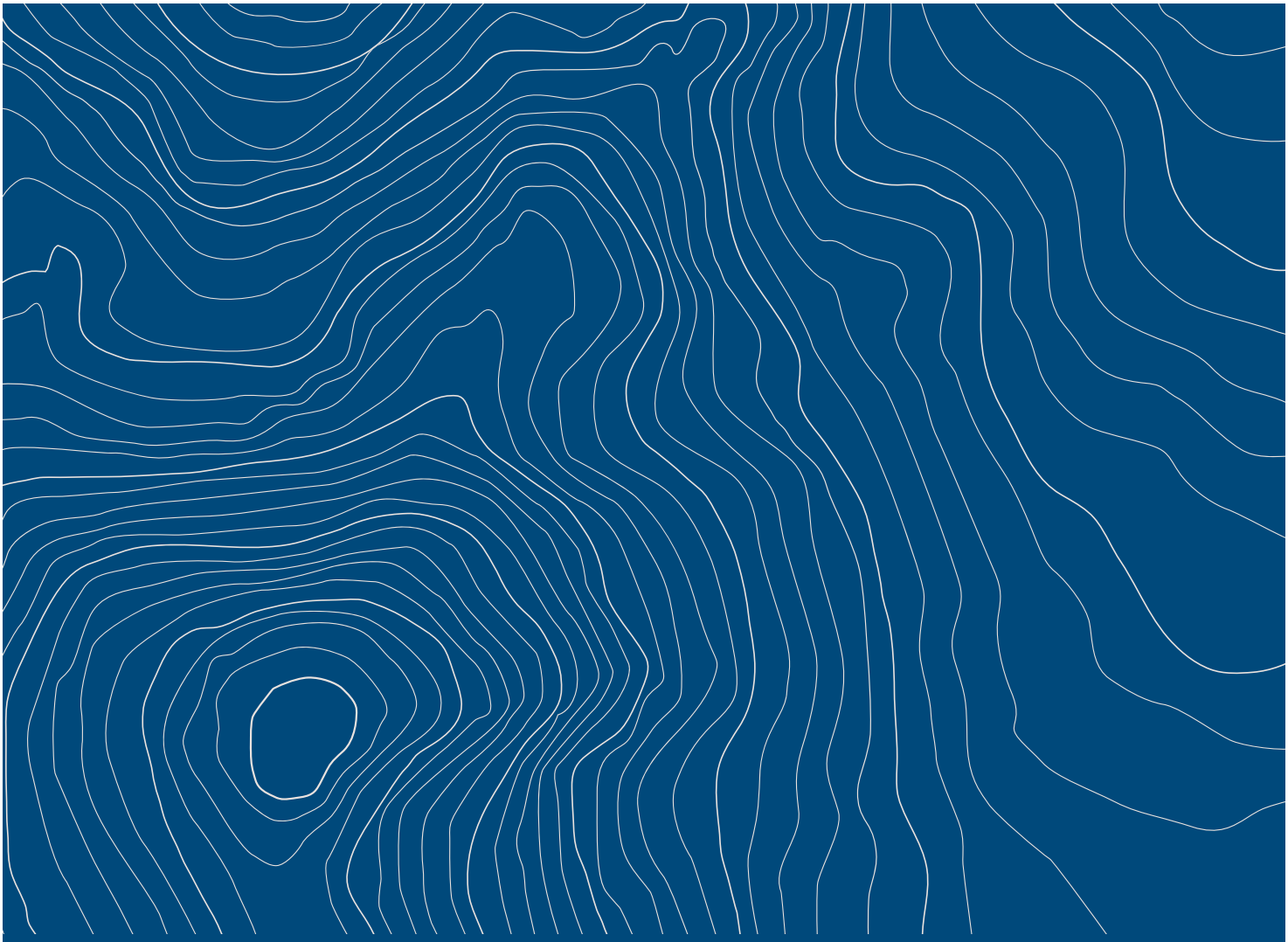

Dublin Array
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EIAR Volume 4: Offshore Infrastructure Technical Appendices Appendix 4.3.13-3 Geophysical Survey 2021 Archaeological Report to support Detection Device Licence 21R0027

Kish Offshore Wind Ltd

RWE SLR GoBe
APEM Group

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Dublin Array Offshore Wind Farm

Geophysical Survey 2021: Archaeological Report

Detection Device Licence 21R0027

Date: March 2022

Revision: 0.2

Revision	Prepared	Checked	Approved
0.1 (Internal)	LN Maritime Archaeology	CH Maritime Archaeology	
0.2	LN Maritime Archaeology	CH Maritime Archaeology	

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Acronyms

Term	Definition
AEZ	Archaeological Exclusion Zone: areas where archaeological receptors are present and should be avoided during project works
APOS	Acoustic Position Operator Station
BIIS	British-Irish Ice Sheet
BP	Before Present
BS	Backscatter
BSB	Below seabed
CD	Chart Datum
DTM	Digital Terrain Model
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
GNSS	Global Navigation Satellite System
HC	Heritage Council
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
ISB	Irish Sea Basin
ISIS	Irish Sea Ice Stream
kHz	Kilohertz
LGM	Last Glacial Maximum
MA	Maritime Archaeology Limited
MAG	Magnetometer
MBES	Multi-Beam Echo Sounder
MHWS	Mean High Water Springs
MRU	Motion Reference Unit
NMI	National Museum of Ireland
nT	Nanotesla
OD	Ordnance Datum
OSL	Optically Simulated Luminescence
RSL	Relative Sea-Level
SBP	Sub-Bottom Profiler
SMR	Sites and Monuments Record
SSS	Side Scan Sonar

UAU	Underwater Archaeological Unit
UHRS	Ultra-High Resolution Seismic
UKHO	United Kingdom Hydrographic Office
USBL	Ultra-Short Baseline
WIID	Wreck Inventory of Ireland Database

1 Introduction

1.1 Overview

1.1.1 Maritime Archaeology Ltd (MA) have been commissioned by Renewables Ireland Limited (RWE) (previously innogy) and Saorgus Energy Ltd (hereafter the Applicant) to undertake a marine archaeological assessment of geophysical data collected up to mean high water springs (MHWS), for Dublin Array Offshore Windfarm (Dublin Array). The collection of geophysical data was conducted under Detection Device Licence 21R0027 and Foreshore Licence FS007029.

