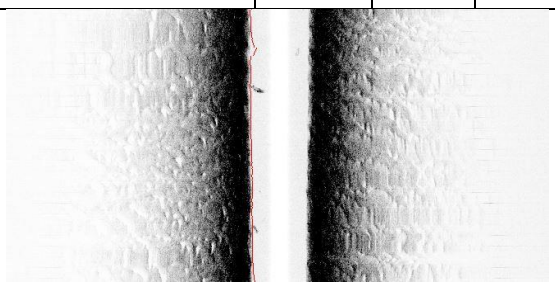
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02780	301782	5853481	52 47 40.816N	05 57 24.108W	LA_E_032.001; LA_E_032A	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, comprising two sub-parallel linears extending 14.5 m from a common point, in 18-20 m of water. No anomaly is indicated at the charted location in the 2019 data set.			



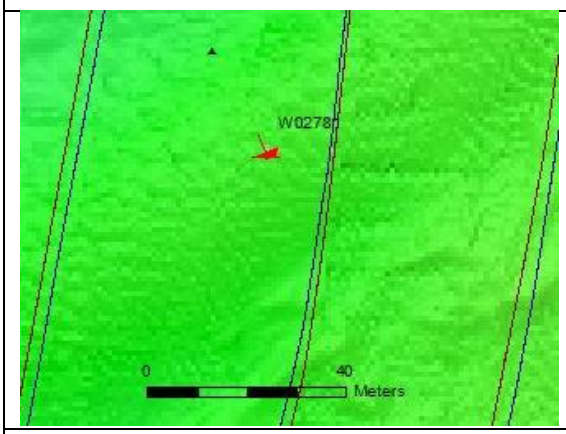
2019 survey summary of seabed at charted location



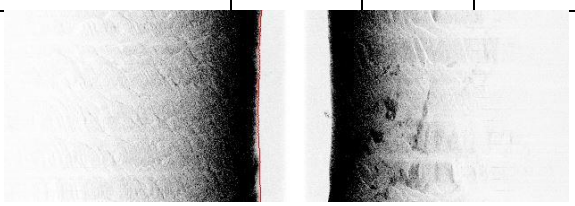
Sonar trace of charted location on line LA_E_032.001

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02781	300952	5854652	52 48 17.549N	05 57 10.925W	LA_W_016.002	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Wooden wreck, in 10 m of water. Average beam measures 200 m wide and deep. Some strakes at 1.3 m long. No anomaly is indicated at the charted location in the 2019 data set. A boulder (target LA_1016) is located 23 m NW.	n/a	n/a	n/a



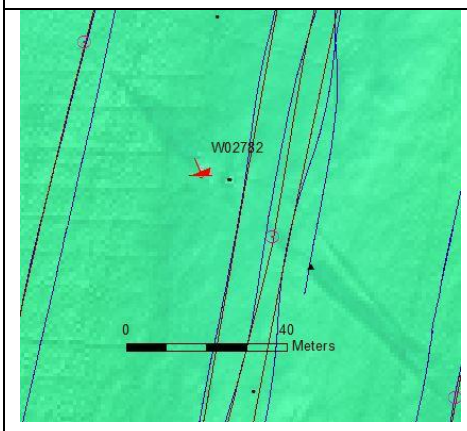
2019 survey summary of seabed at charted location



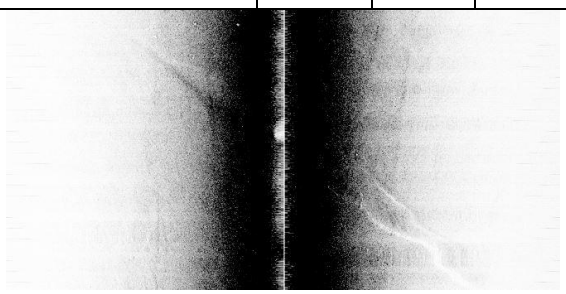
2019 Sonar trace of charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02782	300425	5855377	52 48 40.3N	05 57 40.6W	LA_W_003E.003; R2B310	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible metal wreck in 32 m of water, 'discovered while power cable [was] being laid' for the ABWP 1. No anomaly is indicated at the charted location in the 2019 data set. The charted location is directly overlying/underlying the export cables of the present Windfarm, which are also recorded in the magnetometer data.	n/a	n/a	n/a



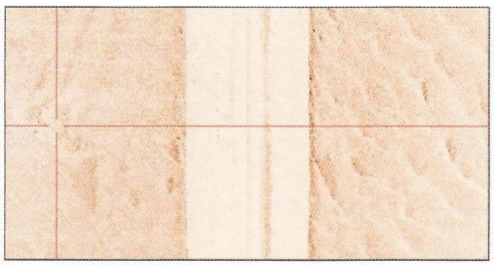
2019 survey summary of seabed at charted location



Sonar trace of charted location. The linear feature crossing the sonar trace are the export cables from the windfarm

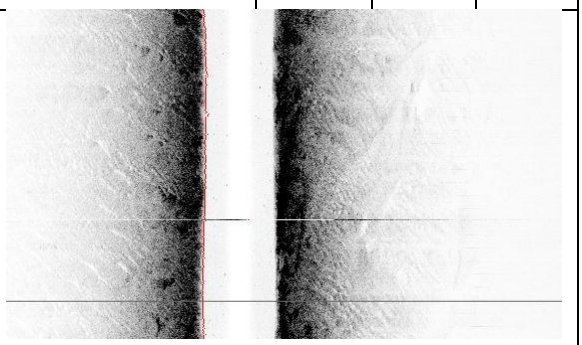
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02783	300975	5854761	52 48 21.1N	05 57 9.90W	LA_W_016.002	70 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, wreck in 15 m of water, orientated NW-SE. The charted location is 13 m NW of a wreck recorded in 2019 (target LA_1033), along with magnetometer reading (MAG_LA_0114), and is considered to be the same site	19.5	6	

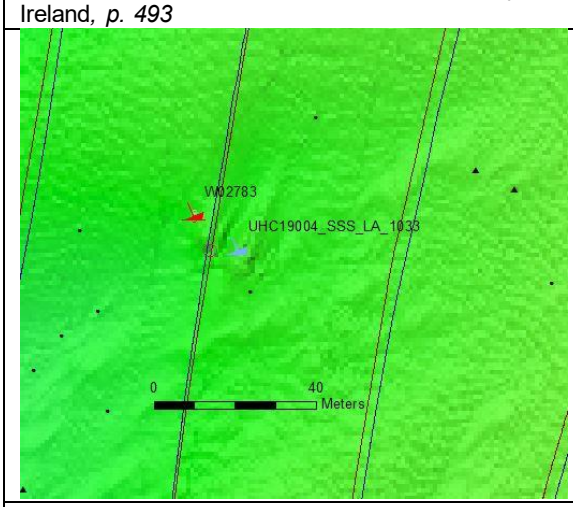


Pl. 137 A 500 kHz side-scan sonar image of a wreck (W02783) discovered during a geophysical survey of Arklow Bay in advance of the construction of a wind farm in 2004. (Courtesy of Donal Boland)

Previous marine geophysical survey records of W02783. Source: K Brady Shipwreck Inventory of Ireland, *p. 493*



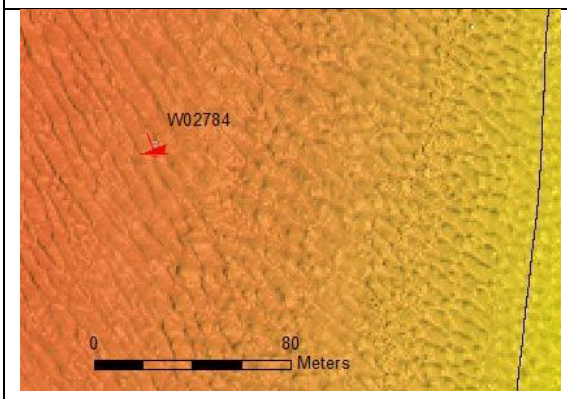
2019 Sonar trace of charted location, showing no feature on left but a wreck feature target LA_1033 on right



2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02784	302782	5860428	52 51 26.64N	05 55 45.84W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, possible wreck, SSS target. 160 m outside survey area, located on central area of Arklow Bank, 160 m W of nearest survey line.	7.7	7.5	

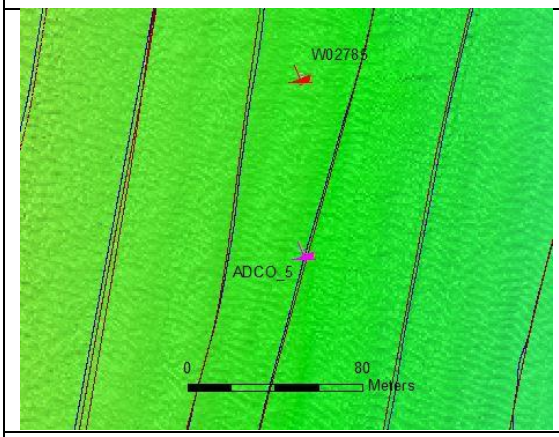


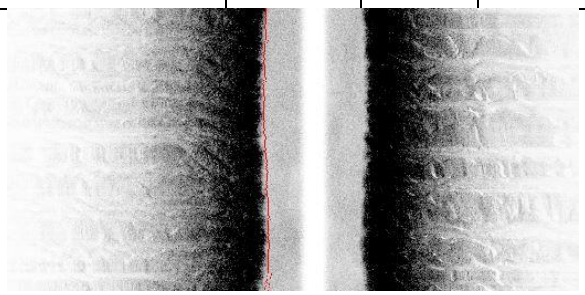
The location lay outside the 2019 survey area.

2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02785	303806	5864039	52 53 24.72N	05 54 59.04W	LA_E_005_il; LAE_006.001	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, three SSS targets in area 21 m by 12 m. No anomaly is indicated at the charted location in the 2019 data set. However, a SSS feature is observed 70 m SSE that is a possible wreck (ADCO_5).	21	12	



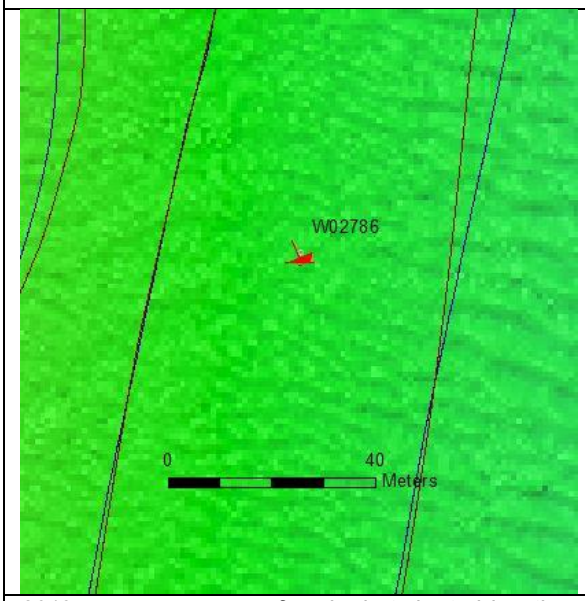


2019 survey summary of seabed at charted location

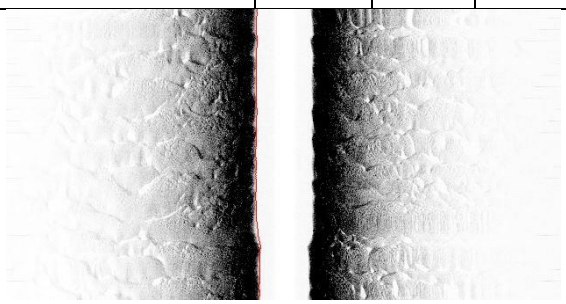
2019 sonar trace shows no feature at the charted location but a possible wreck feature is recorded to the SSE (ADCO_5)

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02786	303861	5864572	52 53 42N	05 54 57.24W	LA_E_004b.001; LA_E_005_il.001	50 m radius from centrepoint

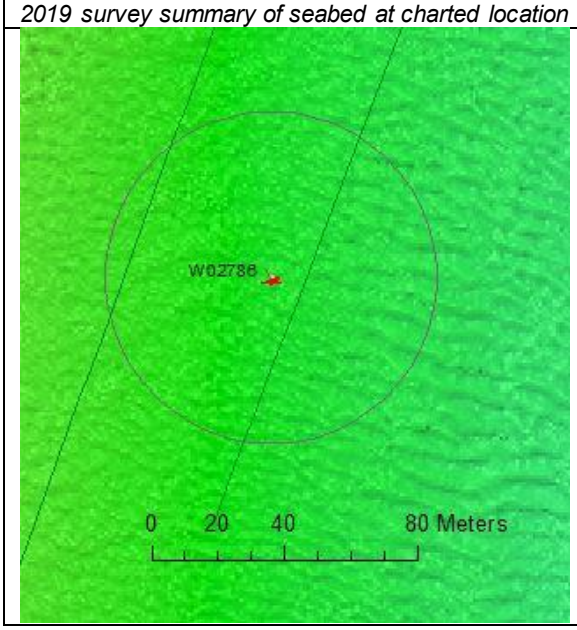
Description and comment	Length	Width	Height
Unknown, Possible wreck, four regularly spaced backscatter targets and a probably man-made object. No anomaly is indicated at the charted location in the 2019 data set. The location lay just within the 2022 survey area. No target was recorded in the 2022 data set.	4.5	4.5	



2019 survey summary of seabed at charted location



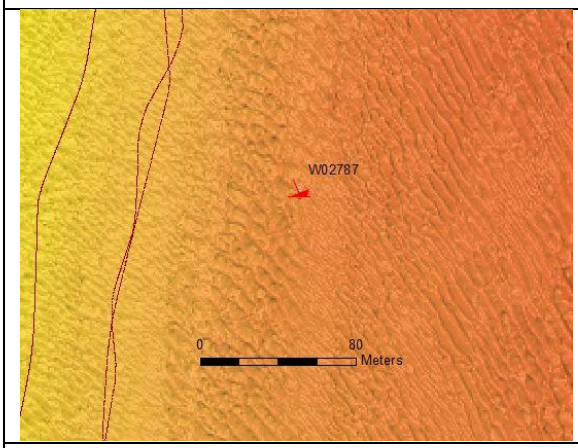
2019 Sonar trace of charted location



2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. No acoustic targets were recorded at the location in 2022.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02787	302454	5860151	52 51 17.28N	05 56 2.76W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target, linear anomaly among sand ripples. 80 m outside survey area, located on central area of Arklow Bank, 80 m E of nearest survey line.	20.7	0.5	

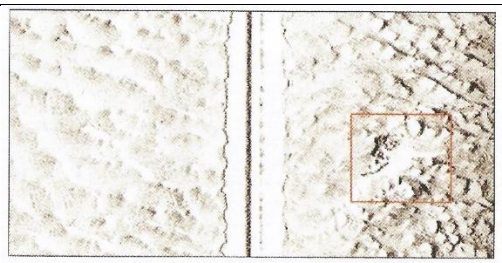


2019 survey summary of seabed at charted location

The location lay outside the 2019 survey area.

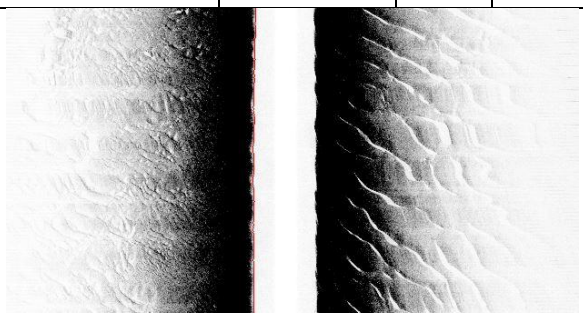
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02788	302221	5859559	52 50 57.84N	05 56 13.92W	LA_W_021.001; LA_W_022.001; L1313_LA_W_A_021_1_MAG	None

Description and comment	Length	Width	Height
Unknown, Possible wreck, backscatter linears, acoustic shadow, scour mark and magnetic signature. No anomaly is indicated at the charted location in the 2019 data set. Magnetometer trackline directly overhead did not register it. The location is 70 m SE of 2019-identified Wreck sites LA_1602 and LA_1605, and 63 m WSW of magnetometer target MAG_LA_0049. Allowing for chart correction due to GIS projection, W02788 is considered to be more correctly located at LA_1605.	23.0	8.5	

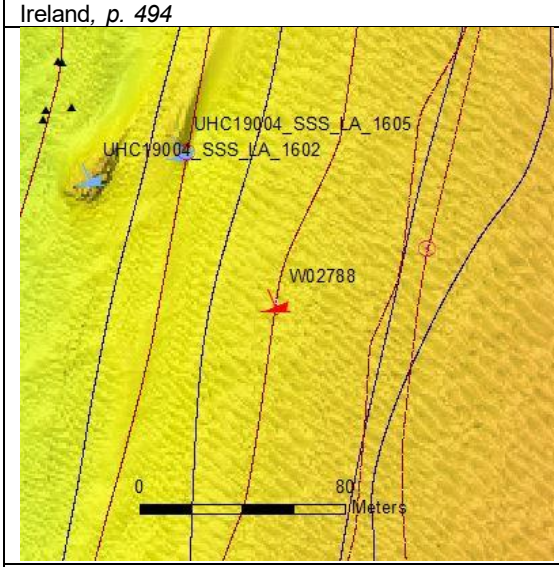


Pl. 138 A 500 kHz side-scan sonar image of a possible wreck (W02788) discovered during a geophysical survey of the Arklow Bank in advance of the construction of a wind farm in 2001. (Courtesy of Donal Boland)

Previous marine geophysical survey records of W02783. Source: K Brady Shipwreck Inventory of Ireland, *p. 494*



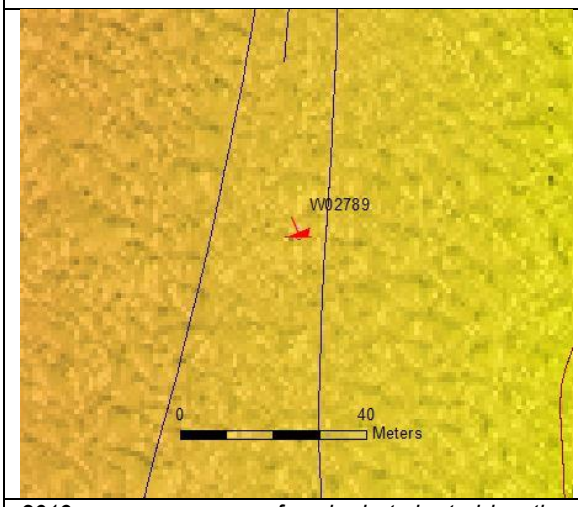
2019 sonar trace of charted location



2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02789	303368	5863378	52 53 2.76N	05 55 21W	LA_E_combined; LA_N_010_EXT	50 m radius from centrepoint

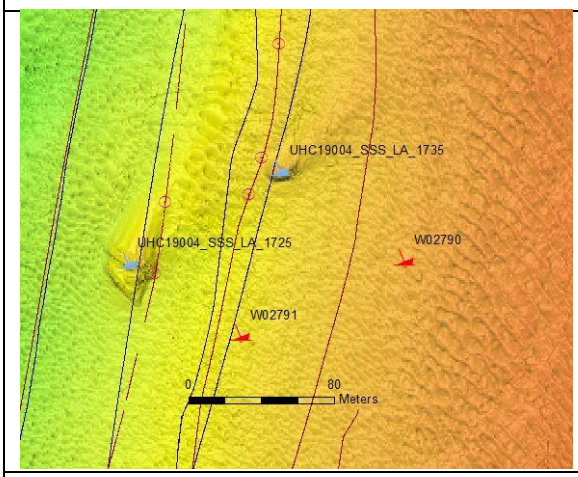
Description and comment	Length	Width	Height
Unknown, Possible wreck, comprising high back scatter anomaly among sand ripples. No anomaly is indicated at the charted location in the 2019 data set.	11.7	4.6	



2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02790	302446	5860764	52 51 37.08N	05 56 4.56W	n/a	None

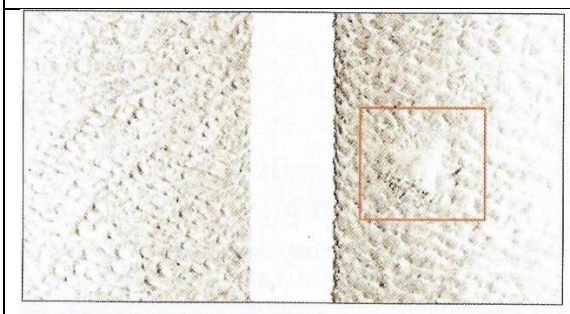
Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. 80 m outside survey area, located on central area of Arklow Bank, 30 m E of nearest survey line (Mag line). The charted location is however 78 m SE of 2019 survey Wreck target LA_1735. There is a similarity with the spatial variation here and with W02791 (charted position 100 m SW) and target LA_1735. Allowing for chart correction due to GIS projection, W02790 is considered to be more correctly located at LA_1735.	8.0	5.8	



2019 survey summary of seabed at charted location

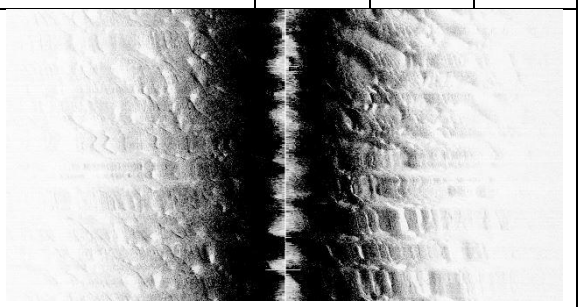
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02791	302356	5860723	52 51 35.64N	05 569.24W	LA_N_002_ext.001; LA_W_019a	None

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target, acoustic shadows and seabed scouring. No anomaly is indicated at the charted location in the 2019 data set. The charted location is 70 m SE of 2019 survey Wreck target LA_1725. Allowing for chart correction due to GIS projection, W02791 is considered to be more correctly located at LA_1725.	n/a	n/a	n/a