1.2 Purpose of this report

1.2.1 The purpose of this Geophysical Report is to present the results from the geophysical survey undertaken in 2021 under the Detection Device Licence (21R0027) and Foreshore Licence FS007029. Note that the determination of sensitivity of the receiving environment to the construction, operation and maintenance, and decommissioning of Dublin Array, the magnitude of the effect, and the overall significance of each effect will be presented within the relevant chapter of the Environmental Impact Assessment Report (EIAR), Volume 3 Chapter 13: Marine Archaeology.

1.2.2 The aim of this report is to identify known or potential marine archaeological receptors within the subtidal Foreshore Licence area following geophysical data collection and provide a baseline assessment of the archaeological potential of the area.

1.2.3 The key objectives for this assessment are to:

- Undertake a review of known and potential archaeological receptors within the Foreshore Licence area;
- Undertake an assessment of the site-specific geophysical data for known and potential archaeological receptors within the Foreshore Licence area; and
- Summarise the environmental context and identify deposits of archaeological potential.

1.3 Report structure

1.3.1 This report is structured as follows:

- Section 1 introduces the report and outlines its aims;
- Section 2 presents the methodology and data sources applied to characterise the marine archaeology baseline;
- Section 3 outlines the archaeological baseline;
- Section 4 makes recommendations for how to mitigate potential impact on archaeological receptors;

- Section 5 is references; and
- Section 6 includes annexes that outline all known, unknown, and uncharted wrecks, and all geophysical targets identified.

2 Methodology

2.1 Approach

2.1.1 The following section sets out the methods followed for the collation of data for the baseline assessment and the site-specific surveys that were undertaken to characterise the known and potential marine archaeology receptors within the Foreshore Licence area under the Detection Device Licence (21R0027). Detailed methodology for the assessment is presented below.

2.2 Geophysical survey extent

2.2.1 The geophysical survey extent falls within the Foreshore Licence area and covers the planned location for Dublin Array and areas of search for export cable routes to shore (Figure 1). The geophysical data collected includes Side Scan Sonar (SSS), Multi-beam echo sounder (MBES), Magnetometer (MAG), and Sub-Bottom Profiler (SBP) data. Within the Foreshore Licence area all known wrecks and sites, as well as documented losses, have been included in the baseline assessment using the datasets outlined in Table 1.

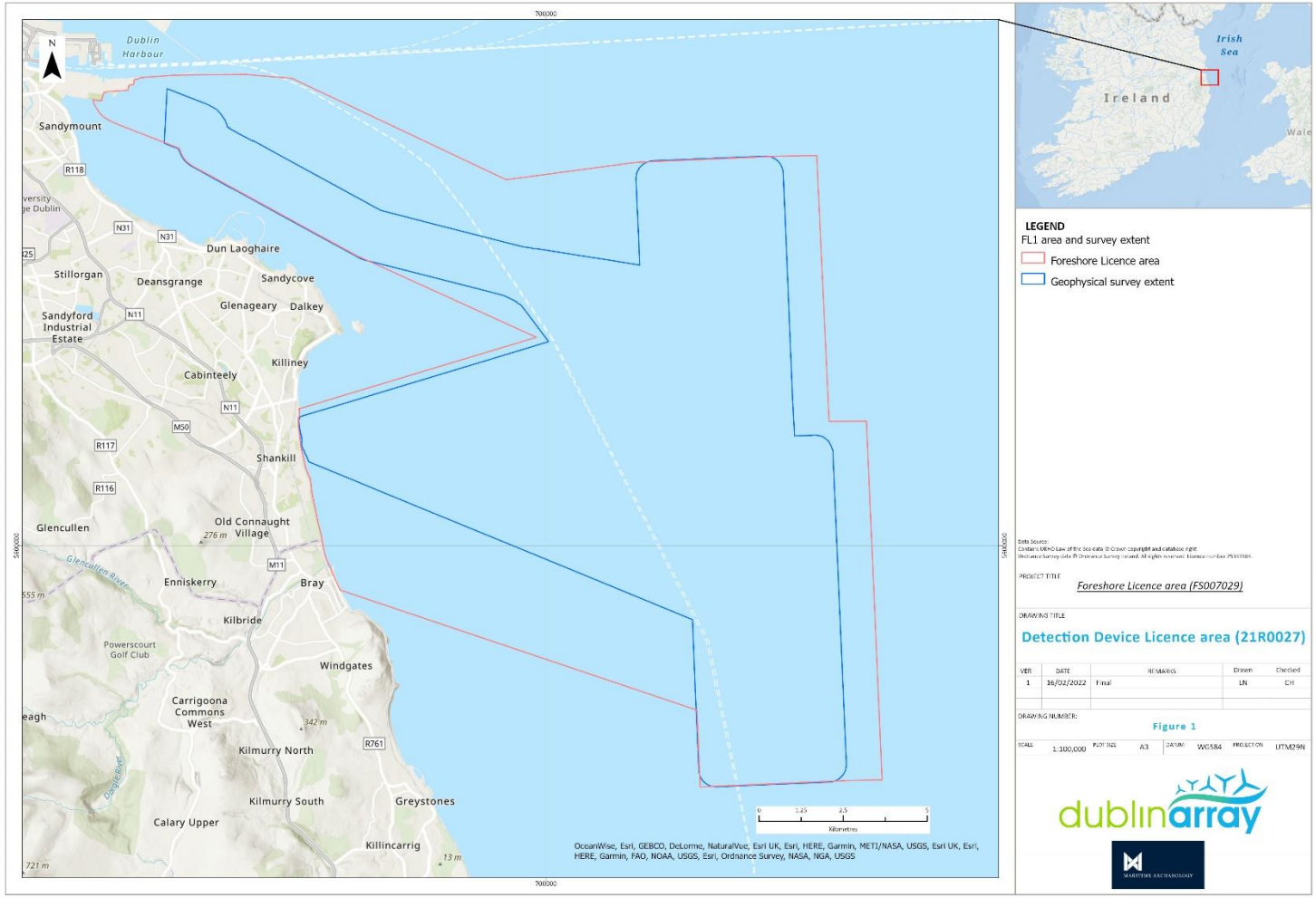
2.2.2 Archaeological sites within the marine zone have been used to inform the archaeological potential of the Foreshore Licence area. The two databases used, the Wreck Inventory of Ireland Database (WIID) and the Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) databases, were cross-referenced to remove duplicated entries. Where relevant the Wrecksite.eu database was used to provide more detail on the known wrecks identified within the Foreshore Licence area.