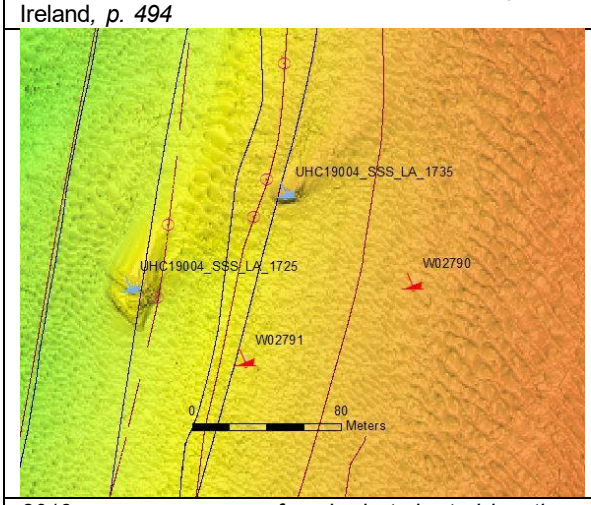


Pl. 139 A 500 kHz side-scan sonar image of a possible wreck (W02791) discovered during a geophysical survey of the Arklow Bank in advance of the construction of a wind farm in 2001. (Courtesy of Donal Boland)

Previous marine geophysical survey records of W02783. Source: K Brady Shipwreck Inventory of Ireland, *p. 494*



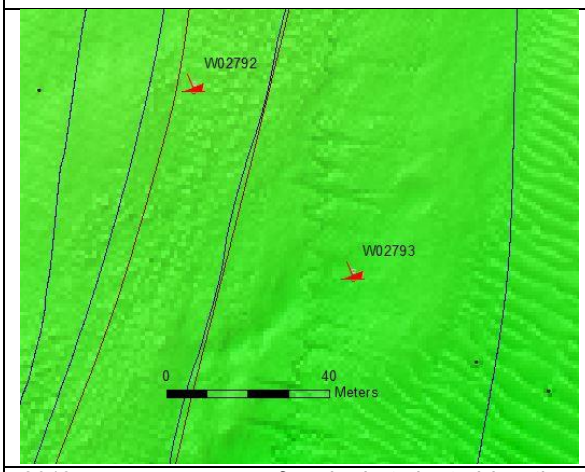
2019 sonar trace of seabed at charted location



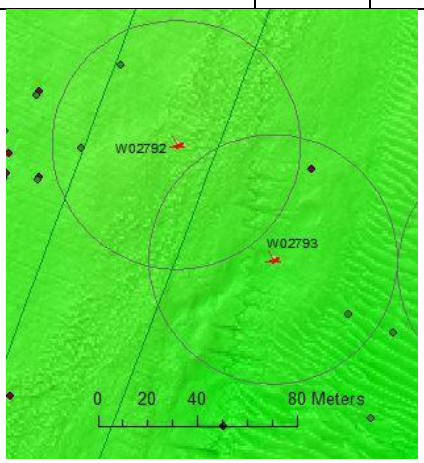
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02792	303012	5865887	52 54 23.4N	05 55 45.48W	LA_W_011d.001; LA_W_012.003	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set.	3.3	2.7	



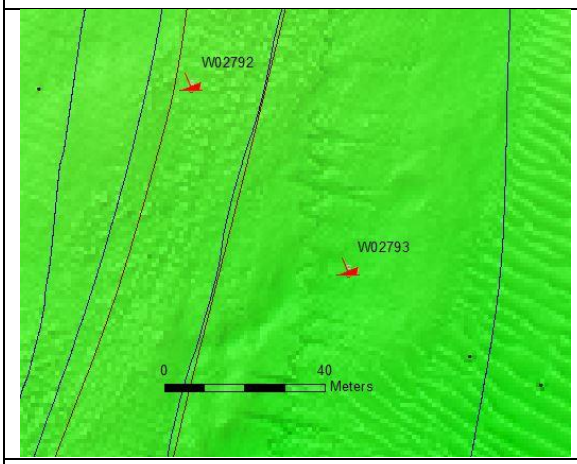
2019 survey summary of seabed at charted location



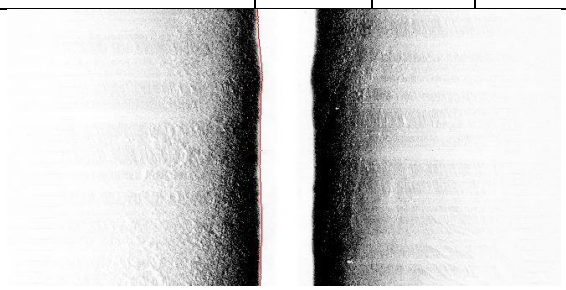
2022 survey results on 2019 multibeam bathymetry, showing AEZs, 2022 SSS survey lines and 2022 targets (in red) and 2019 targets (green and black). No wreck site was recorded at the location in 2022.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02793	303051	5865841	52 54 21.96N	05 55 43.32W	LA_W_012.003; LA_W_013	50 m radius from centrepoint

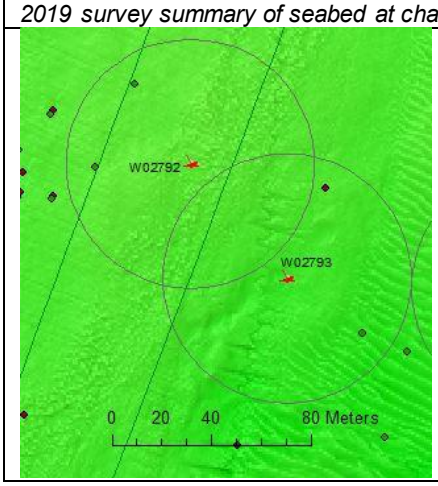
Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set.	5.1	2.8	



2019 survey summary of seabed at charted location



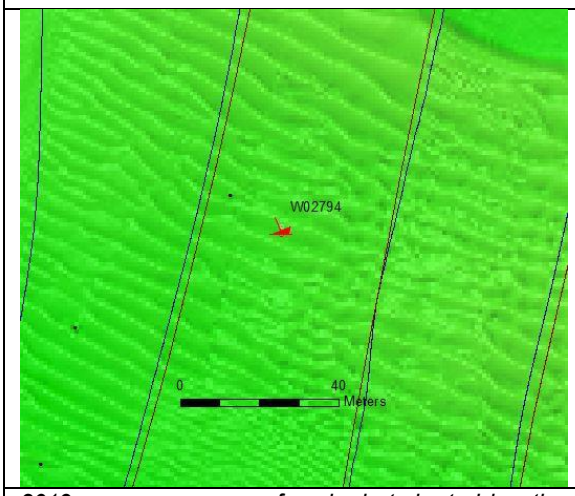
2019 sonar trace of seabed at charted location



2022 survey results on 2019 multibeam bathymetry, showing AEZs, 2022 SSS survey lines and 2022 targets (in red) and 2019 targets (green and black). An additional boulder contact was recorded 36 m N of the charted location of the wreck, but no wreck site was recorded in 2022.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02794	303151	5865837	52 54 21.96N	05 55 37.92W	LA_W_014.001; LA_W_015a	50 m radius from centrepoint

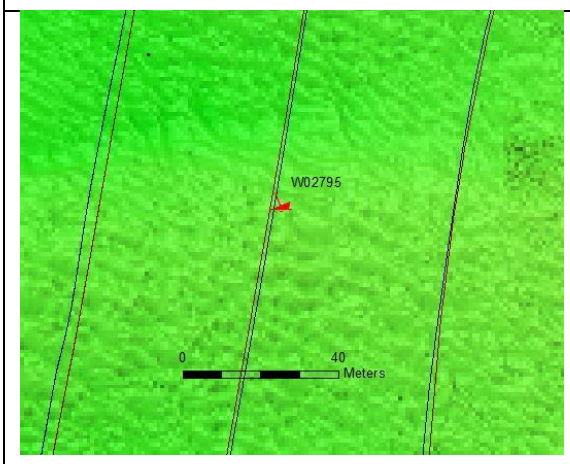
Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set. A boulder (target LA_1951) is recorded 15 m NW.	13.4	2.4	



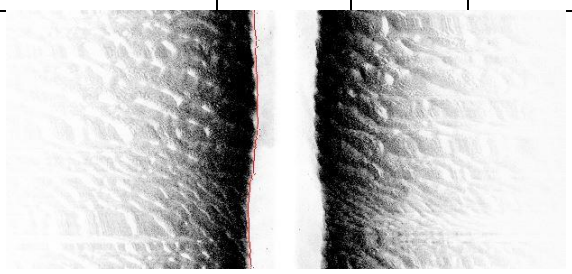
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02795	303247	5865710	52 54 18N	05 55 32.52W	LA_W_017	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set.	3.4	1.0	



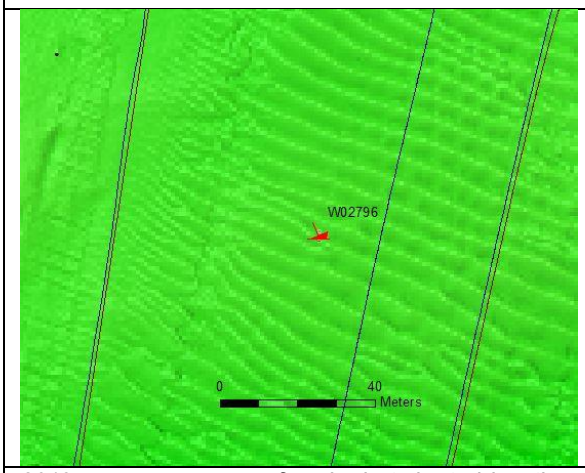
2019 survey summary of seabed at charted location



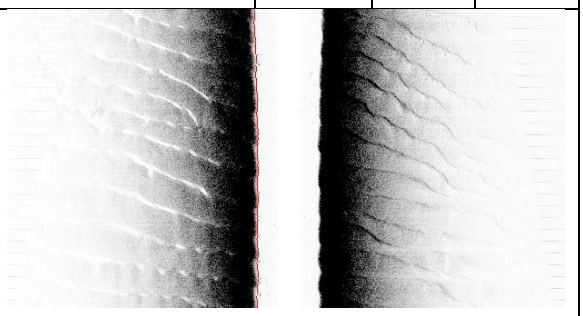
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02796	303037	5865663	52 54 16.2N	05 55 43.68W	LA_W_013	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set.	5.8	2.6	



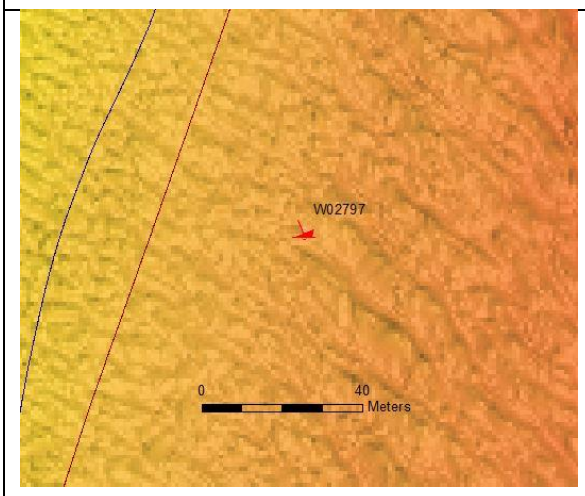
2019 survey summary of seabed at charted location



2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02797	302965	5863583	52 53 8.88N	05 55 42.96W	LA_N_002_ext	50 m radius from centrepoint

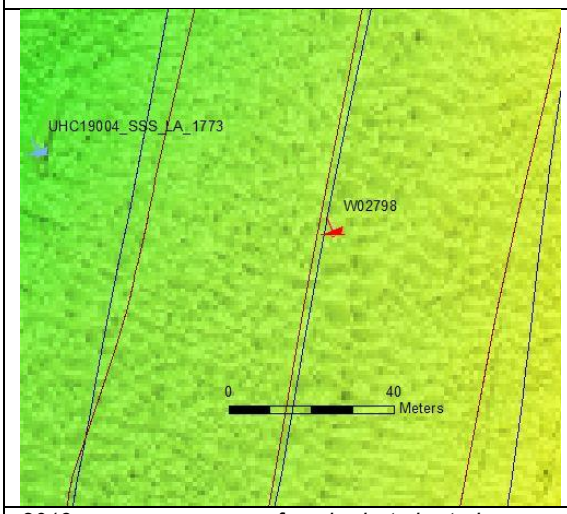
Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target, debris over 14 m by 6 m area. No anomaly is indicated at the charted location in the 2019 data set.	14.0	6.0	



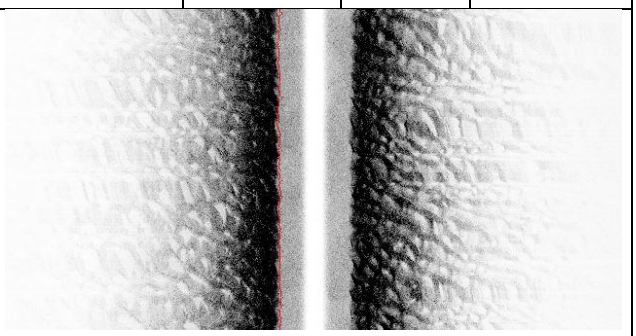
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02798	302452	5861744	52 52 8.76N	05 56 6.36W	LA_W_017.001	None

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target measuring 12.8 m by 4.9 m in size reported in 2001. No anomaly is indicated at the charted location in the 2019 data set. The charted location is 78 m ESE of 2019 survey Wreck target LA_1773. Allowing for chart correction due to GIS projection, W02798 is considered to be more correctly located at LA_1773.	12.8	4.8	



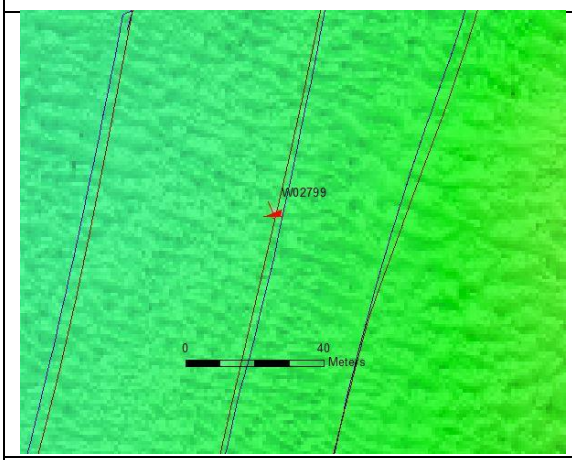
2019 survey summary of seabed at charted location



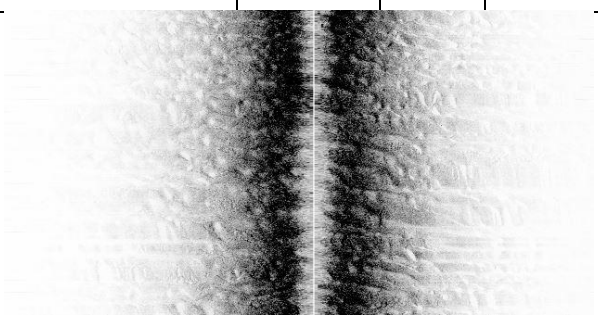
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02799	302116	5861112	52 51 47.88N	05 56 22.92W	LA_W_013a; L0142_LA_W_013a_0002	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set. Magnetometer trackline L0142_LA_W_013a_0002 passed directly overhead and did not register an anomaly.	13.5	2.3	



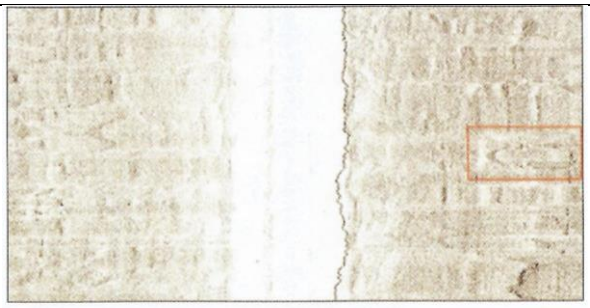
2019 survey summary of seabed at charted location



2019 sonar trace at charted location

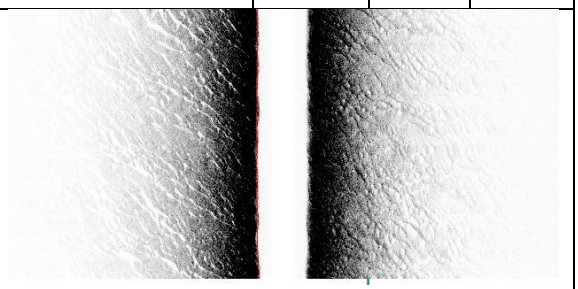
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02800	303111	5864357	52 53 34.08N	05 55 36.84W	LA_N_001_ext	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target, vessel shaped. No anomaly is indicated at the charted location in the 2019 data set.	22.6	3.8	

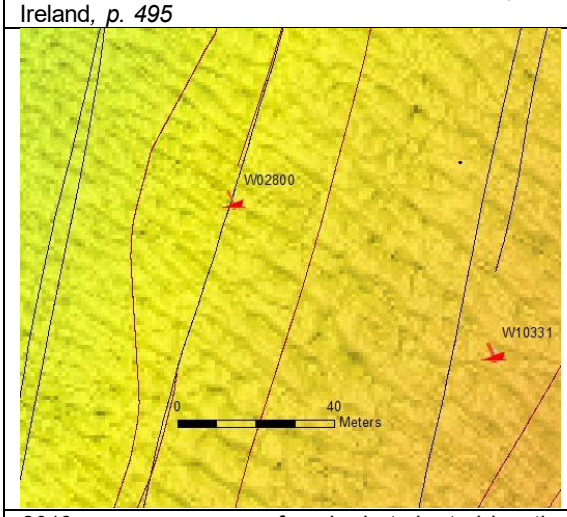


Pl. 140 A 500 kHz side-scan sonar image of a possible wreck (W02800) discovered during a geophysical survey of the Arklow Bank in advance of the construction of a wind farm in 2001. (Courtesy of Donal Boland)

Previous marine geophysical survey records of W02783. Source: K Brady Shipwreck Inventory of Ireland, *p. 495*



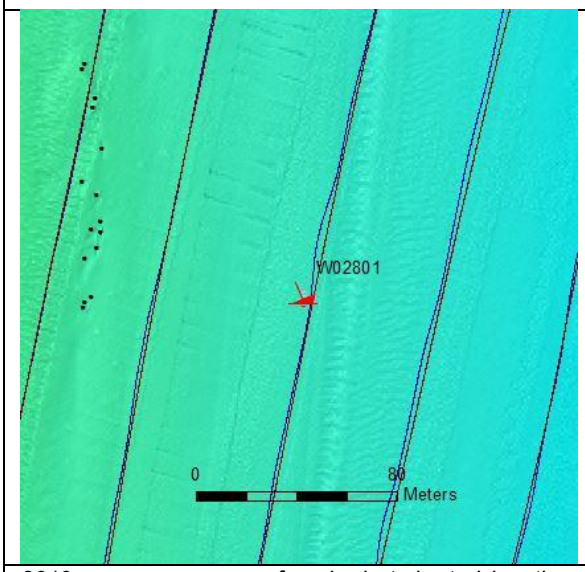
2019 sonar trace at charted location



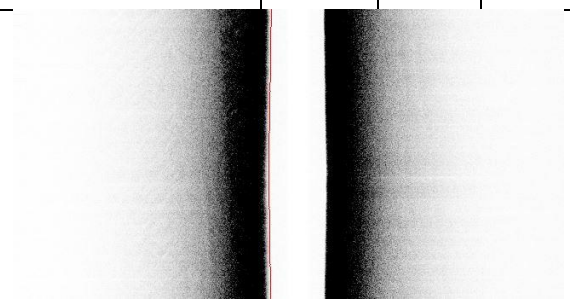
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02801	304123	5864216	52 53 30.84N	05 54 42.48W	LA_E_011A.001; LA_E__012E.009; LA108_LA_E_011a_0003	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. No anomaly is indicated at the charted location in the 2019 data set. A line of boulders was recorded in the 2019 survey some 80 m W, aligned N-S and extending over an area 100 m long.	14.9	6.2	



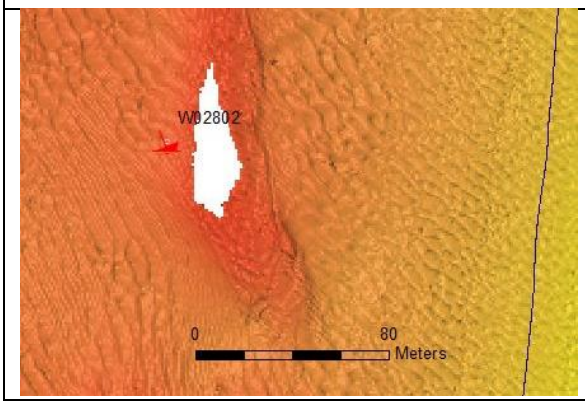
2019 survey summary of seabed at charted location



2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W02802	302613	5859410	52 50 53.52N	05 55 52.68W	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target. 160 m outside survey area, located on central area of Arklow Bank, 160 m W of nearest survey line.	11.2	4.2	

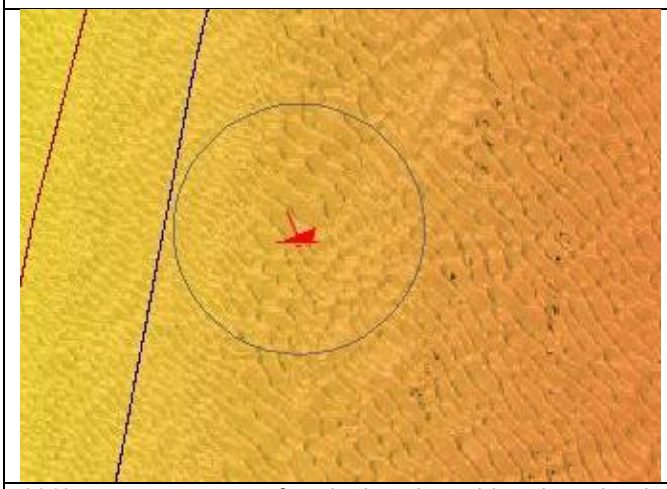


2019 survey summary of seabed at charted location

The location lay outside the 2019 survey area.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W09512	300408	5850140	52.95833	-5.95833	LA_W_022_Ext.002	None

Description and comment	Length	Width	Height
MV *Cameo*, cargo ship, lost 10/09/1950. Located by UKHO 60 m outside survey area, located on central area of Arklow Bank, 60 m W of nearest survey line. However, INFOMAR (reference GSI 405) recorded what it suggests is the *Cameo* in 2016, located 380 m north of the present location. The location recorded by INFOMAR retains a substantial wreck that was also recorded in 2019. The INFOMAR entry presented in this catalogue with entry LA_0428.	64	8.5	



2019 survey summary of seabed at charted location, showing 50 m-radius exclusion zone

The location lay outside the 2019 survey area.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W09566	193492	5854812	52.80833	-6.12917	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Corona, UKHO. 1 km N of survey area (CR3).			

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W10325	307756	5853129	52.79367	-5.85133	n/a	None

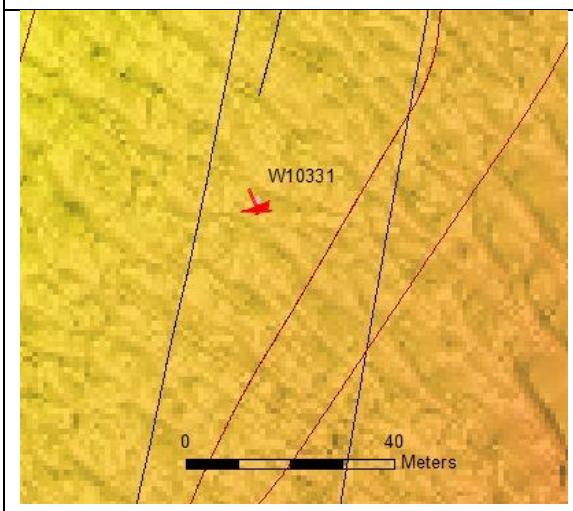
Description and comment	Length	Width	Height
Unknown, Wreck surveyed by the *Celtic Voyager* in 2012 as part of the INFOMAR seabed mapping programme. Wreck lies in 58 m of water. GSI Wreck No_316. 5.4 km E of survey area.	51.0	6.3	

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W10326	305990	5855386	52.8133	-5.87883	n/a	None

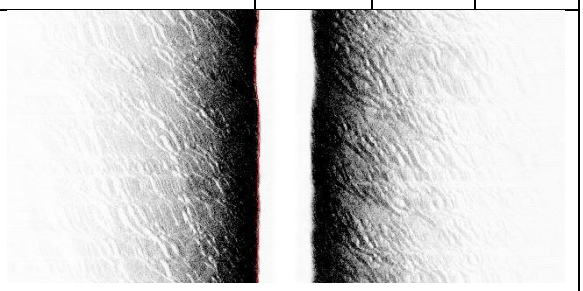
Description and comment	Length	Width	Height
Unknown, INFOMAR seabed mapping programme. Wreck lies in 34 m of water. GSI 315. 3.3 km E of survey area.	68.0	9.6	

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W10331	303177	5864318	52.89247	-5.9259	LA_N_003ext	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, UKHO. No anomaly is indicated at the charted location in the 2019 data set.			



2019 survey summary of seabed at charted location



2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W11021	193172	5854391	52.80467	-6.13417	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, UKHO. 700 m N of Survey area.			

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W11475	192718	5853079	52.79305	-6.14167	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, UKHO. Inside Arklow Port, approximately 460 m W of survey area.			

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W11721	292189	5859792	52.84819	-6.08611	n/a	50 m radius from centrepoint

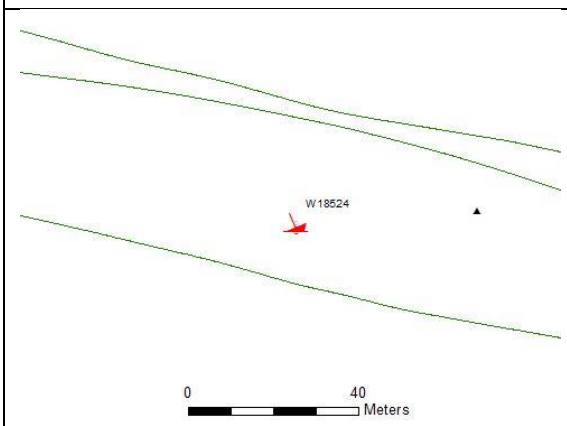
Description and comment	Length	Width	Height
Unknown. 960 m N of survey area.			

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W17904	101046	5853880	52.7972	-6.01783	n/a	50 m radius from centrepoint

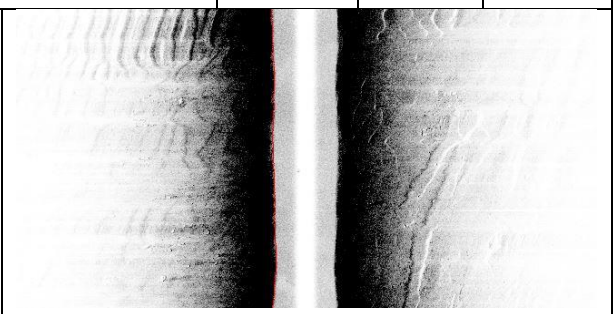
Description and comment	Length	Width	Height
Unknown, Wreck surveyed by the *Celtic Voyager* in 2011 as part of the INFOMAR seabed mapping programme. Wreck lies in 27 m of water. GSI Wreck No_297. 1.7 km W of survey area.	26.0	10.0	

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W18524	297534	5856663	52.82167	-6.00492	R2B208	50 m radius from centrepoint

Description and comment	Length	Width	Height
Unknown, Possible wreck, SSS target in 15-16 m of water. 80 from W02647. No anomaly is indicated at the charted location in the 2019 data set. debris target R_0646 located 40 m E.			



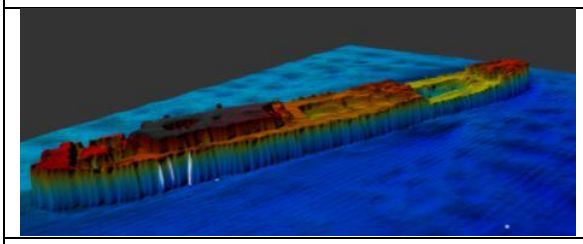
2019 survey summary of seabed at charted location



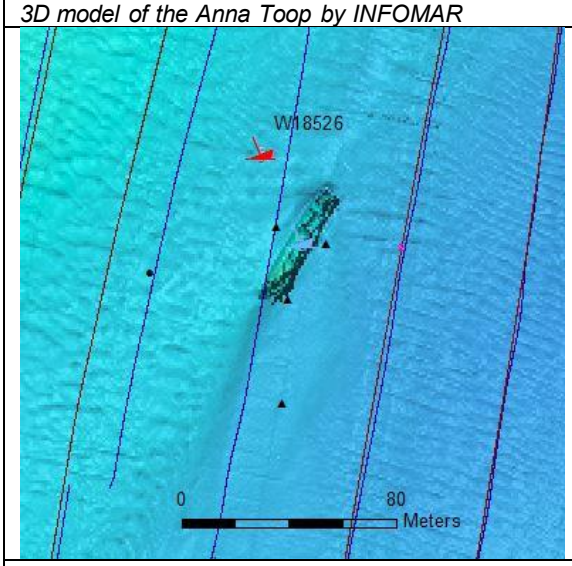
2019 sonar trace at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
W18526	300926	5846368	52.73472	-5.94867	LA_E_017_009; L0050_LA_E_017_0021	100 m radius from centrepoint

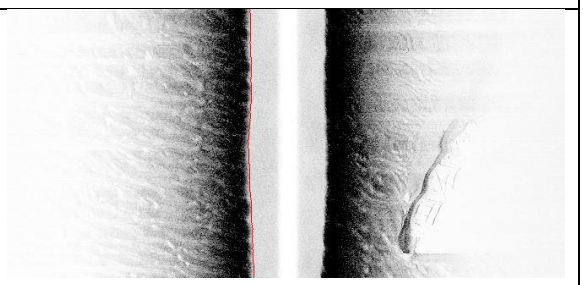
Description and comment	Length	Width	Height
SS Anna Toop cargo ship, Wreck, c/o Roy Stokes. No anomaly is indicated at the charted location in the 2019 data set. However, the wreck is located 57 m NE and is recorded in the 2019 survey as target LA_3638. It is associated with debris and magnetometer anomalies. Correlates with 2019 Survey LA_3638.			



3D model of the Anna Toop by INFOMAR



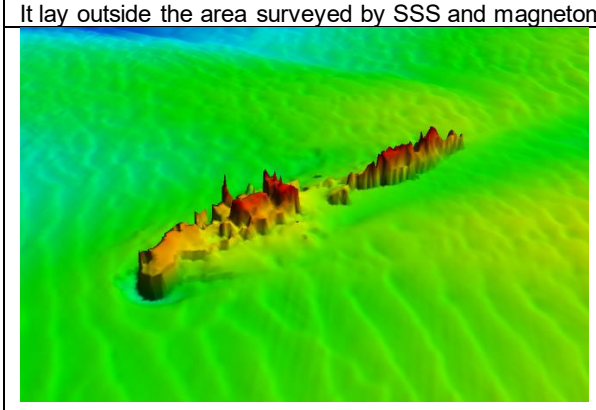
2019 survey summary of seabed at charted location



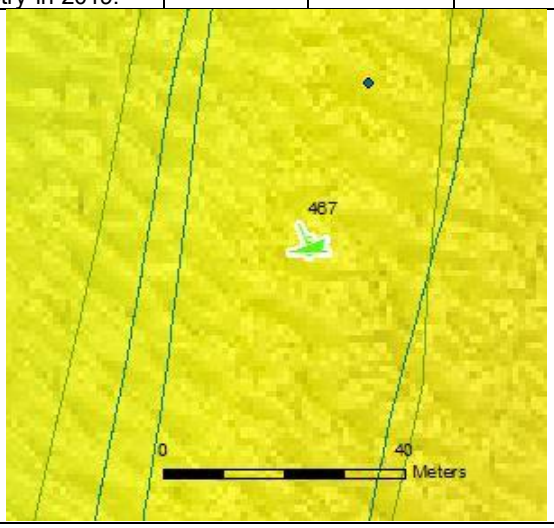
2019 sonar trace at charted location on left, with indication of Wreck 368 on right

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GSI 467	300041	5849442	52.757778	-5.963333	None	100 m radius from centrepoint

Description and comment	Length	Width	Height
Recorded by INFOMAR during cruise GEO16_03 as a metal wreck measuring 67 m, 12 m wide, at a depth of 15 m. This wreck site is not yet absorbed into the Historic Shipwreck Inventory. It lay outside the area surveyed by SSS and magnetometry in 2019.	67	12	



INFOMAR Multibeam image from 2016



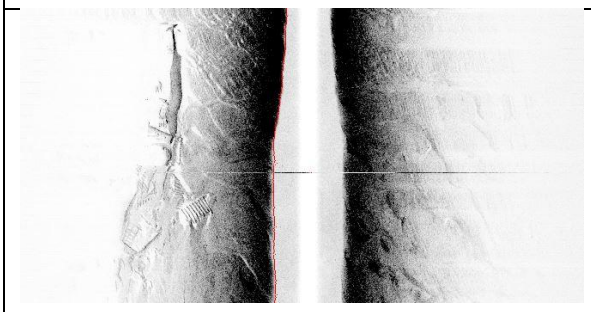
2019 survey summary of seabed at charted location

8.2 2019 marine geophysical survey of Ultrabeam and Alphamarine for SSE, shipwreck

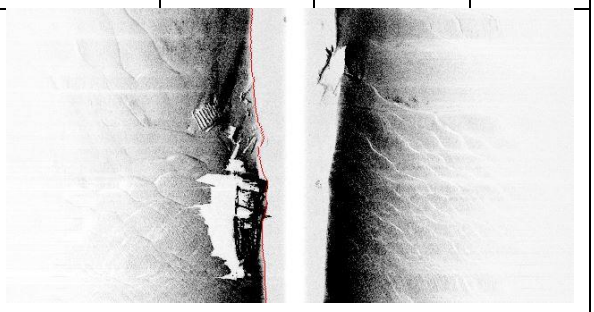
The 2019 survey identifies each geophysical target by a unique number, which is present at the end of the reference string: UHC19004_SSS_LA_#### when identified on data sets acquired for the Array Area, and UHC19004_SSS_R_#### when identified on data sets acquired for the Cable Routes. The following catalogue entries highlight the unique number in **bold**, and this is the number used to refer to particular targets in ADCO's technical chapter.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_0390**	300047.0	5850134.2	52.763172	-5.9627779	LA_W_017.005	200 m radius from centrepoint

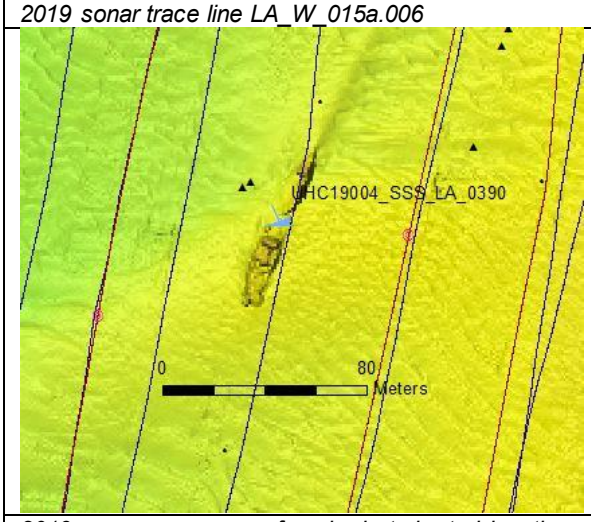
Description and comment	Length	Width	Height
Wreck. Substantial vessel remains on seabed, aligned NE/SW with bow indicated to NE. Mid-section appears partially buried, with stern section standing proud. Debris next to vessel on W side. Scour pocket extend 200 m to the NE, with debris recorded 150 from wreck. This is a contender for being the wreck in the 603-ton steamship *Hellenis*, lost in 1869 (W02690), based on its size and configuration.[4] It compares favourably with INFOMAR reference GSI 403, at the same location. 2022 survey recorded a wreck at this location, reference GR_SSS_0138.	59.2	9.1	1.3



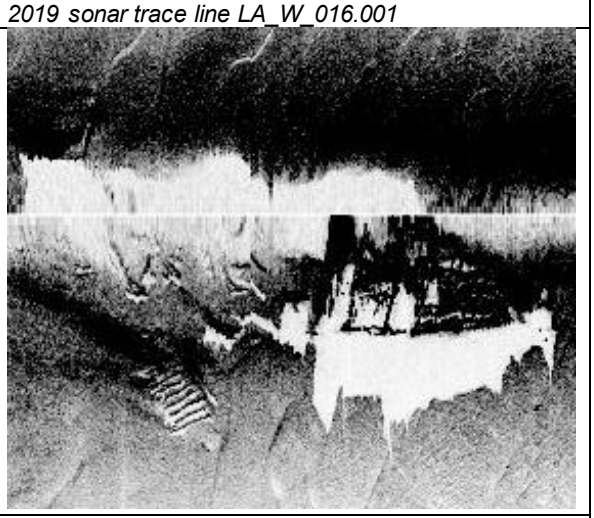
2019 sonar trace line LA_W_015a.006



2019 sonar trace line LA_W_016.001



2019 survey summary of seabed at charted location

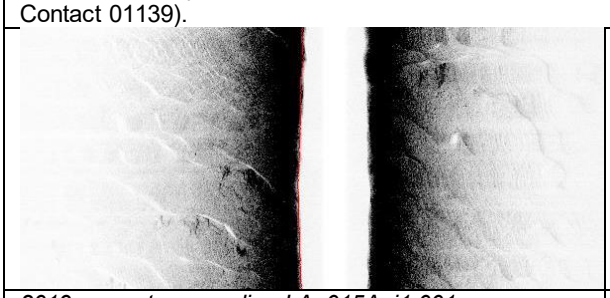


2019 sonar trace line LA_W_016.001 enlarged, rotated and slant range corrected showing stern section

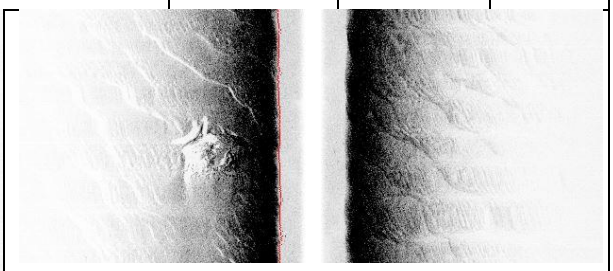
[4] Karl Brady, UAU, *pers. comm*. July 2020.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_0421**	300071.0	5850359.6	52.765835	-5.963555	LA_W_015A_i1.001	50 m radius from centrepoint

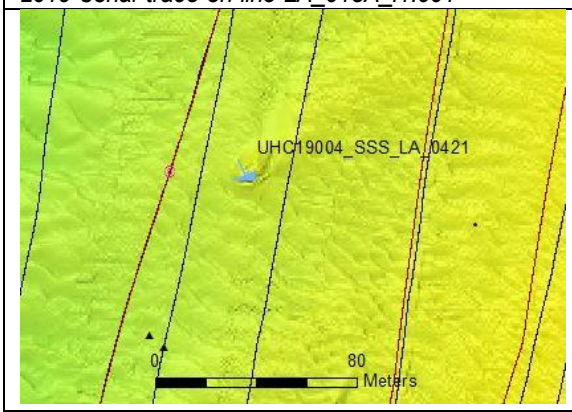
Description and comment	Length	Width	Height
Potential wreck or debris. SSS anomaly associated with magnetometer target MAG_0151. The 2022 survey recorded a contact as debris at this location (GR Contact 01139).	19.6	13.0	2.6



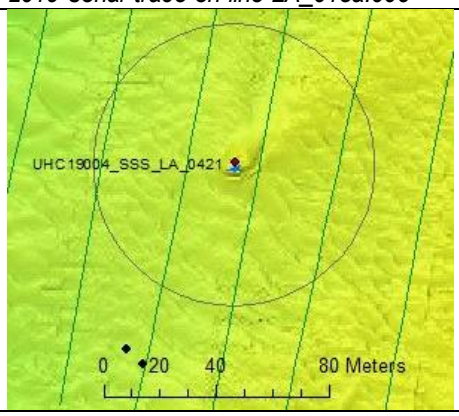
2019 sonar trace on line LA_015A_i1.001



2019 sonar trace on line LA_015a.006



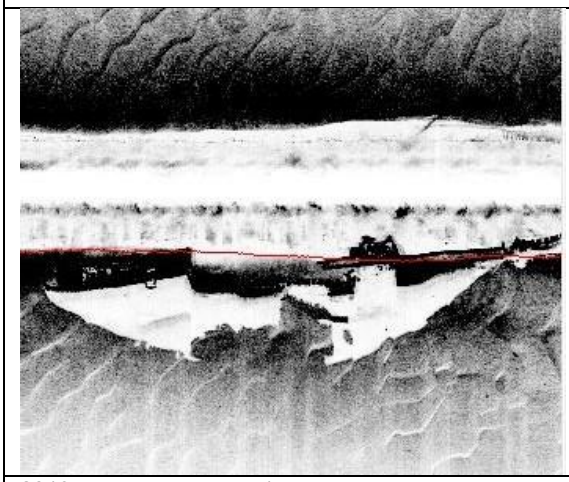
2019 survey summary of seabed at charted location



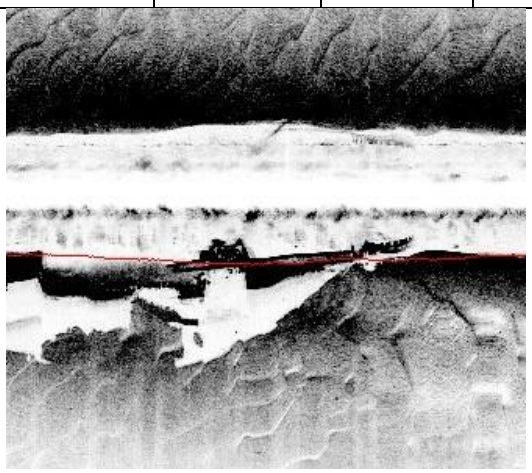
2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. Targets in black (debris) were recorded in 2019

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_0428**	300434.8	5850503.6	52.767288	-5.957980	LA_W_022_Ext.002	150 m radius from centrepoint

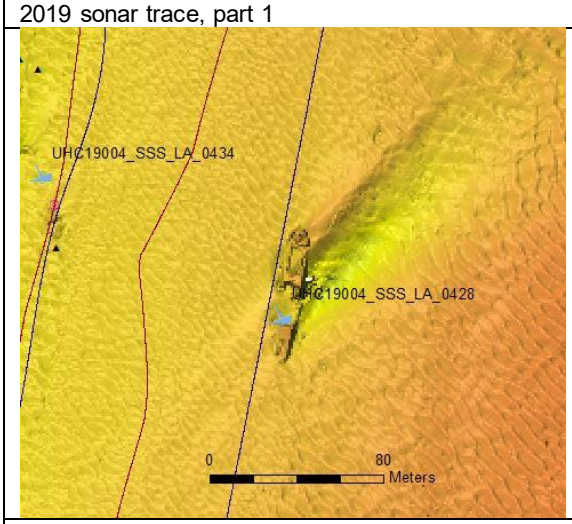
Description and comment	Length	Width	Height
Wreck. Very well defined and well exposed. Aligned NNE/SSW with bow indicated facing S. Rounded stern, elevated stern deck, elevated bridge. Scour pocket extends across the midships and reaches 100 m NE. Considered to be the same as GSI 405, which INFOMAR records as the wreck of the MV *Cameo*. It is 100 m E of Wreck LA_0434. Wreck recorded in 2022 as GR_SSS_1211.	68.5	11.1	6.1