2.3 Marine archaeology receptors

2.3.1 The term marine archaeology receptors used within this report are defined as (a) Known receptors for example, physical resources such as shipwrecks, aviation remains, archaeological sites, archaeological finds and material including pre-historic deposits and (b) Unknown receptors such as documented losses or other archival documents and/or oral accounts of wrecking events recognised as of historical/ archaeological or cultural significance.

2.3.2 Known wreck sites are charted wrecks that have been identified and related to documented losses. Unknown wrecks are charted wrecks that have not been identified yet, and uncharted wrecks are new wrecks whose location had not been previously identified.

Figure 1: Foreshore Licence area



2.4 Data sources

2.4.1 A systematic review of marine archaeological and historical data available to the project has been undertaken to update the understanding and characterisation of the marine archaeological baseline from the original Environmental Impact Statement (EIS) and the accompanying addendum (as submitted in 2012 and 2013 respectively as part of the Foreshore Lease application) (Saorgus Energy Limited 2012; 2013a; 2013b).

2.4.2 The archaeological reports produced for the original EIS included a baseline assessment which provided the baseline characterisation of the area and assessment of geophysical data collected by Hydrographic Surveyors Ltd (Headland Archaeology, 2009).

2.4.3 Geophysical survey data was collected in 2021 to characterise the known and potential marine archaeology receptors within the Foreshore Licence area. The results are presented in **Section 3.4**. Where the information and data from the original application and EIS remains relevant it has been considered and utilized alongside the new geophysical data. The data sources used to inform the baseline are provided in **Table 1** below, alongside their temporal extents, and spatial extents in the context of the project.

Table 1: Data sources considered in the development of the marine archaeology baseline

Data source	Type of data	Temporal and spatial coverage
Fugro, (2021). WPM1, WPM2 & WMP3 – Main Array & ECR. Dublin Array Offshore Site Investigation (Ireland, Irish Sea).	Geophysical survey including SSS, MAG, MBES and SBP data collection.	Majority coverage of the Foreshore Licence area (see **Figure 1**)
Dublin Array Environmental Impact Statement (2012/2013 baseline)	Original Dublin Array EIS and technical appendices for marine archaeology.	Partial coverage of the Foreshore Licence area
Archaeological Excavations Bulletin	Database of Irish excavation reports carried out across Ireland. Irish database compiled from the published Excavations Bulletin with additional online-only material from 2011 onwards. The map search was used to find relevant reports.	Data collected from 1970 to date across Ireland
Heritage Maps Viewer	The Heritage Maps Viewer is run by the Heritage Council (HC). It contains compiled heritage data for Dublin County. However, it is important to note that the data is still in the process of being uploaded to the database as it is a relatively new website. It was used primarily to access archaeological reports from assessments and excavations in the area.	Ireland wide, including the offshore environment

Data source	Type of data	Temporal and spatial coverage
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource (INFOMAR) Shipwreck Database	INFOMAR aims to map the physical, chemical and biological features of Ireland's seabed. The shipwreck data was downloaded in vector form and contained all Irish shipwrecks, their known location and associated information.	Waters around Ireland, data taken from surveys undertaken since 1999
INFOMAR Geophysical Data	The geophysical data from INFOMAR was assessed in ArcGIS to identify any additional targets or anomalies in the Foreshore Licence area.	Waters around Ireland, data taken from surveys undertaken since 1999
National Museum of Ireland (NMI)	The topographical files relating to the townlands along the coast from Dublin Bay, Co. Dublin to Bray, Co. Wicklow were consulted at the NMI in Dublin. Although the archives of twenty townlands were investigated, only five returned relevant records, including: Blackrock, Bray, Dalkey Island, Killiney and Sandymount.	Ireland wide
Sites and Monuments Records (SMR), held by the National Monuments Service (NMS)	The SMR onshore and intertidal data was made available through the online Historic Environment Viewer database. A polygon was created to include the townlands along the coastline from Howth, Co. Dublin to Bray, Co. Wicklow and extended from MHWS to approximately 1 km inland.	Ireland wide
United Kingdom Hydrographic Office (UKHO) via INFOMAR	UKHO wrecks are included in the INFOMAR data and are categorised as; ▪ Obstruction; or ▪ Wreck; and classified as: ▪ LIVE, detected in recent surveys; ▪ DEAD, not detected in recent surveys; or ▪ LIFT, removed from the seafloor.	As above INFOMAR database
Wrecksite.eu	Database used to find additional information and wreck reports for identified shipwrecks in both the UKHO and INFOMAR datasets.	International
Wreck Inventory of Ireland Database (WIID), held by the NMS	Data from the WIID was downloaded from the NMS online Wreck Viewer. The known locations of wrecks are represented, however, these only account for *c.* 22% of the total number of records held by the NMS. The coordinates given represent the known approximate centre of the record and is not indicative of its geographic extent.	Recorded wrecks across Ireland's waters out to the continental shelf
Brooks and Edwards Sea-level Database for Ireland (2006)	This database is relevant to the palaeoenvironmental potential of the Foreshore Licence area.	Ireland wide

2.5 Methodology for the archaeological assessment of geophysical data

2.5.1 Fugro Ltd. was contracted by the Applicant to acquire shallow geophysical and Ultra-High Resolution Seismic (UHRS) data within the Foreshore Licence area.

2.5.2 The Fugro *Mercator* was tasked with carrying out geophysical surveys within the geophysical survey extent in water depths >7m. The Mercator conducted UHRS only over the Kish and Bray Banks where water depths exceeded 7m. A third-party vessel, the *Spectrum 1* conducted geophysical surveys to acquire data for the project over the shallowest parts of the Kish and Bray Banks in water depths <7m. The Fugro *Seeker* conducted geophysical surveys of the nearshore of the geophysical survey extent in water depths <7m.

2.5.3 The survey equipment used, and associated vessels are outlined below in **Table 2**.

Table 2: Survey vessel and geophysical survey equipment specs.