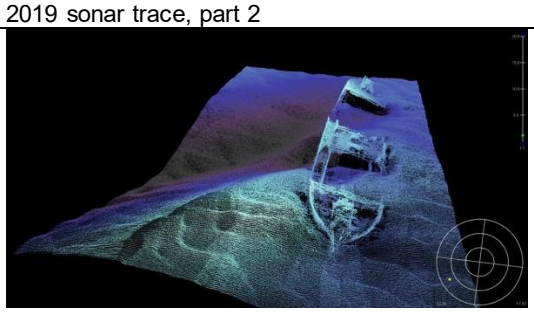
2019 sonar trace, part 1



2019 sonar trace, part 2



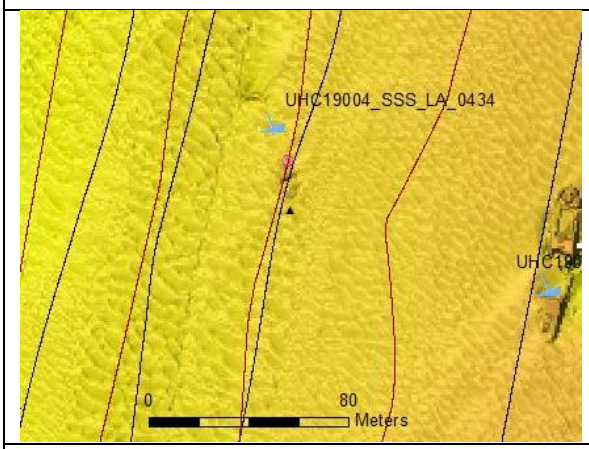
2019 survey summary of seabed at charted location



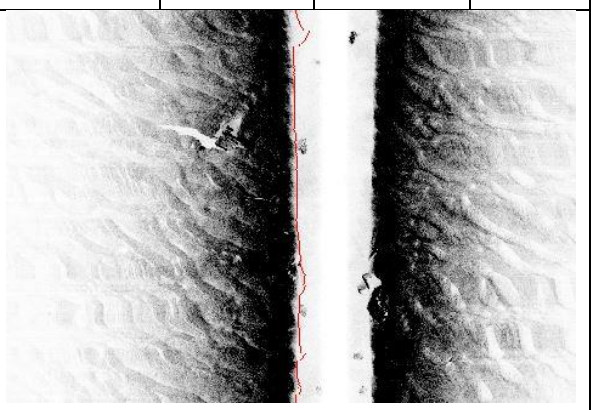
MV Cameo as recorded by INFOMAR in 2016

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_0434**	300323.5	5850568.9	52.767838	-5.959779	LA_W_020a	100 m radius from centrepoint

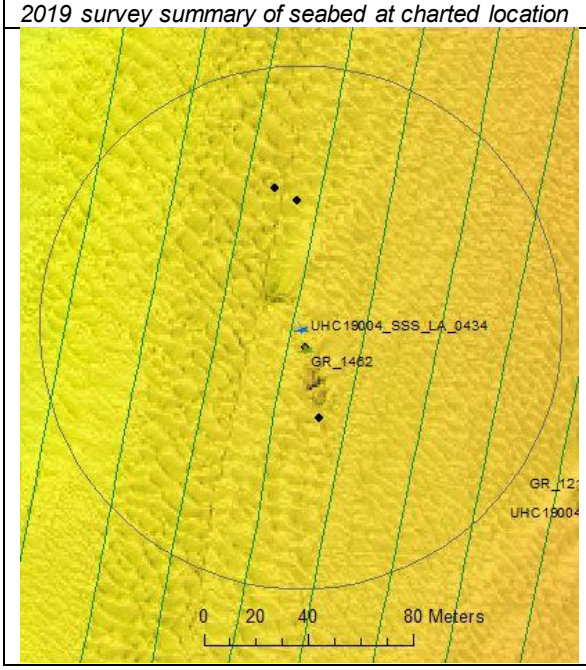
Description and comment	Length	Width	Height
Possible wreck. Defined by area of debris that is largely buried but with two exposed elements at either end, the southmost corresponding with magnetometer target LA_0147. Aligned NW/SE. Two outlying debris targets recorded 35 m to the N. 100 m W of Wreck LA_0428. Wreck recorded in 2022 (GR_SSS_1462), position taken 6 m south of that recorded in 2019	57.9	10.2	1.1



2019 survey summary of seabed at charted location



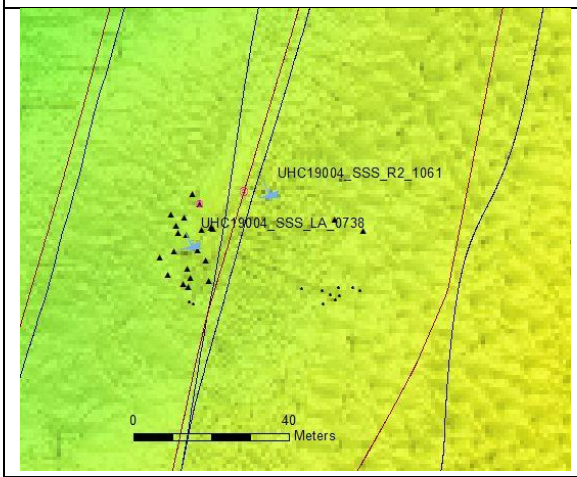
2019 sonar trace



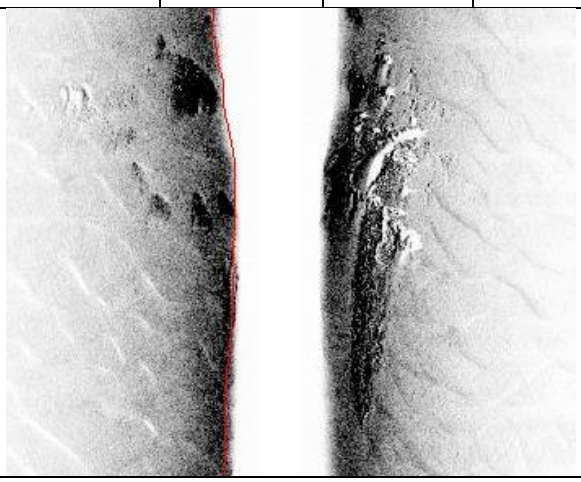
2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. Targets in black (debris) were recorded in 2019

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_0738**	300789.0	5853374.6	52.793342	-5.954673	LA_W_018A_i4	50 m radius from centrepoint

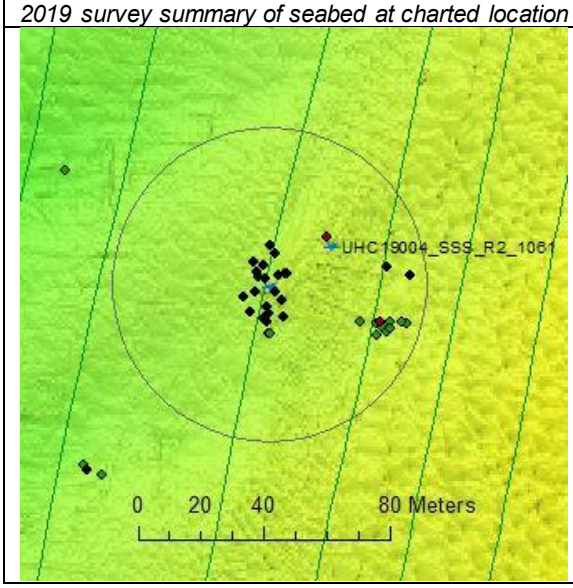
Description and comment	Length	Width	Height
Wreck. Clearly defined on seabed, orientated NNE/SSW with elements that stand proud in the northern half. Closely grouped set of debris and magnetometer targets extend 20 m N and 20 m S of the wreck's centrepoint. 21 m SW of Wreck/Wreckage LA_1061. 36 m NW of boulder cluster. The 2022 survey did not record any target at the location of LA_0738, but did record a boulder feature (GR_contact_0001) 30 m ESE, where a boulder cluster was recorded in 2019.	21.3	9.0	1.2



2019 survey summary of seabed at charted location



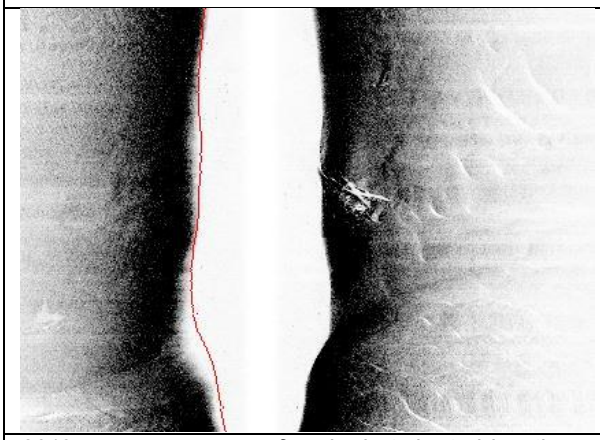
2019 sonar trace



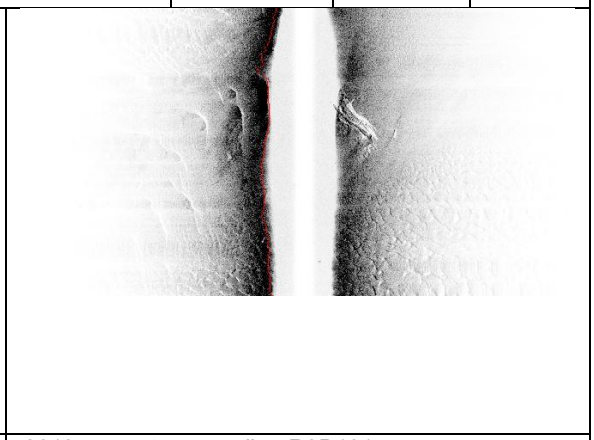
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 SSS survey lines. The targets in black (debris) and green (boulders) are those from 2019, while the red targets are from 2022. The 2022 did not record any target at the location of LA_0738

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_0761**; UHC19004_SSS_ **R2_0991**	300425.8	5853474.3	52.794103	-5.960113	LA_W_010c.004; R2B101	50 m radius from centrepoint

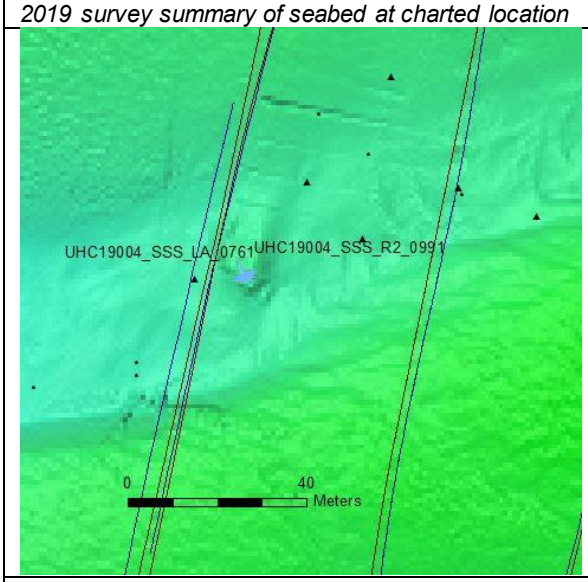
Description and comment	Length	Width	Height
Wreck. Exposed on sand, suggested orientation NW/SE but bow and stern appear to be buried. Debris recorded 10 m to W and 20 m to E. The location was surveyed again in 2022 but it was not detected in any of the devices deployed above it, which comprised multibeam, SSS and magnetometer.	19.3	4.0	2.5



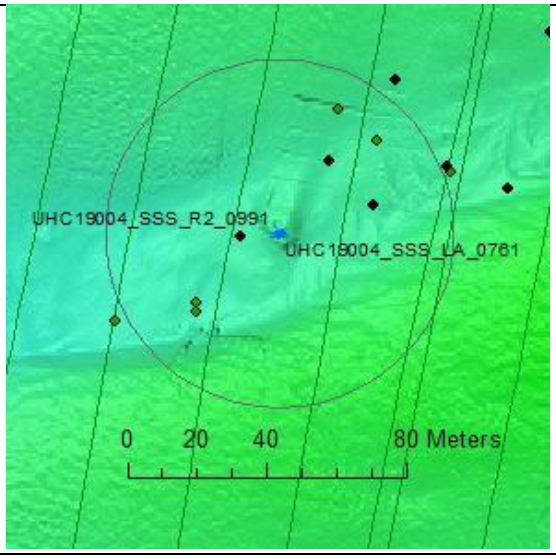
2019 survey summary of seabed at charted location



2019 sonar trace on line R2B101



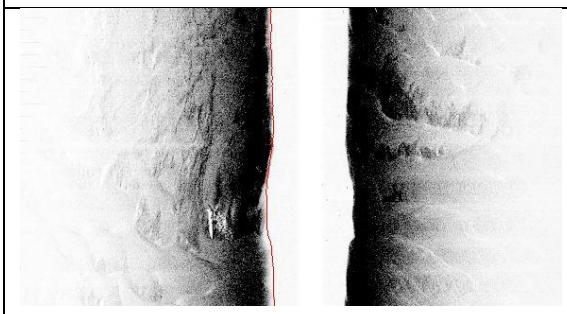
2019 survey summary of seabed at charted location



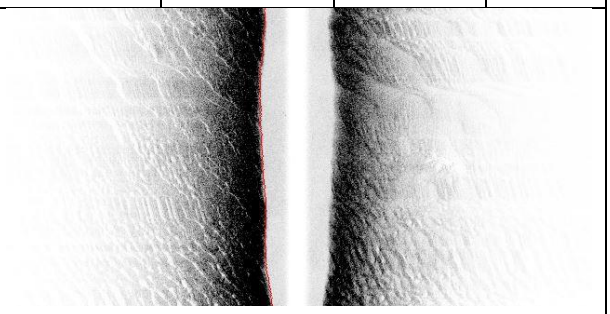
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 SSS survey lines. The targets in black (debris) and green (boulders) are those from 2019. The 2022 did not record any target at the location of LA_0761 / R2_0991

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_0855**; UHC19004_SSS_**R2_1014**	300647.5	5853867.7	52.797685	-5.957123	LA_W_014a.002; R2B107	50 m radius from centrepoint

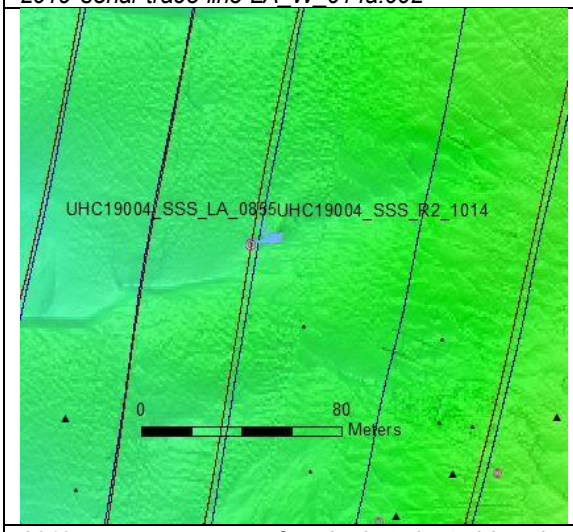
Description and comment	Length	Width	Height
Potential wreck. Partially exposed, orientation unclear. Magnetometer target associated, MAG_0127. The 2022 recorded the wreck at the same location (GR_SSS_4454).	22.8	9.2	0.8



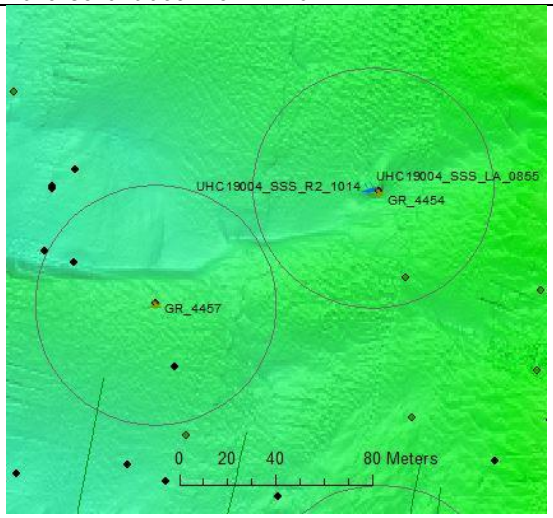
2019 sonar trace line LA_W_014a.002



2019 sonar trace line R2B107



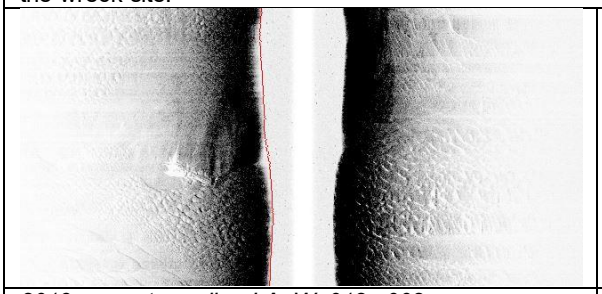
2019 survey summary of seabed at charted location



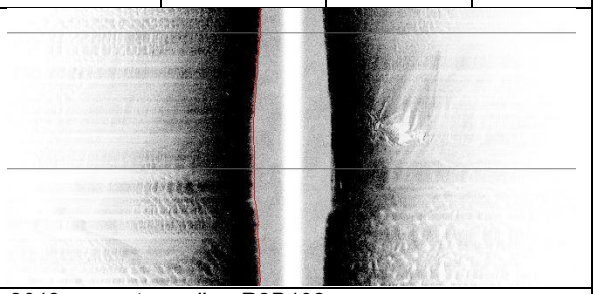
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 target (in red). The 2022 survey recorded the wreck at the same location as recorded in 2019

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_0958**; UHC19004_SSS_**R2_0961**	300677.9	5854362.6	52.802229	-5.956921	LA_W_012a.002; R2B108	50 m radius from centrepoint

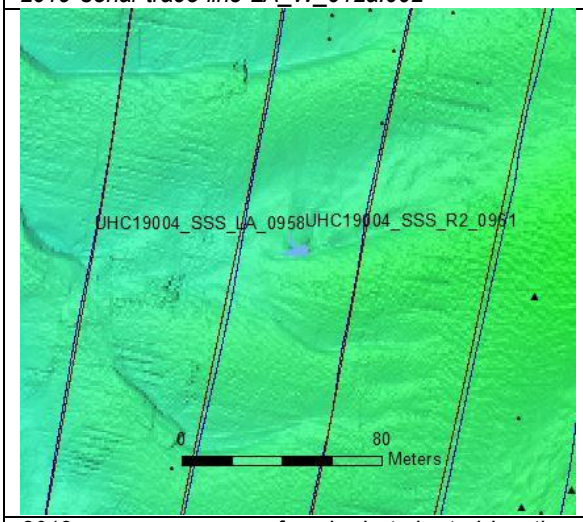
Description and comment	Length	Width	Height
Wreck. Lies exposed, orientated E/W. 2022 survey recorded a target feature located 9 m south of the 2019 location, and identified as a wreck, GR_SSS_4456. The observation is consistent with the 2019 record, and the variation in distance can be a result of where the position was recorded along the length of the wreck site.	13.0	4.9	1.6



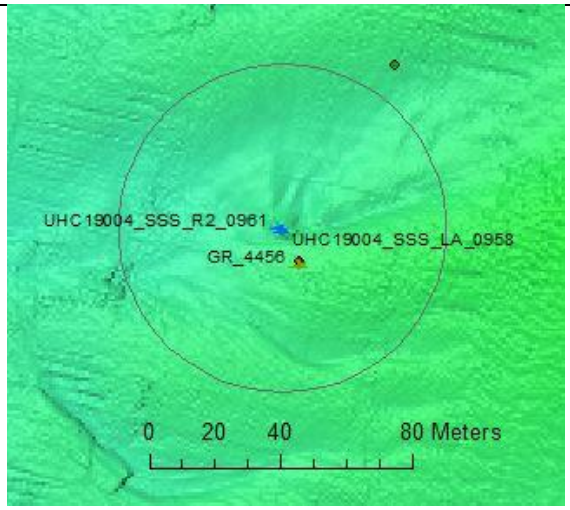
2019 sonar trace line LA_W_012a.002



2019 sonar trace line R2B108



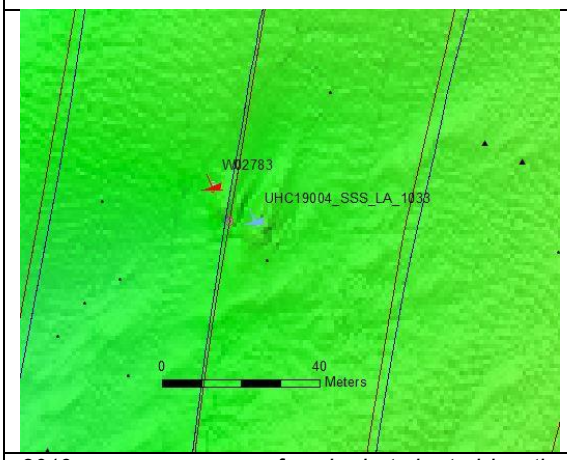
2019 survey summary of seabed at charted location



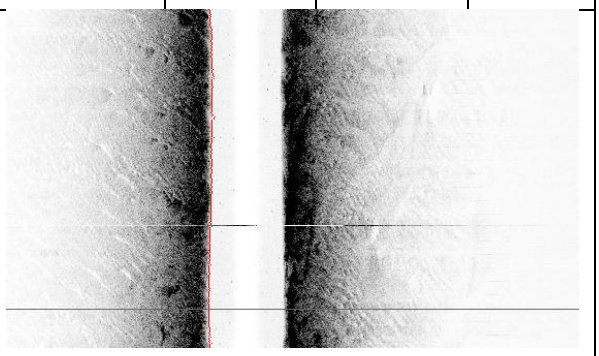
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 target (in red) and 2019 targets (green and black). The 2022 survey recorded a feature 9 m SSE of the 2019 location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1033**	300985.8	5854752.4	52.805396	-5.951944	LA_W_017.003	70 m radius from centrepoint

Description and comment	Length	Width	Height
Wreck. Orientated NW/SE, associated magnetometer target MAG_0114, boulders and outlying debris also recorded. 13 m SE of W02783, and is considered to be the same site.	21.4	9.6	1.7



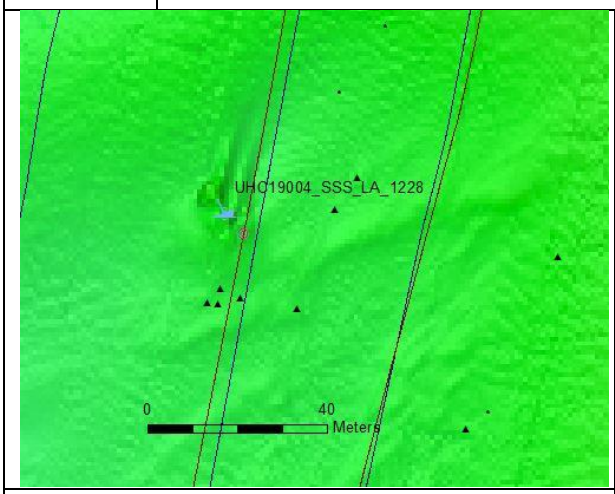
2019 survey summary of seabed at charted location



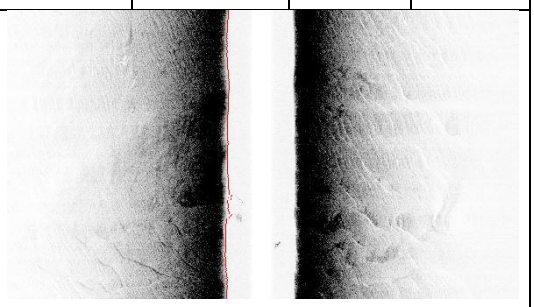
2019 sonar trace

Reference	UTM E	UTM N	Latitude		Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1228**	301131.0	5855739.7	52.814552		-5.950866	LA_W_016.003	50 m radius from centrepoint

	Description and comment	Length	Width	Height
	Wreck. Poorly defined, seabed scoured around it, magnetometer target 0089 associated, debris cluster recorded 17 m to the S, and other debris recorded 30 m E.	27.7	9.8	2.1



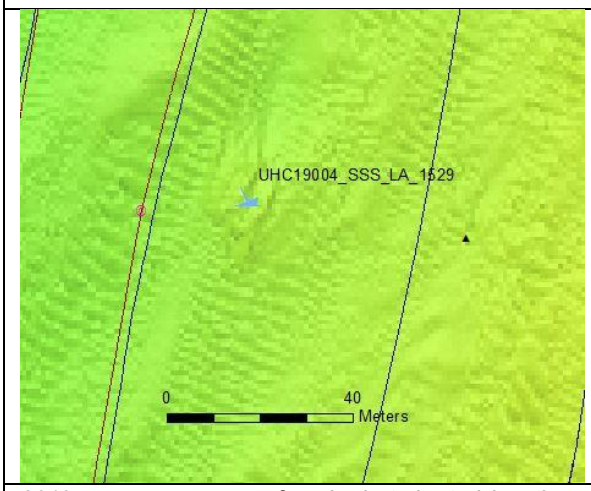
2019 survey summary of seabed at charted location



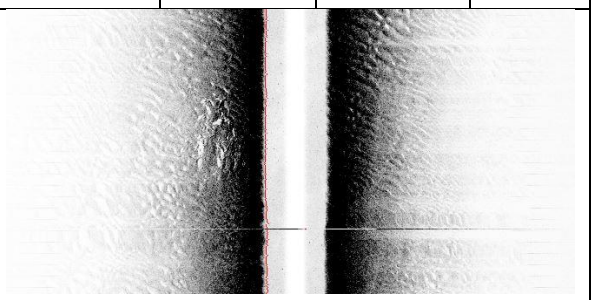
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1529**	301879.8	5858841.5	52.842724	-5.941741	LA_W_018.001	50 m radius from centrepoint

Description and comment	Length	Width	Height
Potential wreck. Poorly defined, seabed scoured around it, orientated NE/SW, magnetometer target MAG_0054 recorded on trackline 22 m to W.	27.3	14.5	1.0



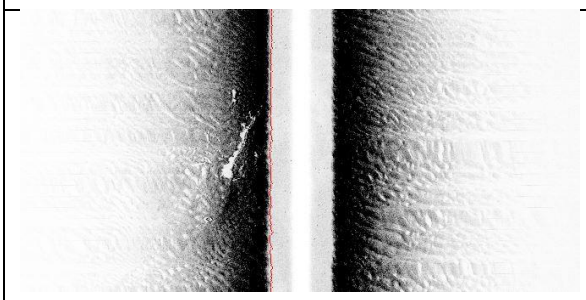
2019 survey summary of seabed at charted location



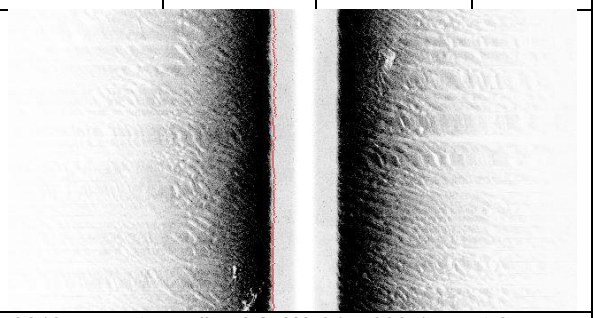
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1553**	301958.7	5859184.7	52.845832	-5.940864	LA_W_018.001	50 m radius from centrepoint

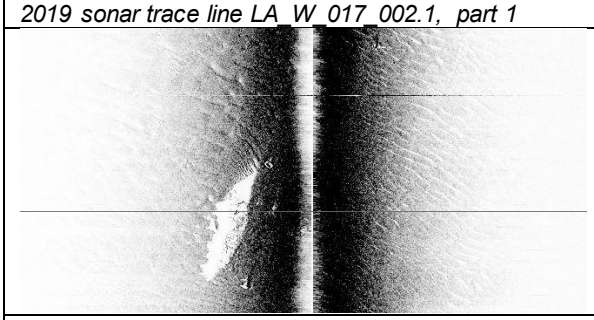
Description and comment	Length	Width	Height
Wreck. Well defined linear shape orientated NE/SW, corresponding magnetometer target MAG_0051 on survey line 12 m to the W. Debris recorded N, S and W of wreck close to it.	46.7	10.0	1.6



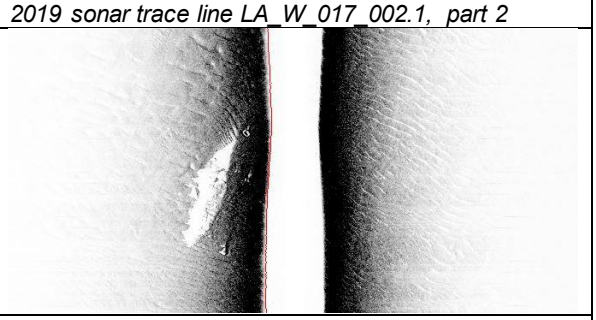
2019 sonar trace line LA_W_017_002.1, part 1



2019 sonar trace line LA_W_017_002.1, part 2



2019 sonar trace line LA_W_018_001, part 1



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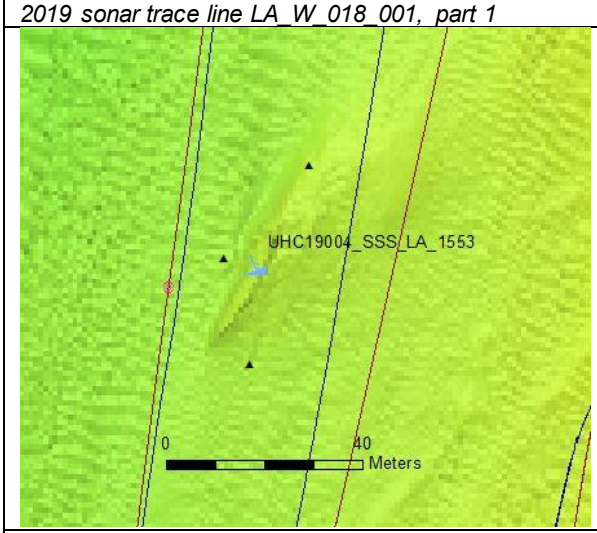
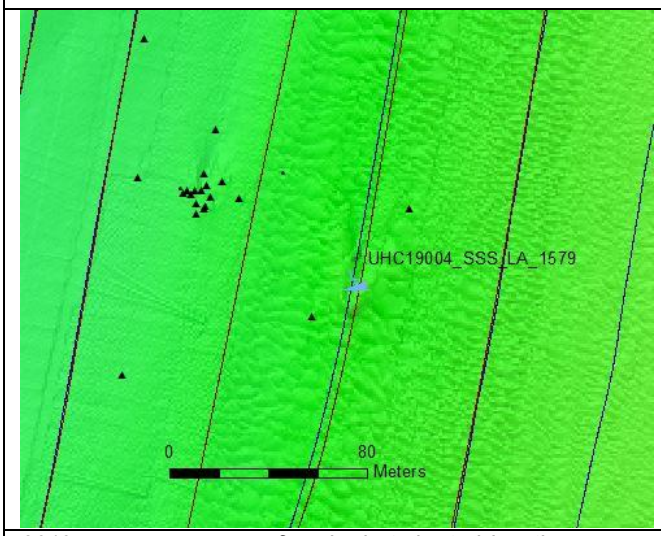


2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1579**	301747.9	5859529.9	52.848897	-5.944139	LA_W_011b	100 m radius from centrepoint

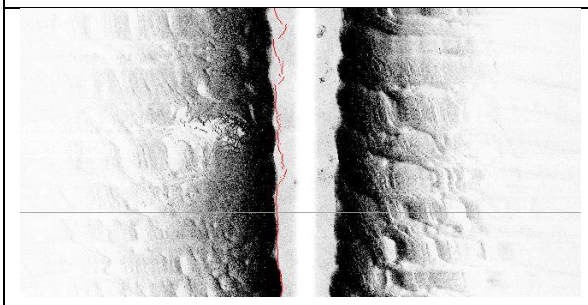
Description and comment	Length	Width	Height
Possible wreck site. Ill-defined at target location on sonar traces but depression indicated on multi-beam. A cluster of debris targets is recorded 70 m NW, occupying a 20 m E/W by 15 m N/S area, and is included as being within the footprint of this target.	45.7	13.2	1.4



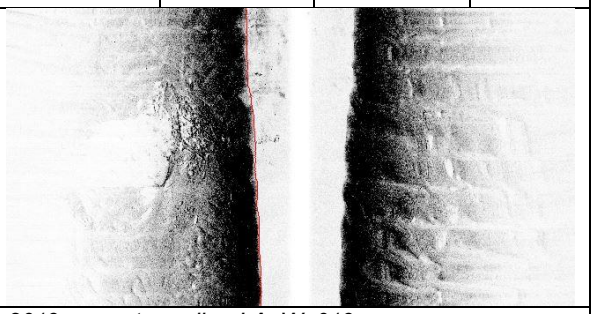
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_1602**	302148.4	5859608.3	52.849808	-5.938315	LA_W_019a	100 m radius from centrepoint

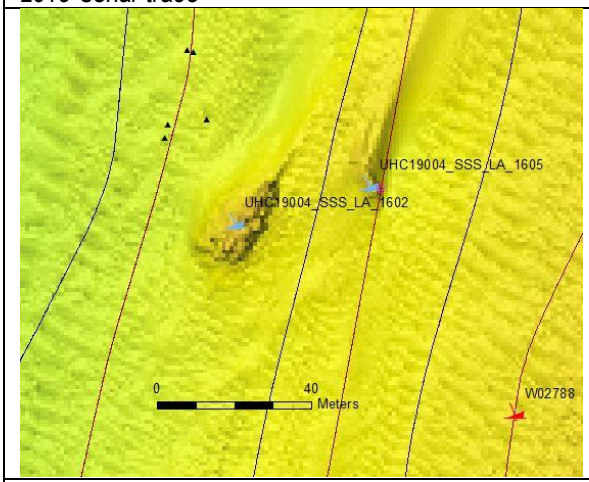
Description and comment	Length	Width	Height
Wreck. Well defined vessel indicating a broad shape with clear bow and stern. Orientated NE/SW, associated scour hollow around it and extending to NE. Debris recorded 33 m and 51 m to NW. 30 WSW of Wreck LA_1605.	23.8	5.8	5.3



2019 sonar trace



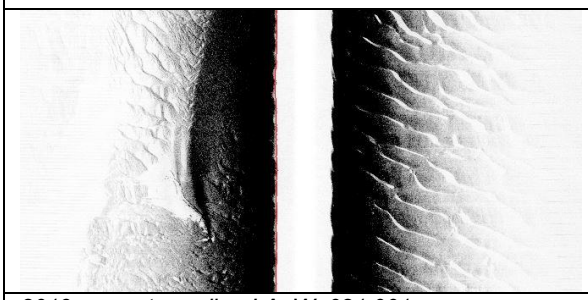
2019 sonar trace line LA_W_019a



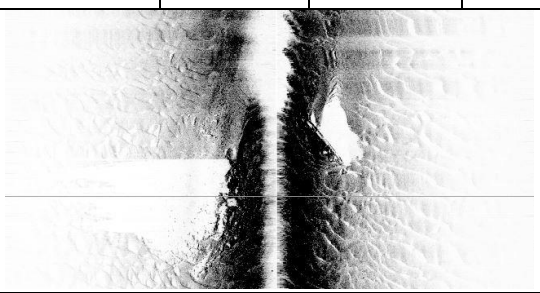
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1605**	302183.5	5859618.1	52.849909	-5.937801	LA_W_021.001	100 m radius from centrepoint

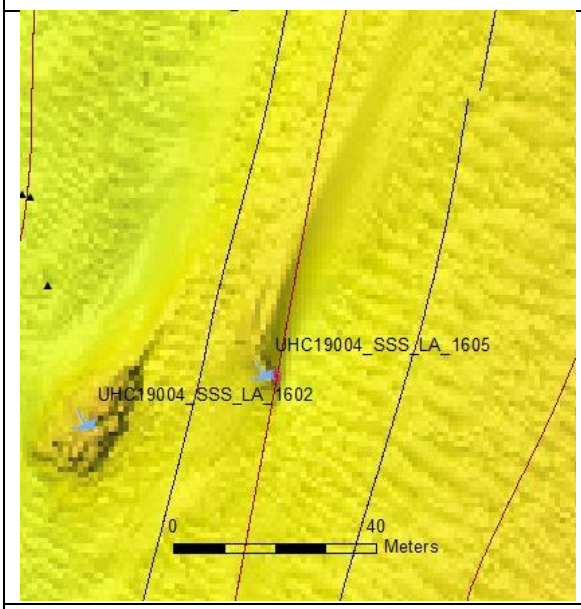
Description and comment	Length	Width	Height
Wreck. Well defined hull and probable bow, lying on its side, orientated N/S with bow to S. Magnetometer target 0048 directly associated with it. Scour hollow extends c. 100 m NE. 30 m ENE of Wreck LA_1602. 66 m NE of W02788. Considered to be the same site.	24.2	7.3	2.0



2019 sonar trace line LA_W_021.001



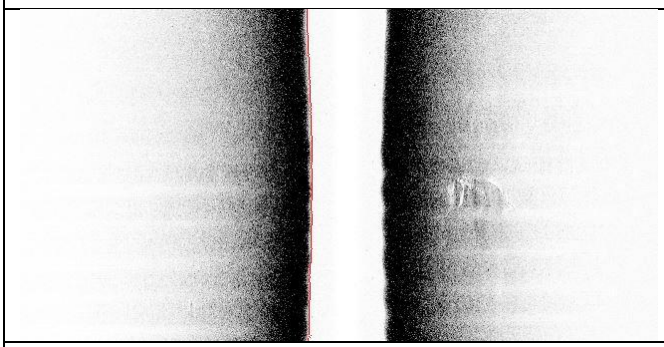
2019 sonar trace LA_W_020_001, Slant Range corrected



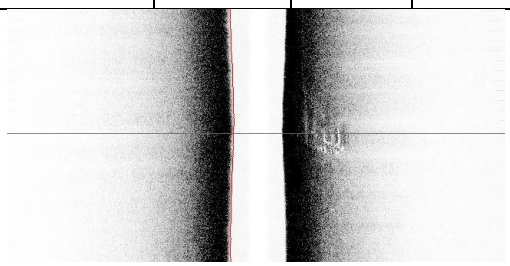
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1641**	301661.6	5859997.5	52.853034	-5.945782	LA_W_009.002	70 m radius from centrepoint

Description and comment	Length	Width	Height
Potential wreck. Poorly defined. Debris and boulders recorded up to 60 m from site.	13.8	5.9	0.4



2019 sonar trace line LA_W_009.002



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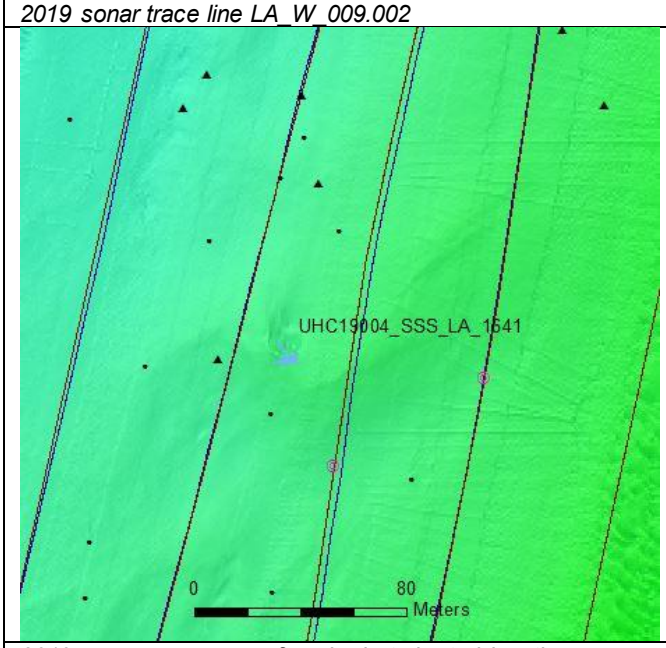
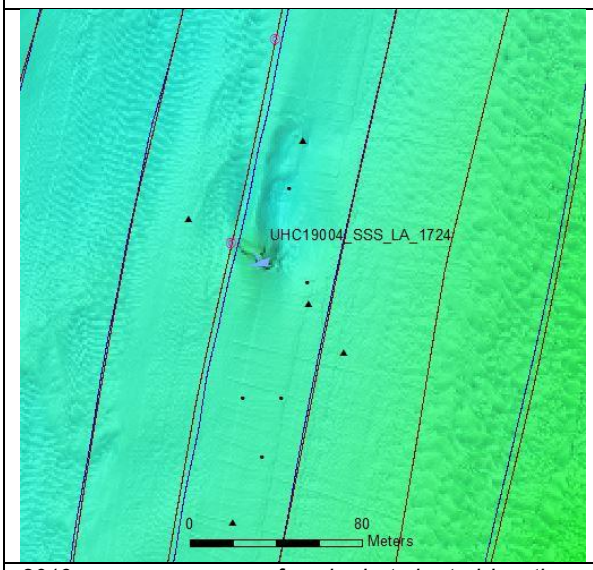


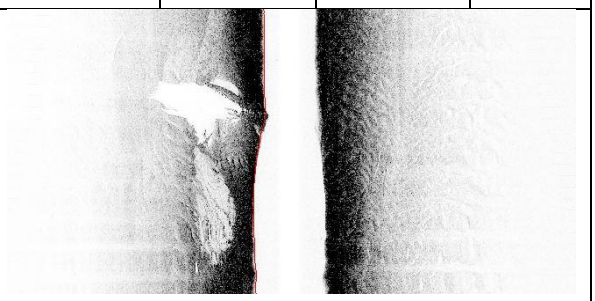
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1724**	301857.7	5860772.1	52.860152	-5.943248	LA_W_009.002	150 m radius from centrepoint

Description and comment	Length	Width	Height
Wreck. Well defined linear-shaped site with acoustic shadows on two sides, and scour hollow around the site and extending to the N from it in two channels. Orientated E/W. Magnetometer target MAG_0035 associated. Debris and boulders recorded N and S of the site, suggesting a debris trail that could reach 100 m N and 130 m S.	38.2	18.4	4.6



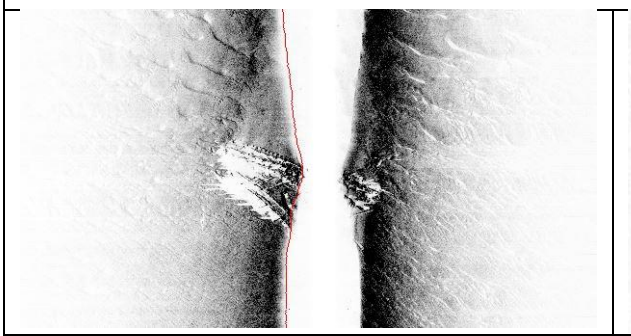
2019 survey summary of seabed at charted location



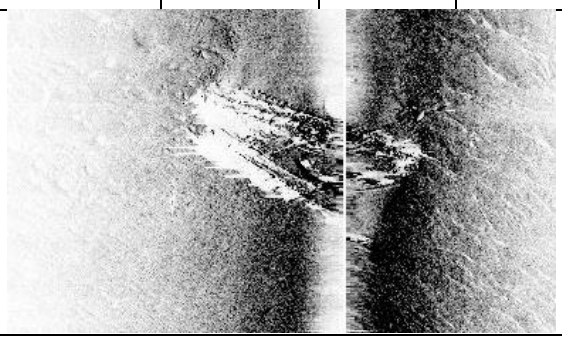
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1725**	302293.6	5860762.7	52.860104	-5.936854	LA_W_018.001	70 m radius from centrepoint