Vessel	Requirement	Equipment
Fugro *Mercator*	Primary global navigation satellite system (GNSS)	Fugro StarPack GNSS receiver with Starfix.G2+ corrections
	Secondary GNSS	Fugro StarPack GNSS receiver with Starfix.G2+ corrections
	Motion Reference Unit (MRU) and heading sensor	▪ 2 x Applanix POS MV IMUs and Antennas, 1 x iXBlue Octans 3000 MRU; ▪ 2 independent systems for deriving vessel motion; and ▪ ± 0.1 m horizontally (2-sigma, 95%).
	Ultra-Short Baseline (USBL)	▪ Kongsberg HiPAP 351P with C-Node mini S34 beacons ▪ 0.25° angular accuracy (1 sigma); ▪ <0.5% of slant range (1 sigma) range accuracy; ▪ Antenna aperture 200°; ▪ Operating frequency 20 to 30 kHz
	Multibeam echosounder	▪ 3 Soundings per 0.25 m bin in 95% of the survey area; ▪ Dual Teledyne RESON Seabat T50R (400 kHz) multibeam echo sounders; ▪ Dual Applanix POS MV 320 IMUs and Antennas; ▪ Valeport mini–Sound Velocity Sensor (SVS); ▪ Starfix NG software; ▪ Caris processing software; and ▪ Starfix. VBAProc processing software.
	Side Scan Sonar	▪ 15 m to 75 m line spacing with 100% coverage; ▪ Fish altitude above seabed, between 5% and 12% of the range operated; ▪ 1 x EdgeTech 4205 tri-frequency (230/540/850kHz) side scan sonar; - 540 kHz used to acquire data; ▪ 1 x Oceanenviro EIVA standalone winch with armoured cable; ▪ 1 x Kongsberg HiPAP 351P USBL subsea positioning; ▪ EdgeTech Discover data acquisition software; and ▪ Chesapeake SonarWiz data processing software.
	Magnetometer	▪ Resolution of 0.1 nT ▪ Tow height above the seabed ≤ 3.0 m in water depths below 10 m LAT, ≤ 4.0 m in water depths above 10 m LAT and ≤ 6.0 m for lengths spanning less than 200 m when flying over sand waves; ▪ Geometrics G-882 caesium vapour marine magnetometer

		▪ STR MI-DTS MiniPort DTS Subsea Unit; ▪ Geometrics G-88x telemetry system frame; ▪ Kongsberg HiPAP 351P USBL subsea positioning; ▪ Mag Log acquisition software; ▪ Oasis Montaj data processing software.
	Parametric Sub-bottom Profiler	▪ Frequency set at 8kHz and 1 pulse ▪ Vertical resolution of 0.2m with up to 5 m penetration below seabed (BSB) ▪ Innomar Medium SES-2000 parametric sub-bottom profiler ▪ Acquisition system: SESWIN 24bit; ▪ Conversion Software: SES Convert 2.3.3.1; ▪ Processing Software: RadExPro 2020.1; ▪ Interpretation Software: Kingdom Suite 2018.
	Sound velocity probe	1x Valeport Mini SVS installed on SSS
	Sound velocity sensor	1x Valeport Mini SVS installed near MBES head
	Tidal heights	Fugro StarPack GNSS receiver with Starfix.G2+ corrections
	UHRS	▪ 200 m line spacing; ▪ Penetration of at least 50 m BSB depending on geology; ▪ 2 x Geo-Source stacked dual 400; ▪ 2 x Geo-Spark 6kW power supplies; ▪ 1 x Geo-Sense Ultra Hi-Res 48 Channel Streamer; and ▪ 1 x Geo-Sense single channel reference hydrophone.
Spectrum 1	Primary GNSS	Applanix POS MV Primary Antenna
	Secondary GNSS	Applanix POS MV Secondary Antenna
	MRU and heading sensor	▪ Teledyne 16 Reson INS Type-20 (Applanix POS MV Wavemaster II); ▪ 2 independent systems; ▪ ± 0.1 m horizontally (2-sigma, 95%); and ▪ ± 0.2 m vertically (2-sigma, 95%).
	USBL	▪ Sonardyne Mini Ranger 2 USBL ▪ WSM 6+ Transponders (2 x operational + 1 x spare); ▪ 0.25° angular accuracy (1 sigma); ▪ <0.5% of slant range (1 sigma) range accuracy; ▪ Antenna aperture 200°; and

		▪ Operating frequency 20 to 30 kHz.
	Surface-towed equipment positioning	Fugro MarineStar™
	Multibeam echosounder	▪ Single head MBES (512 - 1024 soundings per head per ping); and ▪ RESON SeaBat T50-R (0.5° across track, 1.0° along track at 400 kHz) multibeam echosounder.
	Side Scan Sonar	▪ 15 m line spacing and 100% coverage; ▪ Fish altitude above seabed of between 10% and 15% of the range operated; ▪ EdgeTech 4125i side scan sonar (400/900kHz); ▪ 1 x STR PCR-75-SS sonar winch with armoured cable; ▪ Sonardyne Mini-Ranger 2 USBL sub-sea positioning; ▪ EdgeTech Discover data acquisition software; and ▪ Chesapeake SonarWiz data processing software.
	Magnetometer	▪ Resolution of 0.1 nT; ▪ Flying height of 3.0 m when water depths <10 m LAT and 4.0 m for water depths >10 m LAT; ▪ Geometrix G-882 Magnetometer; ▪ Cable and winch; ▪ Sonardyne Mini-Ranger 2 USBL sub-sea positioning; ▪ MagLog data acquisition software; and ▪ Oasis Montaj data processing software.
	Parametric Sub-bottom Profiler	▪ Frequency set at 8kHz and 1 pulse; ▪ Vertical resolution of 0.1m with up to 8 m penetration BSB; ▪ Innomar SES-2000 Medium-100 Parametric sub-bottom profiler; ▪ Acquisition system: SESWIN; ▪ Conversion Software: SES Convert 2.3.3.2; and ▪ Processing Software: ISE 2.9.5.63 and RadExPro 2020.4.
	Sound velocity probe	Valeport SwiFT
	Sound velocity sensor	Valeport Mini
Fugro ***Seeker***	Primary GNSS	Fugro StarPack GNSS receiver with Starfix.G2+ corrections
	Secondary GNSS	Fugro StarPack GNSS receiver with Starfix.G2+ corrections
	MRU and heading sensor	▪ Applanix POS MV MRU ▪ 2 independent systems;

		▪ ± 0.1 m horizontally (2-sigma, 95%); and ▪ ± 0.2 m vertically (2-sigma, 95%).
	USBL	▪ Nexus Easytrak USBL systems with Applied Acoustics beacons; ▪ 0.25° angular accuracy (1 sigma); ▪ <0.5% of slant range (1 sigma) range accuracy; ▪ Antenna aperture 200°; and ▪ Operating frequency 17 to 30 kHz.
	Multibeam echosounder	▪ 3 soundings per 0.25 m bin in 95% of the survey area ▪ Dual Teledyne RESON 7125 (400 kHz) multibeam echo sounders; ▪ Applanix POS MV 320 IMU and Antennas; ▪ Valeport mini–Sound Velocity Sensor (SVS); ▪ Fugro Starfix NG; ▪ Caris processing software; ▪ Applanix POSPac 8.4 processing software.
	Side Scan Sonar	▪ 40 m to 55 m line spacing with 100% coverage; ▪ Fish altitude above seabed of between 8% and 12% of the range operated; ▪ 1 x EdgeTech 4200 (300/600 kHz) side scan sonar; ▪ 1 x STR ESW-500 series winch with armoured cable; ▪ Nexus Easytrak USBL subsea positioning; ▪ EdgeTech Discover data acquisition software; and ▪ Chesapeake SonarWiz data processing software.
	Single towed Magnetometer	▪ Resolution of 0.1 nT ▪ Tow height above the seabed ≤ 3.0 m in water depths below 10 m LAT, ≤ 4.0 m in water depths above 10 m LAT and ≤ 6.0 m for lengths spanning less than 200 m when flying over sand waves; ▪ 1 x Geometrics G-882 caesium vapour marine magnetometer; ▪ Geometrics G-88x telemetry system frame; ▪ 1 x Nexus Easytrak USBL subsea positioning; ▪ Mag Log acquisition software; ▪ Oasis Montaj data processing software
	Parametric Sub-bottom Profiler	▪ Frequency set at 8kHz and 1 pulse; ▪ Vertical resolution of 0.2m with up to 5 m penetration BSB; ▪ Innomar Medium SES-2000 parametric sub-bottom profiler; ▪ Acquisition system: SESWIN 24bit;

		▪ Conversion Software: SES Convert 2.3.3.1; ▪ Processing Software: RadExPro 2020.1; and ▪ Interpretation Software: Kingdom Suite 2017 / 2018.
	Sound velocity probe	2 x Valeport Mini SVP
	Sound velocity sensor	RESON SVP-70 installed within MBES transducer fairing
	Tidal heights	Post processed Applanix POS MV GNSS heights

Multi-beam echo sounder data

2.5.4 MBES data was received as ungridded ASCII files, and .asc grids reduced to LAT. The data was visualised using the Fledermaus 7 suite; Dmagic to produce a digital terrain model (DTM) gridded at 1m according to the highest resolution xyz data received and hillshaded. These were exported for interpretation into Fledermaus with a 32-step colour map overlaid to aid interpretation and later into ArcGIS Pro for synthesis with other data.

2.5.5 Backscatter (BS) data has also been recorded, measuring the intensity of the echo sounder pings which are assigned a grey-scale value and gridded. This provides an acoustic intensity map that is similar in appearance to SSS data, but without shadows to highlight relief. The data is useful for the interpretation of bathymetric anomalies and enables an understanding of material type for discrete features, and sediment classification of shallow deposits.

2.5.6 The MBES and BS data was reviewed by a qualified marine archaeologist for targets identified during the assessment of other datasets and information regarding the length, width and anomaly height above the seabed was cross-referenced with SSS and sub-bottom results where these features possessed a surface expression.

2.5.7 Target imagery was captured, and feature IDs were assigned ranging between MA4000 – MA4999.

Side Scan Sonar data

2.5.8 The raw data was received in Triton XTF format and post-processed in SonarWiz, imported with a 'threshold' value calculated for the specifics of the instrumentation and the environment, bottom tracked and normalised using the 'Empirical Gain Normalisation' (EGN) function.

2.5.9 The SSS data was reviewed on a line-by-line basis by a qualified marine archaeologist. All anomalies were identified and assessed for archaeological potential as per **Table 3**, target reports were developed and exported as ESRI shapefiles into ArcGIS Pro for synthesis with other data sets.

2.5.10 All SSS anomalies were assigned feature IDs ranging between MA2000 – MA2999.

Magnetometer data

2.5.11 MAG data was assessed using GeoMetrics MagPick software package. Raw xyz profile text files were assessed on a line-by-line basis and only smoothed using low and/or high pass filters where necessary. Data was also gridded from the analytic signal to produce a spatial distribution map of anomalies. Interpreted magnetic targets were identified by combining a manual assessment of the magnetic profiles with a visual assessment of the gridded data.

2.5.12 Magnetic anomalies greater than 5 nT have been accepted as a standard for the smallest change in magnetic field reliably detected (Dix *et al*., 2008). It has been argued that a minimum detectable deflection of 5 nT may be on the conservative side and that, where the data is relatively noise free, 3 or even 2 nT may be practical depending on noise levels, instrument type, data rate and purpose of investigation (Camidge *et al*., 2009). The current filtering of 5 nT was deemed appropriate given the survey parameters.

2.5.13 Objects giving a 5 nT return from a six meter distance are likely to be ferrous objects of around 100 kg (for example, a small anchor) (Camidge *et al*., 2009). Anomalies smaller than this are not likely to be discernible from signal noise unless passed over directly by the fish at extremely short range (c. 2 m). Such signals are not expected to be of archaeological interest, constituting isolated debris or single instances of ferrous anthropogenic material.

2.5.14 These surveys, like most MAG surveys of large areas, are of variable sensitivity (Camidge *et al*., 2009:62). At 6 m range, lines run directly over targets are able to detect a target with a mass of around 100 kg, whereas the line spacing for this survey varies with the average line spacing at 75 or 150 m. At 150 m line spacing the slant range will be around 80 m, which means that only objects of more than 100 tonnes will be discernible at 5 nT deflection. Benefiting the data collection for this case is that the run lies were cross-lined which can possibly reduce the large differential sensitivity (Camidge *et al*., 2009:63).