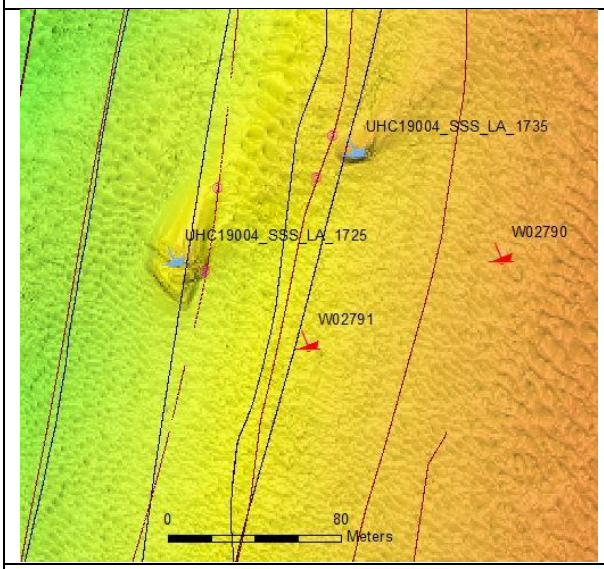
Description and comment	Length	Width	Height
Wreck. Well defined orientated WNW/ESE in scour hollow that extends NE. Sonar trace appears to show a line of strakes indicative of the vessel's frames. Magnetometer target MAG_0036 directly associated, with target MAG_0034 recorded 35 m N. Wreck LA_1735 lies 96 m NE. W02791 lies 73 m SE. Considered to be the same site.	39.2	17.6	3.1



2019 sonar trace



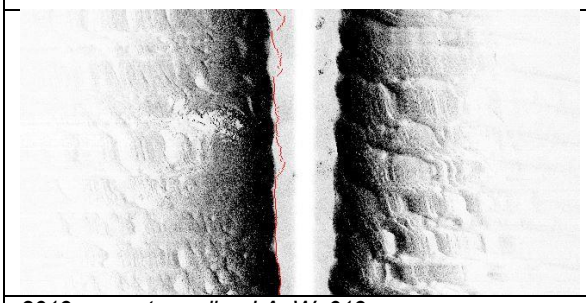
2019 sonar trace, slant range corrected and enlarged to give an improved 'plan view'



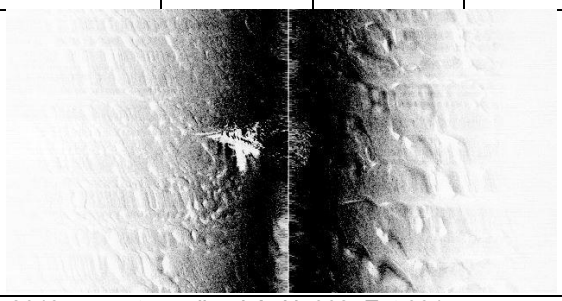
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_1735**	302377.6	5860813.4	52.860704	-5.935531	LA_W_019a	70 m radius from centrepoint

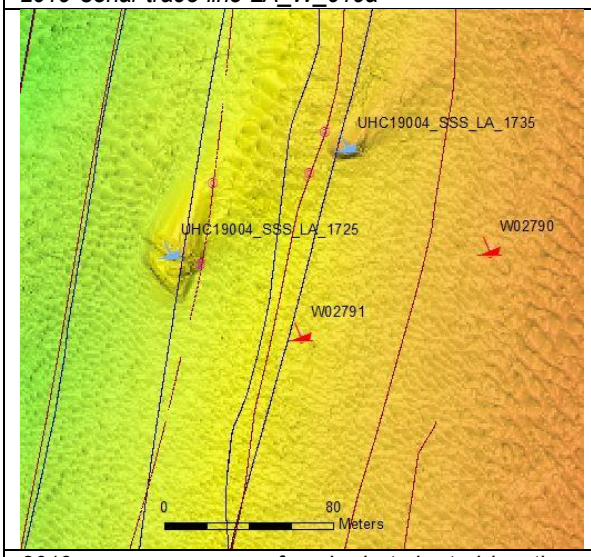
Description and comment	Length	Width	Height
Potential wreck. Poorly defined on sonar trace but occupying a well-defined scour hollow on the multibeam data set, with scour extending NE. Magnetometer targets MAG_0032 and MAG_0033 associated. Wreck LA_1725 lies 96 m SW. W02790 lies 78 m SE. Considered to be the same site.	28.1	8.1	2.5



2019 sonar trace line LA_W_019a



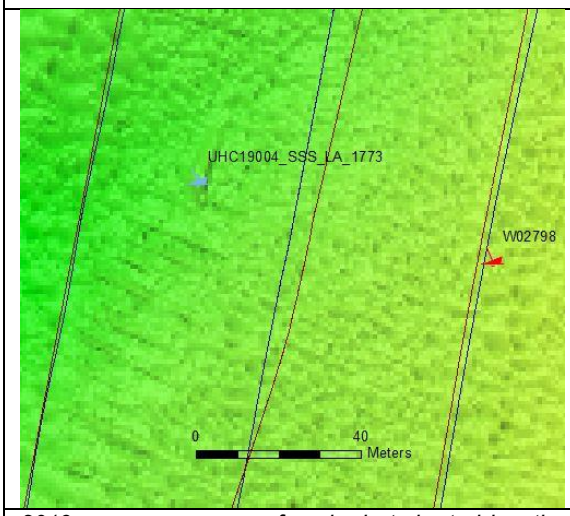
2019 sonar trace line LA_N_002_Ext.001



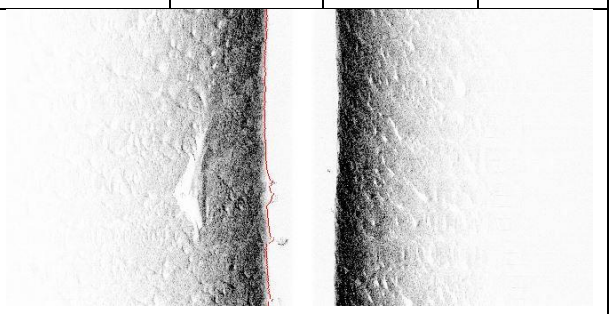
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_1773**	302380.4	5861763.2	52.869200	-5.936105	LA_W_016.006	50 m radius from centrepoint

Description and comment	Length	Width	Height
Potential wreck. Orientated N/S. W02798 lies 71 m ESE. Considered to be the same site.	22.1	4.6	1.9



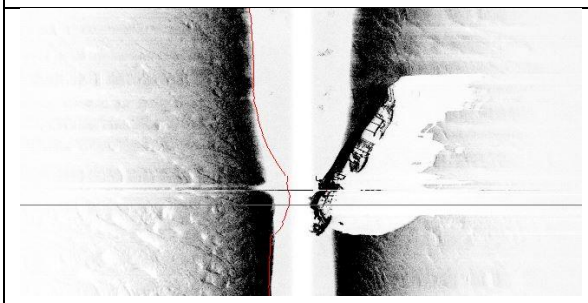
2019 survey summary of seabed at charted location



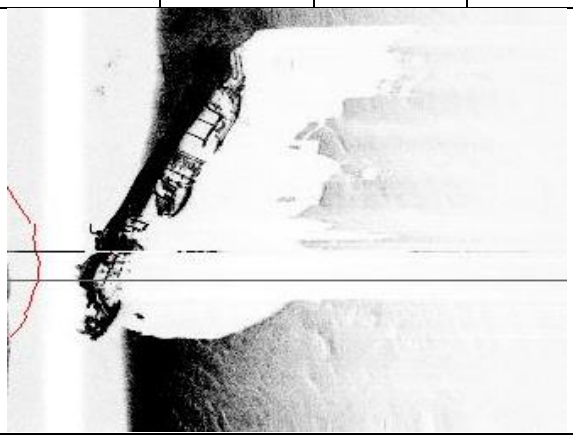
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **LA_3638**	300877.7	5846874.9	52.734925	-5.949330	LA_E_017.009	100 m radius from centrepoint

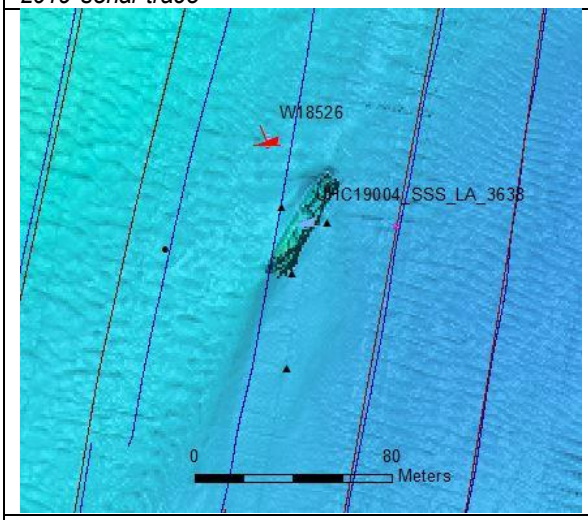
Description and comment	Length	Width	Height
Wreck, the *Anna Toop (SS)* Very well defined and well exposed large vessel, sonar trace records deck detail. Orientated NE/SW. Unclear which end is bow and stern. Magnetometer target MAG_0173 recorded 31 m E is associated. W18526 (cargo ship) is located 58 m SE and must be the same vessel. Debris recorded E and W close by, with more distant debris recorded 33 m S.	47.1	9.4	3.9



2019 sonar trace



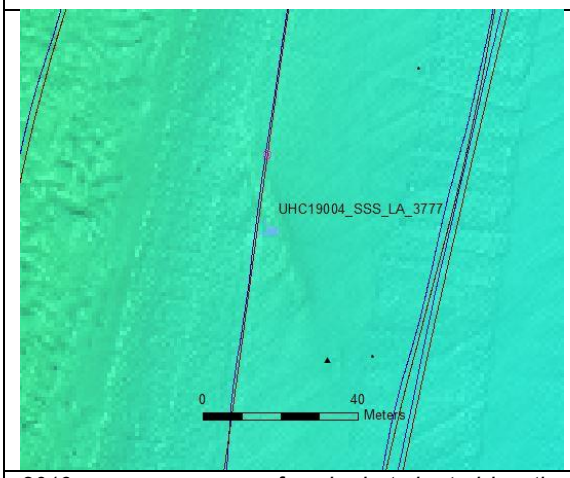
2019 sonar trace, enlarged



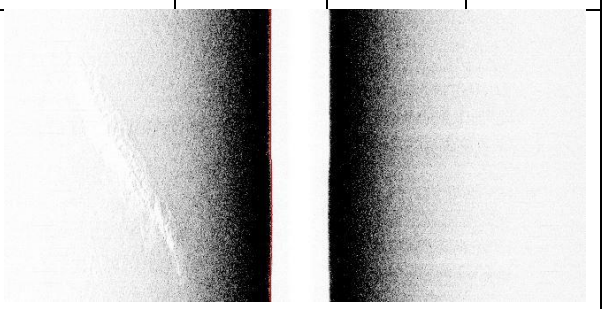
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**LA_3777**	302632.6	5855331.7	52..811537	-5.928631	LA_E_018	100 m radius from centrepoint

Description and comment	Length	Width	Height
Wreck. Defined as a narrow linear boat-shaped target, perhaps with some internal detail indicated. Magnetometer target MAG_0095 recorded at one end, debris recorded at other end, two boulders recorded 40 m and 65 m NE and debris 80 m S, suggesting a linear debris field N and S of vessel.	48.8	5.7	0.9



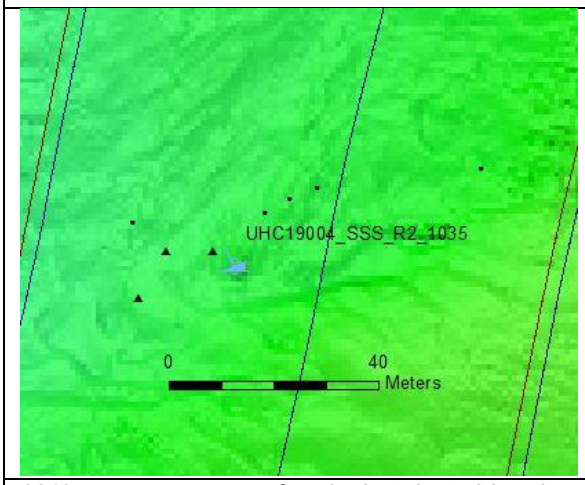
2019 survey summary of seabed at charted location



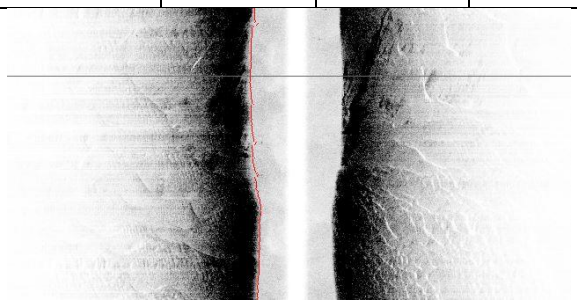
2019 sonar trace line LA_E_018_i1.0001

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**R2_1035**	300650.4	5853694.1	52.796034	-5.956860	R2B105	50 m radius from centrepoint

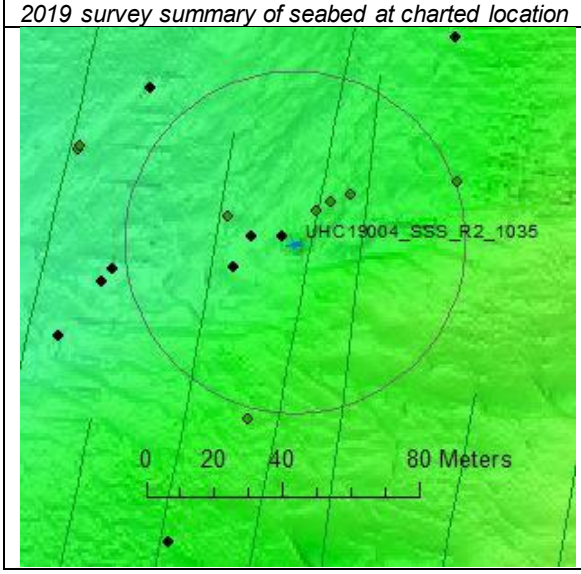
Description and comment	Length	Width	Height
Potential wreck. Debris and associated linear scour feature, and debris recorded extending 20 W in a linear fashion, with boulders recorded to E. The 2022 survey did not record any features at this location.	8.7	4.8	1.2



2019 survey summary of seabed at charted location



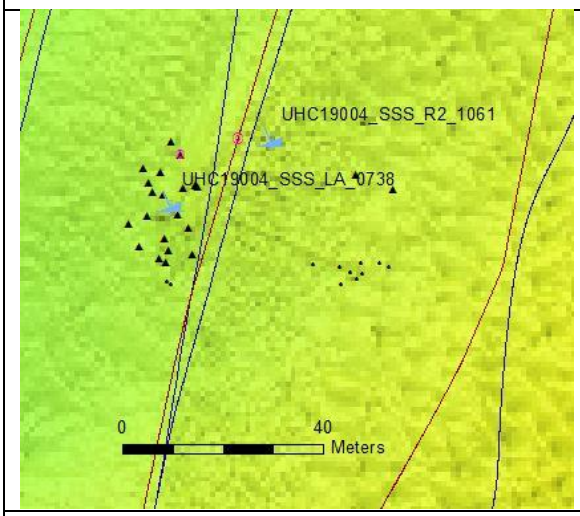
2019 sonar trace



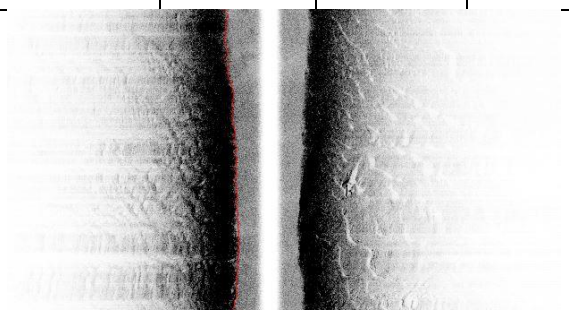
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 SSS survey lines. The targets recorded are those from 2019. No feature was recorded at this location in 2022

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_**R2_1061**	300809	5853387.7	52.793467	-5.954385	R2B108	50 m radius from centrepoint

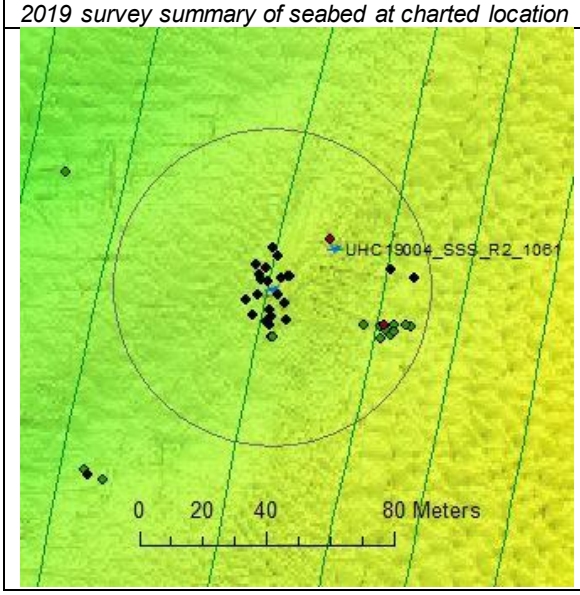
Description and comment	Length	Width	Height
Possible wreck or wreckage. Small target with magnetometer correlation (MAG_0135). 21 m NE of Wreck LA_0738. The 2022 survey recorded an acoustic contact (GR Contact 0000) at the location of R2_1061 and described it as debris.	5.4	1.3	0.8



2019 survey summary of seabed at charted location



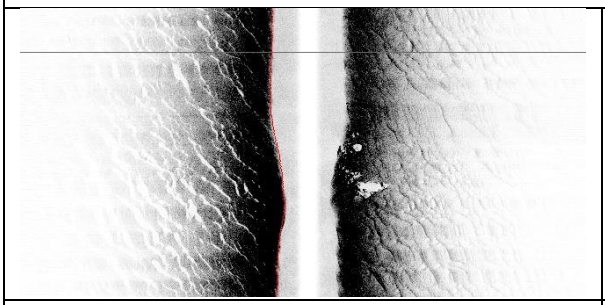
2019 sonar trace



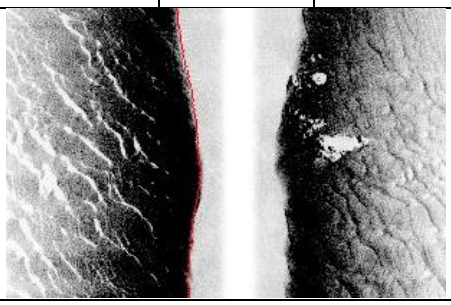
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 SSS survey lines. The targets in black (debris) are green (boulders) recorded are those from 2019, while the red targets are from 2022. The 2022 did not record a wreck at this location but rather debris

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
UHC19004_SSS_ **R2_1070**	300689.7	5853034.1	300689.7	5853034.1	R2B105	50 m radius from centrepoint

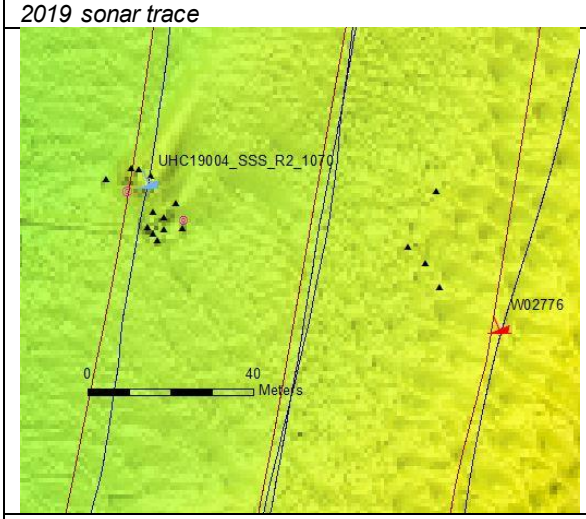
Description and comment	Length	Width	Height
Possible wreck. Debris cluster clearly defined over 20 m by 10 m area orientated NW/SE with two magnetometer targets MAG_0038, MAG_0272. Sonar trace recorded strongly defined V-shaped feature, indicative of a bow or stern. Scour pocket extends 40 m NE. W02776 lies 90 m to SE. The 2022 survey recorded an acoustic contact (GR Contact 0002) 7 m north of the wrecksite location recorded in 2019. Contact 0002 is described as debris, and is one item from a cluster of debris recorded in in 2019. The lack of exposed detail recorded in 2022 indicates the dynamic nature of the surface deposits, which appear to have all but buried the site exposed in 2019.	17.5	6.0	3.5



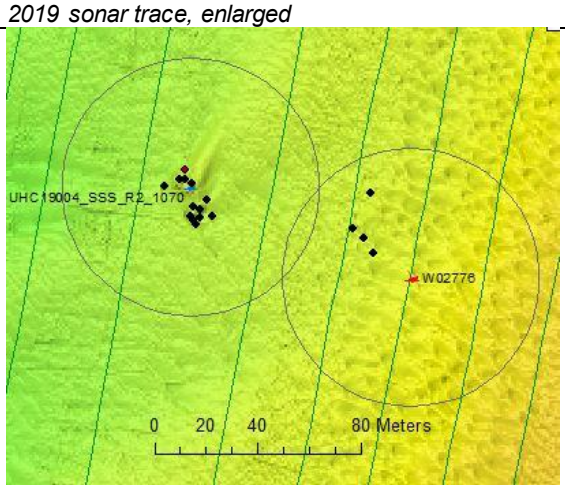
2019 sonar trace



2019 sonar trace, enlarged



2019 survey summary of seabed at charted location



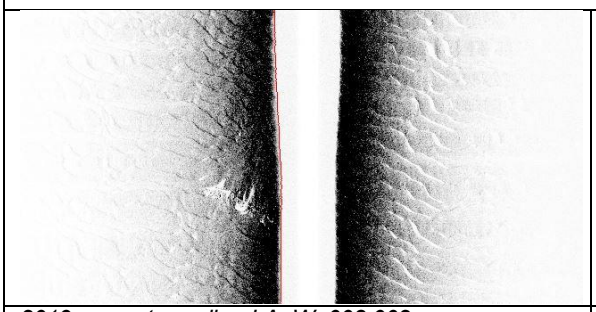
2022 survey results on 2019 multibeam bathymetry, showing AEZ and 2022 SSS survey lines. The targets in black (debris) are green (boulders) recorded are those from 2019, while the red target is from 2022. The 2022 did not record a wreck at this location but rather debris

8.3 Marine geophysical survey targets recorded by Ultrabeam and Alphamarine for SSE, and interpreted by ADCO as being potential additional shipwreck sites

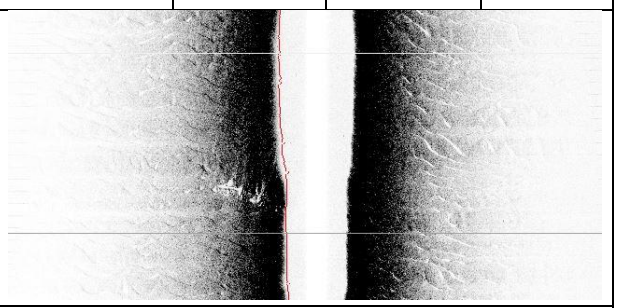
The reference ADCO# is an additional number sequence to distinguish new wreck sites or potential wreck sites based on ADCO's interpretation of the 2019 survey data. Where recorded as targets in the 2019 survey, the survey has given unique identifiers and considered the target to be a boulder, debris or other category. In some instances, the 2019 did not identify a target at the location proposed by ADCO.

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_1	302006.8	5861908.6	52.869963	-5.941015	LA_W_008.002	50 m radius from centrepoint

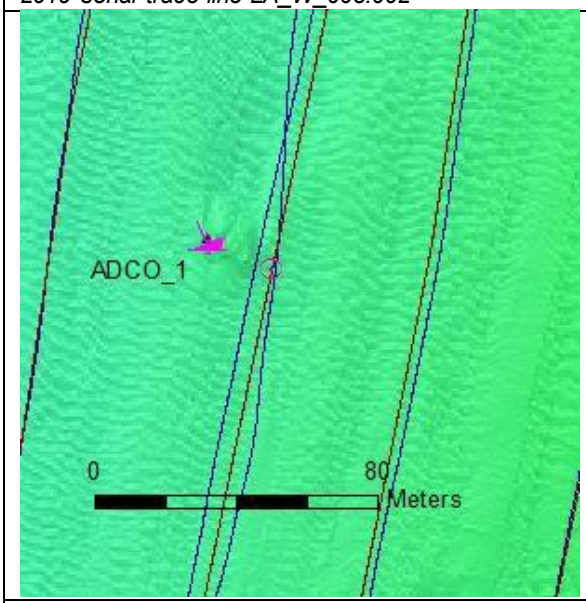
Description and comment	Length	Width	Height
Possible Wreck, comprising a linear feature that was identified in the 2019 survey as a debris target (UHC19004_SSS_LA_1781), and adjacent to magnetic anomaly MAG_0023.	18.0		



2019 sonar trace line LA_W_008.002



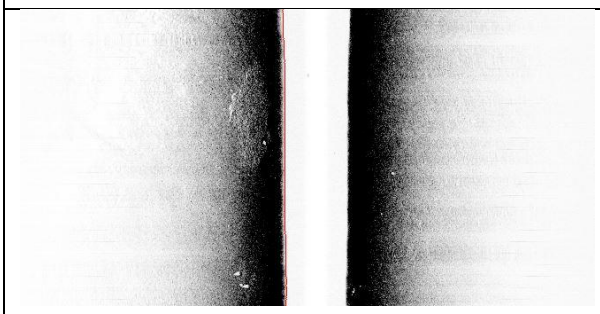
2019 sonar trace line LA_W_W_008c



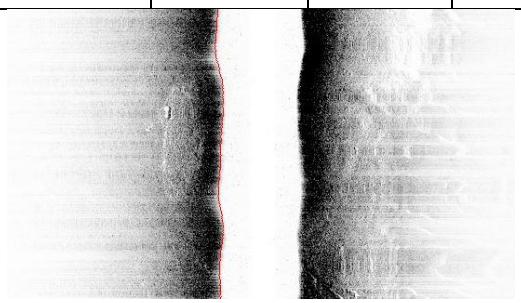
2019 survey summary of seabed at charted location

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_2	302356.0	5864716.0	52.895686	-5.938418	LA_W_003D.001; LA_W_004a.005	50 m radius from centrepoint

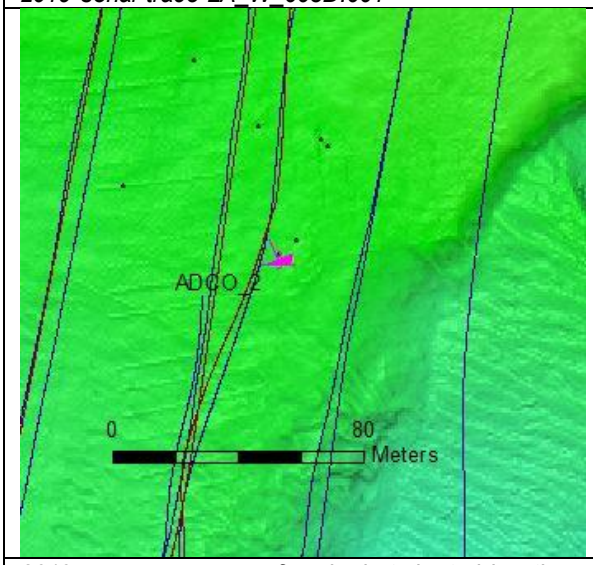
Description and comment	Length	Width	Height
Possible Wreck, boat-shaped feature in sandy/silt area with some boulders noted, one of which was identified in the 2019 survey as a boulder target (UHC19004_SSS_LA_1890).			



2019 sonar trace LA_W_003D.001



2019 sonar trace LA_W_004a.005

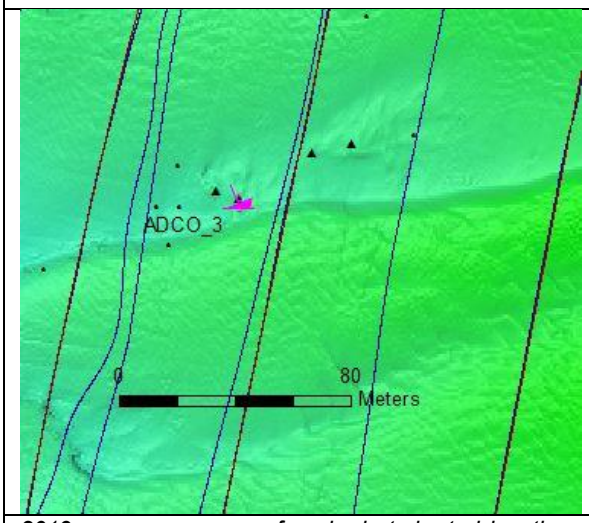


2019 survey summary of seabed at charted location

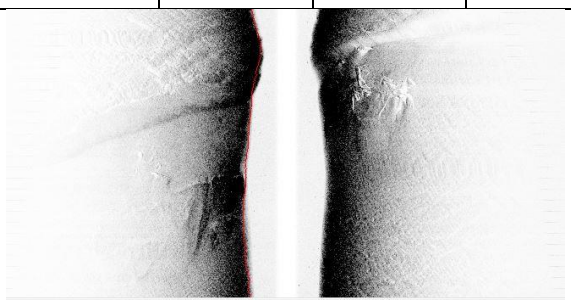
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_3	299390.0	5849702.0	52.759701	-5.973047	LA_W_005.005	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible Wreck, debris cluster and boat-shaped feature, extending over an area *c.* 50 m in diameter. The debris cluster was identified in the 2019 survey, UHC19004_SSS_LA_0331.			



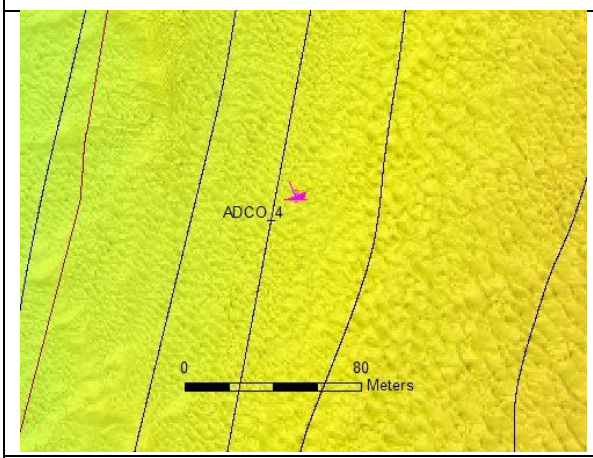
2019 survey summary of seabed at charted location



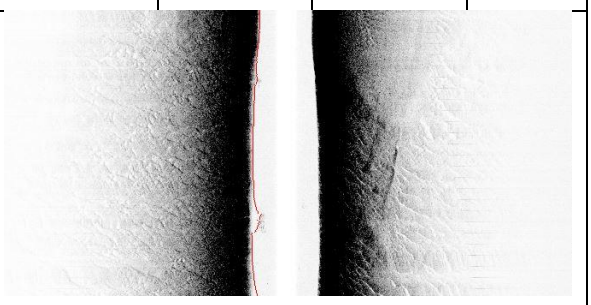
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_4	301617.0	5855788.0	52.815162	-5.943779	LA_W_16.004	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible Wreck, Linear feature with possible scour line extending NE. No target was identified at this location in the 2019 survey.	19.0		



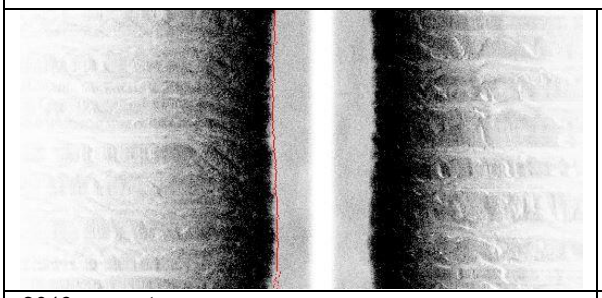
2019 survey summary of seabed at charted location



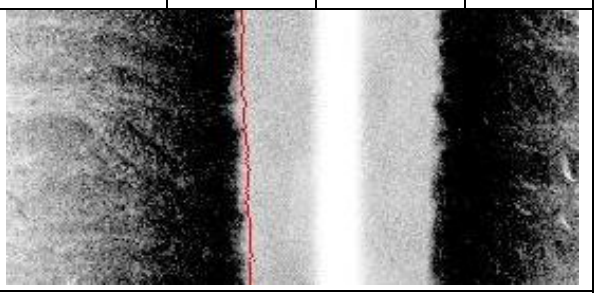
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_5	303808.0	5863958.0	52.889425	-5.916249	LA_E_006.001	50 m radius from centrepoint

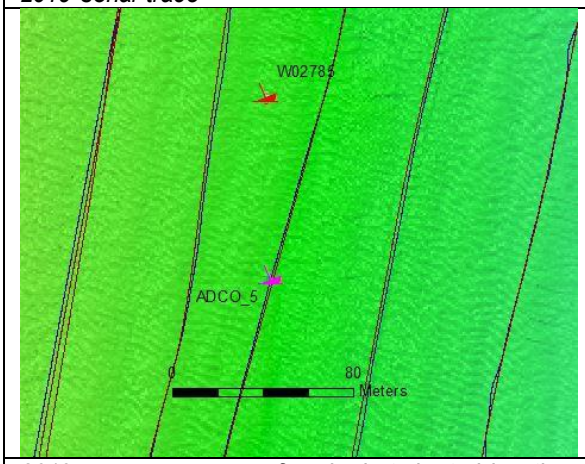
Description and comment	Length	Width	Height
Boat-shaped features 70 m SSE of W02785. No target was identified at this location in the 2019 survey.			



2019 sonar trace



2019 sonar trace, enlarged

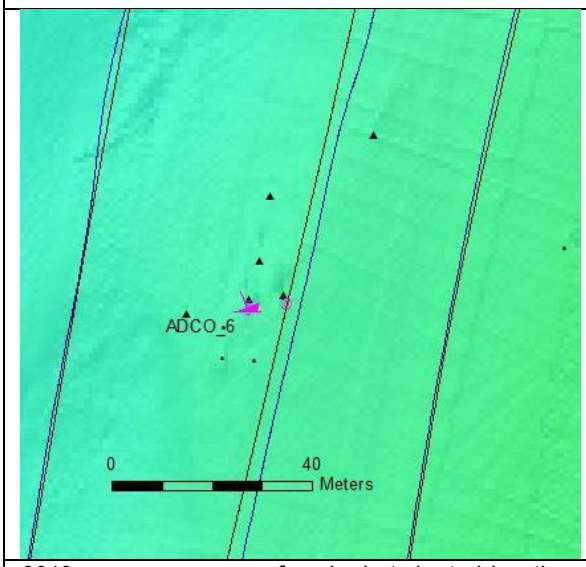


2019 survey summary of seabed at charted location

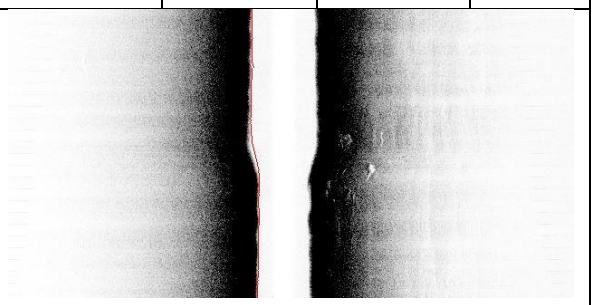
2019 sonar trace

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_6	301749.0	5860313.0	52.855942	-5.944838	LA_W_009.002	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible Wreck, cluster of magnetometer, debris and boulder targets extending over area 22 m E/W x 24 m N/S. Debris targets identified, centred on UHC19004_SSS_LA_1678 and LA_1679 and magnetometer target MAG_0041.			



2019 survey summary of seabed at charted location

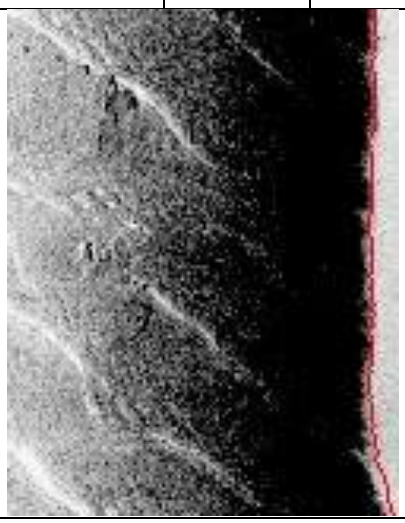


2019 sonar trace

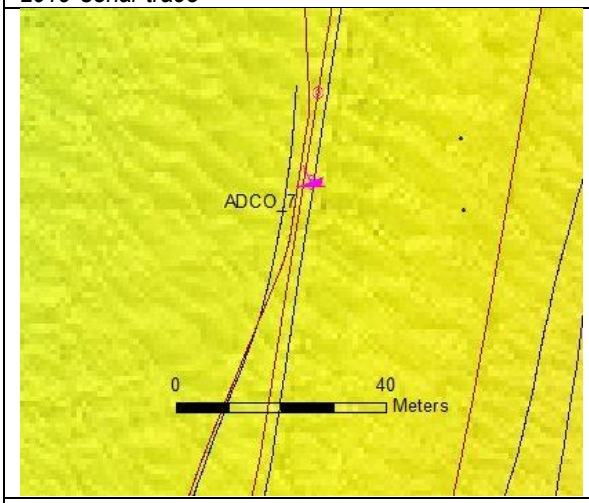
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
ADCO_7	299894.0	5849084.0	52.757778	-5.963333	LA_W_017.005	100 m radius from centrepoint

Description and comment	Length	Width	Height
The SSS trace of 2019 shows a defined boat-shaped feature aligned N-S, that is mostly buried. A magnetometer contact was recorded within 10 m of the site, target MAG_0023.	12 m		

2019 sonar trace



2019 sonar trace, enlarged

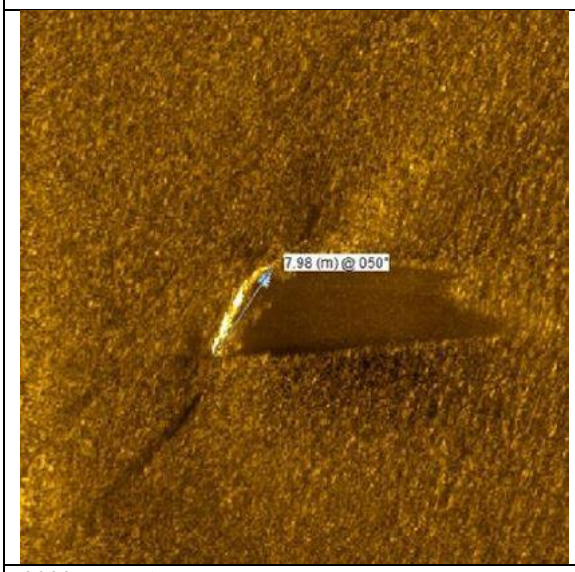


2019 survey summary of seabed at charted location

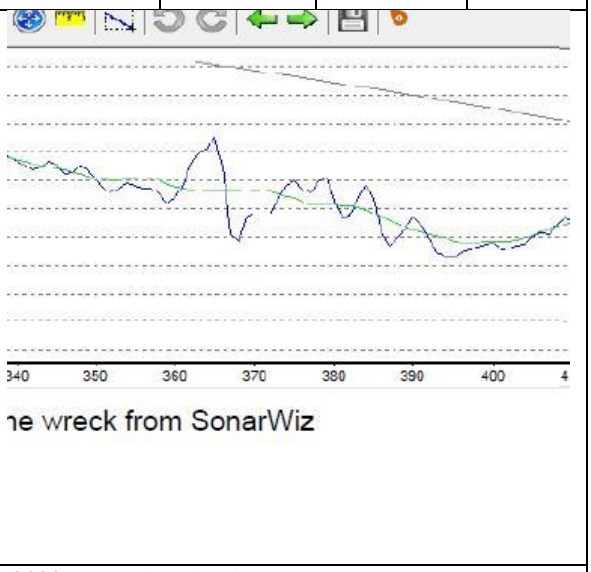
8.4 Marine geophysical survey targets recorded by Green Rebel in 2022 for SSE, and interpreted as being additional shipwreck sites

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_0001	295252.03	58524/32	52.838.36	-6.041444	n/a	50 m radius from centrepoint

Description and comment	Length	Width	Height
Possible wreck, boat-shaped anomaly aligned NE-SW, recorded on multibeam, SSS and magnetometer, at a depth of 16 m. Recorded during 2022 survey by Green Rebel for SSE during Export Cable Route survey that occurred *c*. 800 m south of and outside the 2019 survey area.	8 m	2 m	4.5 m



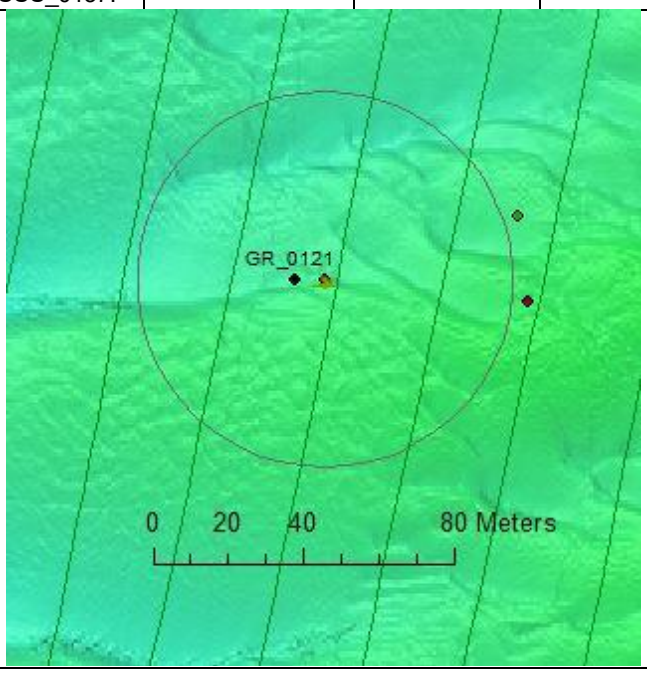
2022 sonar trace



2022 magnetometer trace

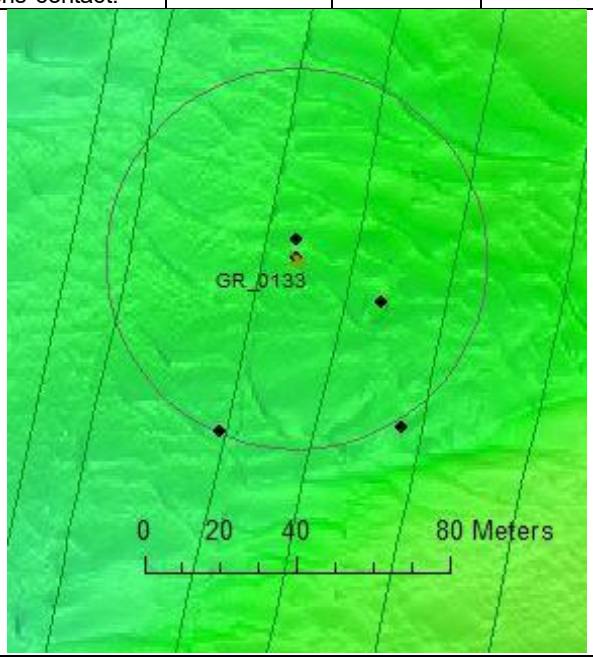
Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_0121	299831.4	5851542	52.77653	-5.96774	LK_1B_CR2B_12_ ABWP_10092022_1417.001	50 m radius from centrepoint