2.5.15 All magnetic targets over 5 nT were exported into ArcGIS Pro for comparative analysis with other geophysical datasets and data identified during the baseline review.

2.5.16 Correlation between magnetic targets and other datasets were based on a 50 m buffer due to the issues inherent in accurately positioning magnetic targets by their detectable magnetic field.

2.5.17 All magnetic anomalies correlating with SSS anomalies or MBES anomalies, and magnetic anomalies ≥100 nT were included in **Annex B** and **Figure 4**. Feature IDs for all magnetic anomalies were assigned IDs ranging between MA5000 – MA21399.

Sub-bottom profiler data

2.5.18 Interpretation of sub-bottom profiler data was undertaken on a line-by-line basis by a qualified marine archaeologist.

2.5.19 The data was received in SEG-Y format, imported, and visualised using SonarWiz. Lines were bottom tracked and gain corrected, and then reviewed in numerical order with features digitised continuously. Features were picked by digitising reflectors and horizons of potential archaeological interest. Discrete reflectors consist of point hyperbolae and blanking effects indicative of potential buried archaeological deposits, such as wreck and debris.

2.5.20 Feature IDs for all sub-bottom anomalies were assigned ID's ranging between MA3000 – MA3999.

Methodology geophysical data interpretation

2.5.21 A qualified and experienced maritime archaeologist has undertaken the archaeological assessment of geophysical data. Following delivery of the survey data as specified above. The raw data has been processed and interpreted as per guidance in Marine Geophysics Data Acquisition, Processing, and Interpretation (Plets *et al.*, 2013).

2.5.22 All anomalies of archaeological potential were assessed against the criteria in **Table 3** and the results of the assessment of all datasets were further reviewed against the baseline data collated for the Foreshore Licence area.

Table 3 : Definition of archaeological categories

Archaeological categorisation	Archaeological definition
Wreck	Known or reported wrecks and/ or apparent shipwreck or aviation material.
Possible wreck or wreck debris	Features not previously recorded as wrecks or aviation, but which are considered likely to be wrecks or associated debris.
Anchor	Features interpreted as anchors not associated with identified wreck sites based on geophysical data including MAG, SSS and MBES.
Archaeological anomalies	Anomalies considered to map material of archaeological potential such as buried and confirmed palaeolandscapes, as well as potential outcropping palaeolandscapes and their margins or locations where a wreck has been recorded but is not clearly defined in the geophysical datasets, or Defined structural outlines or coherent material distributions with strong backscatter, or clearly upstanding objects with shadow, or pronounced scour features; or a combination of these.
Magnetic anomalies	All magnetic reflectors with a return of over 100 nT that were not visible in MBES or SSS or relate to any of the known, unknown and uncharted wrecks.

3 Archaeological baseline

3.1.1 The following section outlines the archaeological context of Ireland which informs the baseline review of potential maritime activity and wrecks within the Foreshore Licence area.

3.2 Maritime activity: baseline review

Introduction

3.2.1 The following section provides a broad overview of human activity within the Foreshore Licence area and the context of the wider area. This is used to indicate the potential archaeological site types that may be encountered within the Foreshore Licence area.

Palaeolithic (800,000-8,000 BC)

3.2.2 The colonisation of Ireland during the Palaeolithic has been the subject of considerable debate in recent decades and within multiple disciplines. During the Palaeolithic, Ireland had several periods of warmer temperate climates and substantial evidence of recolonisation of mammalian species but there is a paucity of definitive evidence of human colonisation of Ireland during this time (Monaghan, 2017). The limited evidence of Palaeolithic tools in Ireland have been recovered from redeposited contexts as opposed to in situ contexts. This absence of in situ evidence for early settlement in Ireland may be associated with the Last Glacial Maximum (LGM) ice cover. Ice sheets may have scoured archaeological deposits, removing all evidence of human activity and re-depositing it deep within gravel beds or till deposits (Warren, 2017). It is also possible that Ireland was not colonised during the Palaeolithic. More recently, however, evidence for human presence was found in the south-west of Ireland in the Alice and Gwendoline Cave; a brown bear patella containing butchery marks was dated to 12,810-12,590 cal. BP (Dowd and Carden, 2016). To date there have been no finds of Palaeolithic remains reported within the marine zone of Irish waters.

3.2.3 Following the LGM, Britain was recolonised by c. 14.6 ka cal BP. At this time Britain was connected to continental Europe, although Ireland was already an island.

Mesolithic (8,000 – 4,000 BC)

3.2.4 Ireland was mostly ice-free by 16,000 cal BP; however, it is not until the Mesolithic period that the earliest definitive evidence of human activity in Ireland is present, with colonisation thought to have begun along the north-eastern coast. In this post-glacial phase, the climate was warmer, dense woodland covered the landscape and faunal populations increased. The people that populated these landscapes hunted, fished and foraged for food in mainly coastal, riverine and lacustrine environments. The Mesolithic period is typically marked by a more mobile lifestyle than observed in later periods, however, there has been increasing evidence of permanent housing structures in both Britain and Ireland (Robertson *et al.*, 2013; Woodman, 1985; Waddington *et al.*, 2007; Waddington and Wicks, 2017).

3.2.5 Although Ireland was not connected to Britain during the Mesolithic, large swathes of land along the Irish coastline were submerged during the last marine transgression, c. 8,000 years ago. Waterborne travel during the Mesolithic was likely undertaken in logboats or skin/hide boats (as summarised in McGrail, 2001: 172-183). Such watercraft were able to operate in sheltered inshore waters, estuaries, and rivers but the extent to which they were capable of making repeated open sea voyages is less clear.

3.2.6 There is a Mesolithic submerged forest located within the Foreshore Licence area. Samples taken dated parts of the forest to the Late Mesolithic (7432-7832 cal. BP), indicating that the mean sea-level at this time was -3.6 m (Mitchell, 1976). A possible relict palaeochannel was also noted in the geophysical surveys conducted for the 2012/2013 EIS (Saorgus Energy Limited, 2012; 2013a; 2013b). This submerged forest is further outlined in Section 3.4 and in the Archaeological Intertidal Survey report (Brady, 2022)

3.2.7 During works associated with the development of the North Wall Quay along the River Liffey in 2004, the remains of five Mesolithic fish traps, dating between c. 6100-5720 BC, were discovered (McQuade and Donnell, 2007). The traps indicate significant human engagement with maritime activities over a considerable period of time. Four of the traps were located close to the Mesolithic shoreline, some 6 m below current Ordnance Datum (OD). The other trap was located close by, between 5 m and 4.66 m below OD. A Neolithic period wattle fence was also found here (c. 5980-5760 BC) suggesting the duration of these activities from the late Mesolithic to middle Neolithic (McQuade and Donnell, 2007).

3.2.8 Excavations of Dalkey Island, to the southeast of Dublin Bay, has produced substantial evidence of Mesolithic occupation. Shell middens containing Mesolithic artefactual evidence, such as 'Bann' flakes (large leaf-shaped lithic blades associated with later Mesolithic assemblages of Northern Ireland), were found in two sites located within the lower, western area of the promontory, on the platform that lies below and west of the cliff face that separates the upper and lower levels (Liversage, 1968; SMR no. DU023-029002). A Mesolithic shell midden was also excavated north of Dublin Bay at Sutton (Mitchell, 1956; 1972).

Neolithic (4,000 – 2,500BC)

3.2.9 During the Neolithic, communities seemingly became less mobile than those of the Mesolithic. Agriculture, the cultivation of cereals and the rearing of stock, became the main source of subsistence. The demands of agriculture led to a physical alteration of the landscape with evidence of forest clearing and the construction of boundaries. Such boundaries were erected through the creation of monumental constructions such as megalithic tombs and stone circles, which have become characteristic of the Neolithic. The current available evidence suggests that Neolithic watercraft, much like those in the Mesolithic, are likely to comprise skin/hide boats or log boats (summary in McGrail, 2001: 172-183).

3.2.10 There are no known Neolithic sites within the Foreshore Licence area. However, there have been finds within the surrounding area which include;

- Three polished stone axe heads, typologically attributed to the Neolithic, were acquired by the NMI, including: one found in Blackrock (NMI 1978:283); one found near a tumulus on Killiney Hill (NMI 1448: W117); and the other found at Sandymount (NMI 1976). The axe head found at Sandymount was confirmed as manufactured of porcellanite from Tievebulliagh, Co. Antrim and of a Neolithic date. Further south along the Irish coast at Bray Beach, a flint struck pebble with two flakes removed, was also found (NMI 2012:271).

- A flint javelin head, with a part of cortex on one side, was found on Dalkey Island in 1988. It was found on the surface of a small mound, possibly burrowed by rabbits. The soil also contained various seashell types, some flint waste flakes, blades with possible secondary working and some bone (NMI 1988:11). During the Liversage excavations (1968), evidence for Neolithic occupation was also found on Dalkey Island. Finds included polished stone axe heads, grinding stones, post holes and middens.

- A Neolithic 'dolmen' tomb enclosed by a circle of stones was located in Dalkey Commons (SMR DU023-038). The dolmen was destroyed in the 18th century during the construction of a Martello tower (SMR no. DU023-052003). Two more dolmen tombs were found in Ballybrack (SMR no. DU026-030) and in Howth (SMR no. DU015-032) as well as a megalithic structure in Killiney (SMR no. DU026-010).

Bronze Age (2,500 – 800 BC)

3.2.11 The Bronze Age is defined by significant technological change with the introduction of metalworking technology to Ireland that coincided with substantial social change. There was a marked increase in sedentary populations, and this was reflected in terms of the material culture as well as the nature of the sites and monuments, although there was a level of continuity from the Neolithic. Burial sites were not as monumental as those observed in the Neolithic, but there were new types of burials, including cist burials, wedge tombs, barrows and cairns. Barrows became more popular in the latter part of the Bronze Age. The most common Bronze Ages sites are burnt mounds known as fulacht fia, with over 4,500 known in Ireland (Waddell, 1998). Fulacht fia are interpreted as open-air cooking places.

3.2.12 The Bronze Age population used routes of communication along the coasts and waterways of the region. Tin is essential in the creation of bronze materials and the closest source of tin was in Devon and Cornwall. Boats were essential for the movement of this resource across the Irish Sea. Skin boats and logboats were still used throughout the Bronze Age in Ireland, however, there is evidence that logboats, such as the Lurgan boat (c. 3900 BP), were adapted and equipped with outriggers to allow for more stability, possibly for open water journeys (Robinson *et al*., 1999). Despite evidence for sewn-plank boats in the British Isles, no such evidence has yet been found in Ireland (McGrail, 2001).

3.2.13 There are no known Bronze Age sites within the Foreshore Licence area, however, sites along the Irish coast include two fulacht fia that were excavated in Castle Farm, Shanganagh in 1990 in advance of a housing development (SMR no. DU026-116). Further to this, the remains of seven skeletons with associated bronze fibulae were recovered, however the date of this material is not clear (SMR no. DU026-067). Finally, to the north of Foreshore Licence area, a Bronze Age logboat, possibly modified with outriggers to aid long-distance sea travel, was uncovered 1 km offshore under two metres of sand during trenching for a pipeline making landfall at Gormanstown, Co. Meath (Brady 2002). Although not located in proximity to the Foreshore Licence area, this find demonstrates the potential for early craft to survive offshore.

Iron Age (800 BC- AD 400)

3.2.14 The Iron Age is defined by the transition to the widespread use of iron instead of bronze. The transition from the Late Bronze Age to Early Iron Age is one of the least understood periods in Irish prehistory as there is comparatively less evidence of settlement from this period than previous periods (Garstki, 2019). There is a paucity of Early Iron Age sites in Ireland until the appearance of La Tène material in the third century BC.

3.2.15 The archaeological evidence for Iron Age boats in Ireland is poor. There are also no extant remains of larger sea-going vessels within Irish waters. However, evidence that they did exist in Ireland during this time comes from a gold boat model, known as the Broighter boat, found in 1896 on farmland near Limavady, Northern Ireland. The model measures 18.4 cm in length and 7.6 cm in width and is generally assumed to represent a hide-built boat from the 1st century BC. The boat model is outfitted with nine benches for rowers, 18 oars with rowlocks, a steering oar at the stern, three forked barge poles, a grappling anchor and a mast with a yard arm (Waddell, 1998).