Description and comment	Length	Width	Height
Observed in area of sand ripples, the target recorded in 2022 as a wreck site lies 7 m east of a features described as debris in 2019. The location is 150 m NW of GR_SSS_0137.	33.4	2.6	2.5

SSS data trace was not available	
2022 sonar trace	*2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. Targets in green (boulders) and black (debris) were recorded in 2019*

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_0133	299997.7	5851443	52.77571	-5.96521	LK_1B_CR2B_19_11092022_0914.002	50 m radius from centrepoint

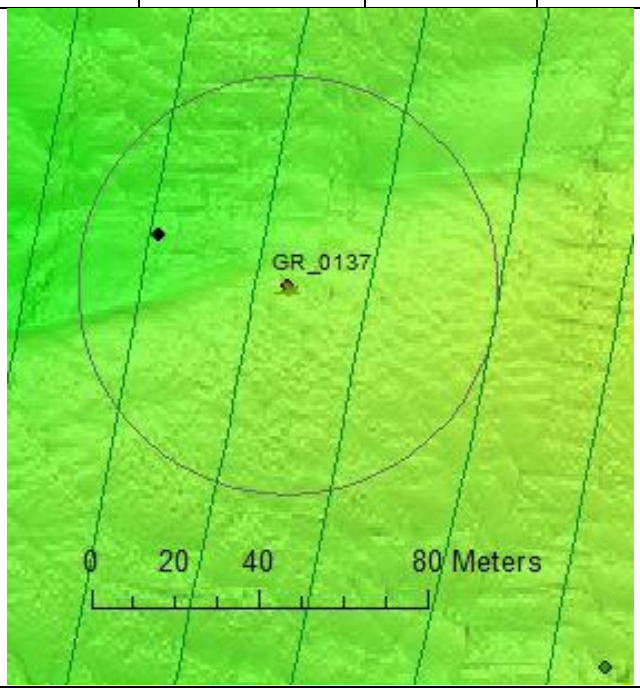
Description and comment	Length	Width	Height
Wreck site recorded in 2022, lying 4 m south of contact described as debris in 2019, and 24 m northwest of another debris contact.	13.7	2.1	0.7

SSS data trace was not available	
2022 sonar trace	*2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. Targets in black (debris) were recorded in 2019*

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_0137	300157.6	5851424	52.77559	-5.96283	LK_1B_CR2B_25_ ABWP_12092022_1203.001	50 m radius from centrepoint

Description and comment	Length	Width	Height
Wreck site recorded in 2022, lying 32 m southeast of contact described as debris in 2019.	20.8	4.4	1.3

SSS data trace was not available

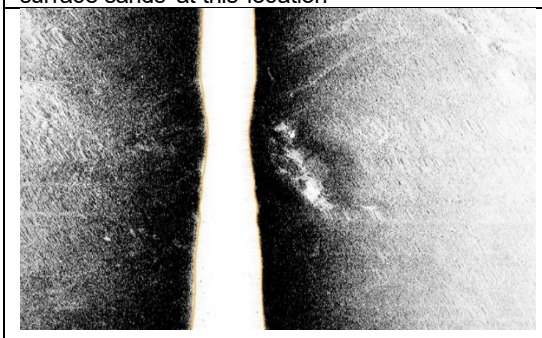


2022 sonar trace

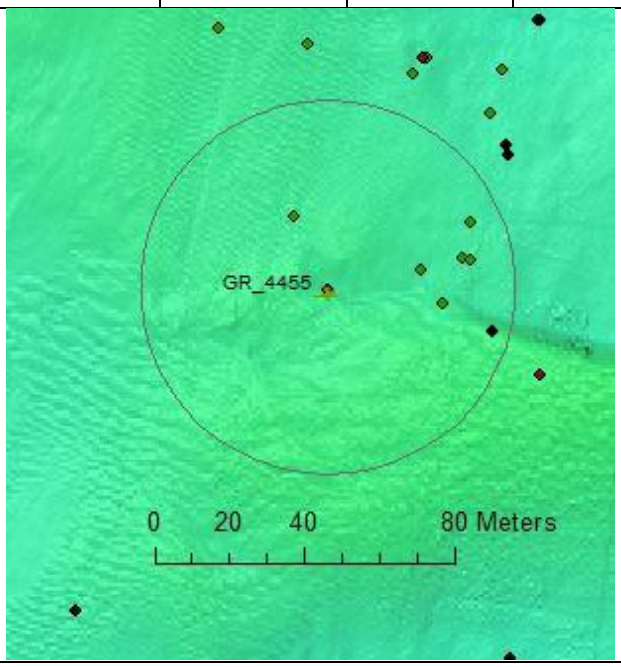
2022 survey results on 2019 multibeam bathymetry, showing AEZ, 2022 SSS survey lines. Targets in black (debris) were recorded in 2019

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_4455	300397.9	5853858	52.79753	-5.96076	GRM_22G03_RR_1A_CR2B_13_ABWP_20220912-2128	50 m radius from centrepoint

Description and comment	Length	Width	Height
The location is approximately 160 m W of GR_SSS_4457, and located at the crest of a sand ripple. The 2019 survey recorded a larger series of boulders to the north and east of the site than were recorded in 2022, suggesting the dynamic nature of the surface sands at this location	54.52	16.41	0.51



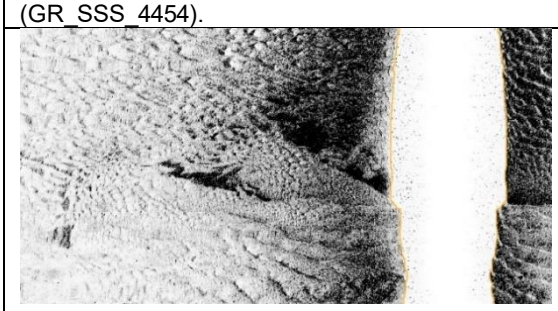
2022 sonar trace



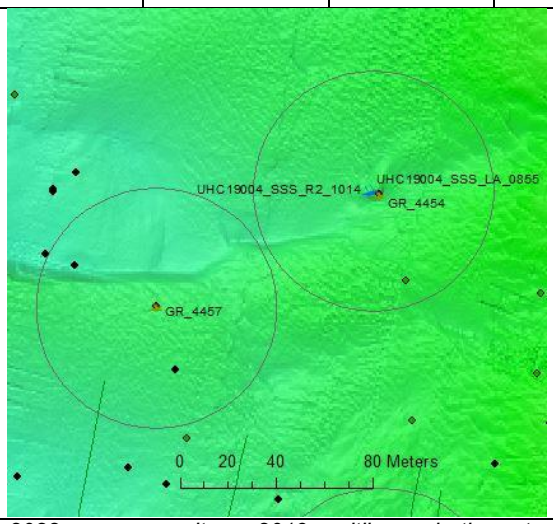
2022 survey results on 2019 multibeam bathymetry, showing AEZ, with 2019 targets in green (boulders) and black (debris) and 2022 targets (in red)

Reference	UTM E	UTM N	Latitude	Longitude	Survey Line/s	Exclusion Zone
GR_SSS_4457	300557.1	5853819	52.79725	-5.95838	GRM_22G03_RR_1A_CR2B_17_ABWP_20220913-0046	50 m radius from centrepoint

Description and comment	Length	Width	Height
Low-lying linear features suggestive of lying on its side with former deck area facing north, partially exposed 10 m south of a sand ripple crest. Located 100m WSW of LA_0855 (GR_SSS_4454).	20.3	056	2.11



2022 sonar trace. The wreck is located in the lower left corner of the image.



2022 survey results on 2019 multibeam bathymetry, showing AEZs and 2022 targets (in red). The 2022 survey recorded the wreck just south of the crest of sand ripple

Plate 1: The wrecking of the Royal Mail steam barque, Armenian, on 25th January 1865, as recorded in the Illustrated London News (Wreck W02658). Source: K. Brady, Shipwreck Inventory of Ireland, p. 477.

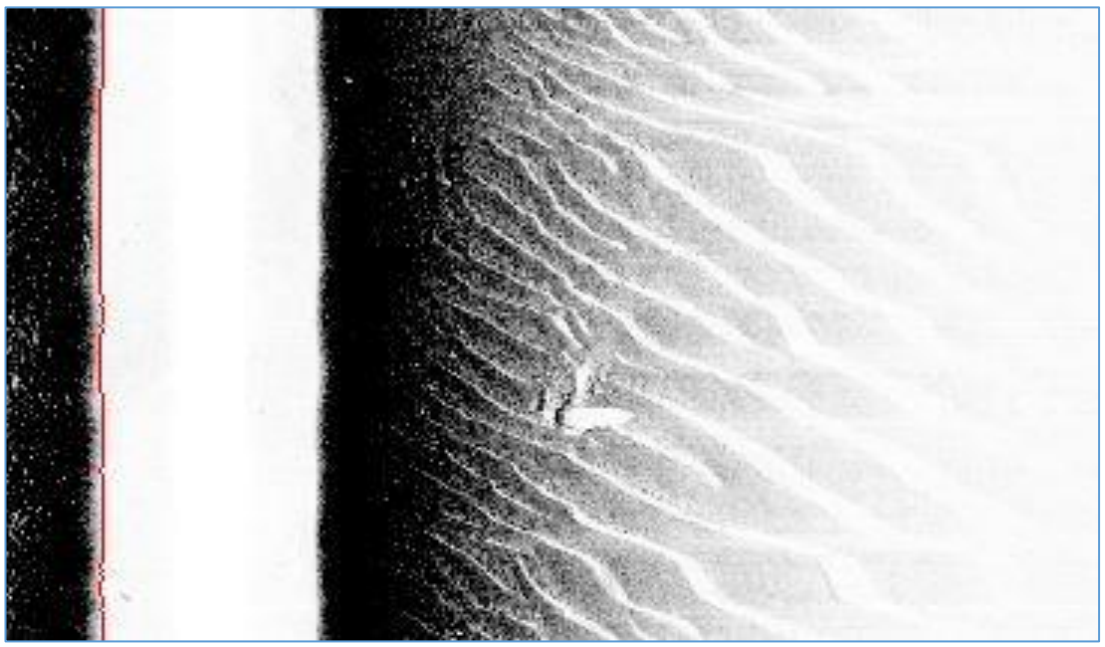


Plate 2: Typical target recorded as a boulder, Target LA_1937. Survey line LA_W_011d.001.

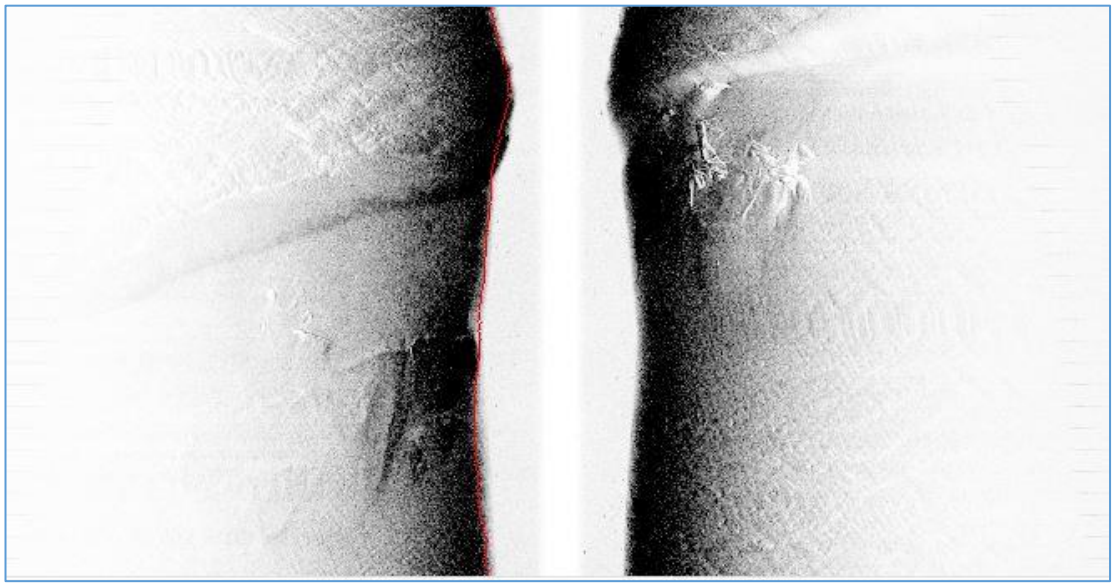


Plate 3: Debris Target LA_0331 showing on the right side of the sonar trace as an erratic assortment of linear elements. In this instance, the sonar feature on the left side of the sonar trace is also of interest but was not recorded as a target in the 2019 survey. The combination of these elements suggests the presence of an unrecorded shipwreck site, referred to as ADCO_3. Survey line LA_W_005_005_

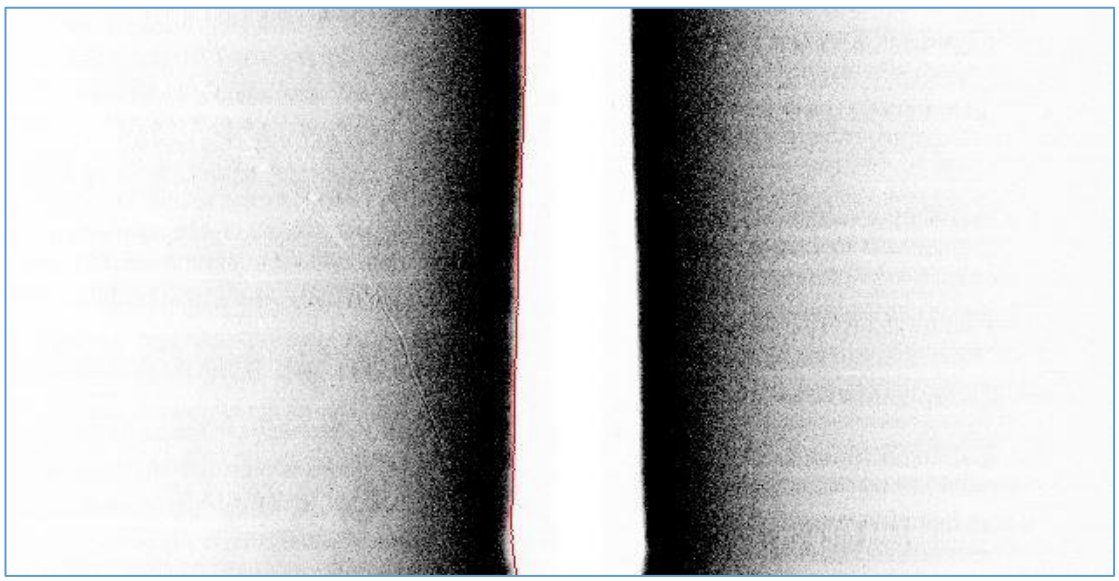


Plate 4: Linear target identified as fishing gear. Targets LA_4097, LA_4099, LA_4100, LA_4102. Survey line LA_E_018.i3.

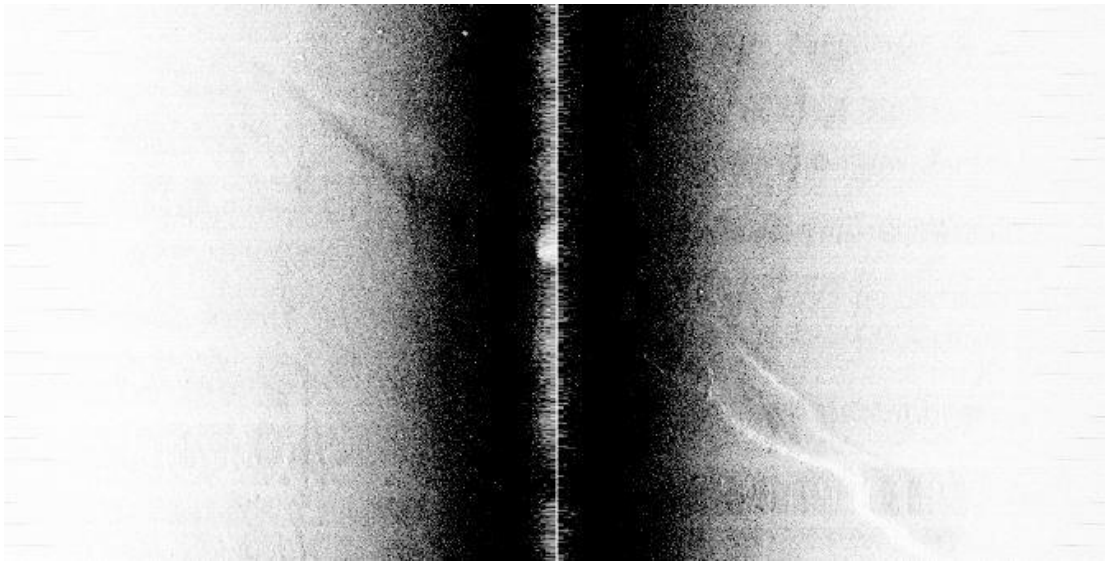


Plate 5: Sonar trace showing the existing export cable from the windfarm that can be recorded in several instances. Survey line LA_W_003E.003.

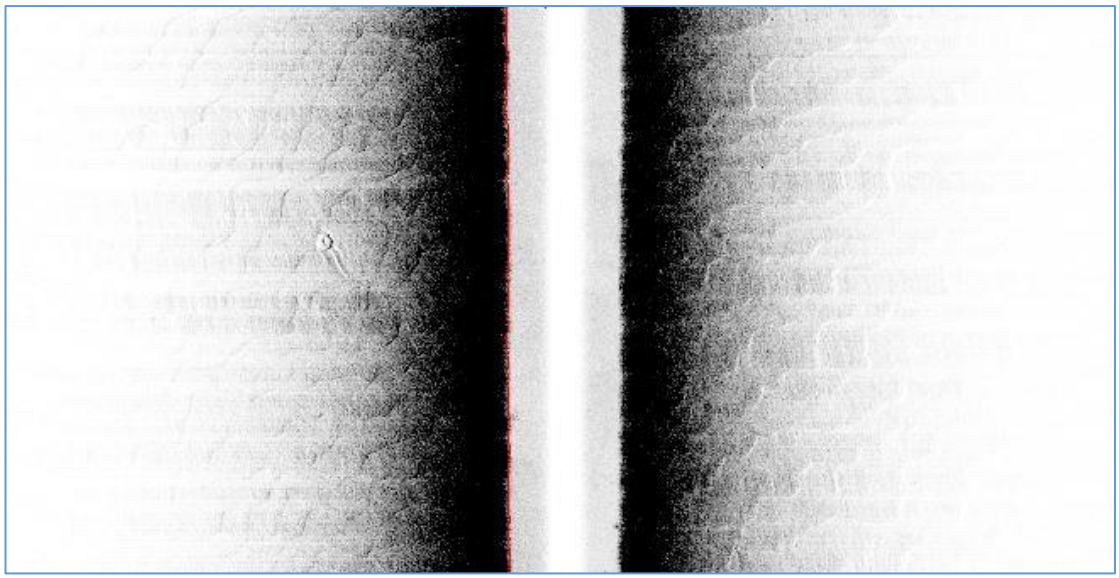


Plate 6: Example of one of three possible unexploded ordnance features recorded on the sonar traces. Target R1_0595. Survey line R1B103.001.

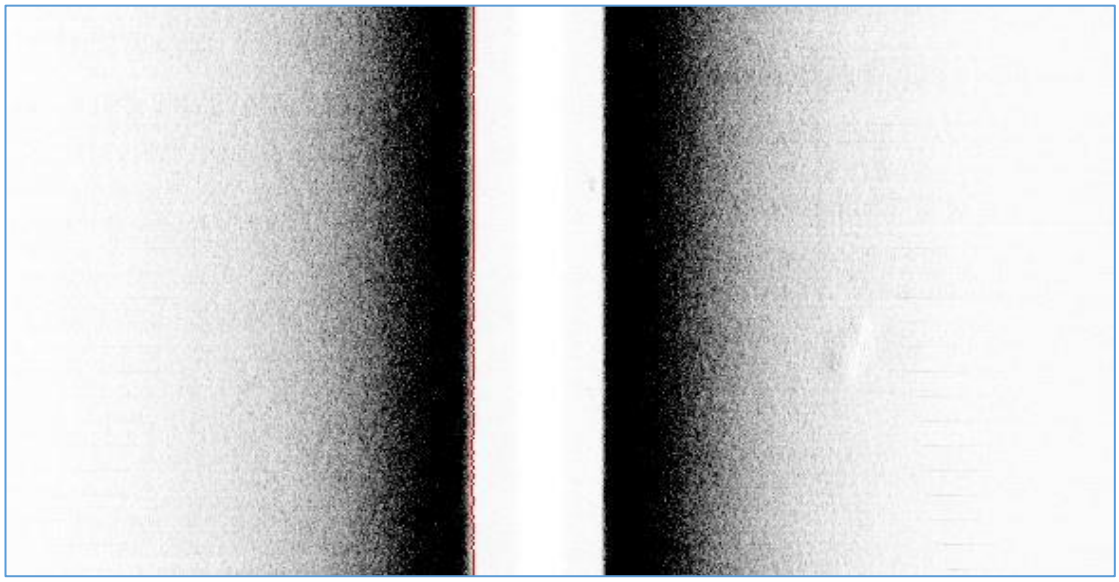


Plate 7: Example of one of two mound features recorded on the sonar traces (on right side of sonar trace). Target LA_01557. Survey line LA_W_006.007.