3.2.16 Several Iron Age logboats / dugouts have been found in Ireland, but they are rarely found in coastal or marine contexts. The construction of logboats during this time was slightly more complex than those observed in previous periods. An example of this more complex construction can be seen on the Lees Island 5 logboat, dated to 754-409 BC, found in Lough Corrib, Co. Galway (Brady, 2014). The boat was fitted with seats and was found with a well-preserved paddle and axe lying inside the boat.

3.2.17 In Britain, we see the continuation and adaptation of the sewn-plank boats from the Bronze Age, however there is no recorded evidence of this type of shipbuilding in Ireland. That being said, a smaller plank-built craft was found in 1968 in Lough Lene, Co. Westmeath. The boat has been interpreted as representing a Roman style, which indicates either the presence or knowledge of Mediterranean or northern European boat-building traditions in Ireland in the Iron Age (O'Sullivan and Breen, 2007).

3.2.18 Although there are no Iron Age finds or sites within the Foreshore Licence study area, there are three Iron Age promontory forts, constructed as defensive settlements recorded along the Irish coast: one at Howth (SMR no. DU016-003001); one on Dalkey Island, (SMR no. DU023-029001); and one in Dun Laoghaire (SMR no. DU023-052001).

3.2.19 The NMI held a record of a tanged iron blade (NMI 1946: 421), that was found among the rocks at Sandycove. This was interpreted as out of context and cannot be positively dated to the Iron Age.

Early Medieval (AD 500 – 1100)

3.2.20 Through the early medieval period, population and demographic changes in Ireland saw the expansion and intensification of settlement landscapes alongside innovations in agricultural technology and crop production, livestock management (dairying) and in craft and industry (O'Sullivan and Breen, 2007). There was also a transition from a society based on tribal chiefdoms and kin-based social groups to one, by the 9th and 10th century, based on dynastic lordships whereby a lord would oversee the urban markets and international trade and exchange. The shift to Christianity also saw an increase in monastic centres and church estates (O'Sullivan and Breen, 2007).

3.2.21 The Dublin Bay area was of increasing maritime importance in the early medieval period as it became more involved in the wider trading networks of northwest Europe. Monastic settlements are evidenced at Dalkey Island, Howth and Ireland's Eye and indicate the prominence of trading posts within the Dublin Bay area (Cunliffe, 2001). The Bay provided a natural advantage of sheltered waters, allowing safe passage for vessels, whilst also allowing access to inland waters.

3.2.22 The archaeological finds from Dalkey Island indicate long-distance maritime activity, with Mediterranean amphorae found, as well as a large amount of E-ware pottery, a grey ware thought to originate from Western Gaul (Doyle 1998; Loveluck and O'Sullivan, 2016). There is little archaeological evidence in Ireland of the varying types of watercraft that were built and in use in the early medieval period when compared to other parts of north western Europe. Historical sources, such as Adomnan's Life of St. Columba, reference multiple Irish vessel types including the early constructions of the currach and a long boat made from pine and oak timbers, but also vessels from other international traders such as the Gaulish barca or Nordic style boats (Wooding, 2002).

3.2.23 From the 10th century onwards, the Hiberno-Norse developed many ports and harbours in Ireland, including Dublin. This enabled the expansion of maritime trade to this area and Ireland was drawn into other maritime trading networks, this time with a focus in the North Atlantic (O'Sullivan and Breen, 2007). There was also an increased focus of fishing along the Irish coastline with a corresponding growth in evidence of early medieval fish traps. Although no fish traps have been recorded in the Foreshore Licence area, there are notable examples in the northeast at Strangford Lough and on the western coast in the Shannon Estuary. Lead line-weights, wooden net-floats and stone sinkers have been found during excavations in Dublin indicating the use of nets and lines from both the shoreline and offshore in boats (O'Sullivan and Breen, 2007).

3.2.24 Land reclamation for Dublin's waterfront is evident from c. 900 AD, with the reuse of ship timbers in the revetments of the bank evident at Wood Quay, the original site of Dublin port which is now further upstream. The timbers found represent Nordic, clinker-built traditions but the timber was of Irish origin suggesting that boats were being built in Dublin (Wallace, 1981; McGrail, 1993).

Medieval (1100 – 1550)

3.2.25 During the Medieval period, the arrival of Anglo-Normans in 1169 saw the further development of Dublin port and it began to take on a more official role; under the new Anglo-Norman laws, the waterfront became property of the Crown and Charter of King John (1167-1216). Through this, came a significant increase in the amount of trade and mercantile activity along the coast and an investment in the waterfront facilities and building of boats and ships (O'Sullivan and Breen, 2007).

3.2.26 With the Anglo-Norman colonisation and development of maritime ports and harbours came a concerted effort to fortify and protect the coast through the construction of castles and mottes. Such examples near the Irish coast include Howth Castle and motte (SMR no. DU016-002001 / DU015-025 / DU015-027001), Bullock Castle (SMR no. DU023-020001), and Dalkey Castle (SMR no. DU023-023010).

3.2.27 Coastal and fishing communities continued to thrive along this coastline and although there is no archaeological evidence within the Foreshore Licence area itself, examples of this fishing activity can be seen along the Irish coast, with the discovery of a 14th century fish weir (SMR no. DU023-035) associated with the castle at Bullock (SMR no. DU023-020001).

3.2.28 In wider northern Europe, a range of ship and boat types had developed during the medieval period, including cogs, hulks and galleys. However, the paucity of material remains of shipwrecks in Ireland is still evident in the Medieval period, and no finds of cogs or hulks have been recovered in Irish waters, but there are multiple documentary references to their usage (O'Sullivan and Breen 2007).

3.2.29 Land reclamation and revetments of the banks of the River Liffey continued through the medieval period and as a result of this by the 14th century Dublin Port began silting up and close approach by larger ships was made increasingly difficult. Larger ships were therefore forced to anchor at places away from the city, such as Dalkey (Wallace, 1981). There was also further evidence that timbers from ships were used in the revetments in the 13th century, again these were of Irish origin.

Post-medieval (1550 onwards)

3.2.30 In the 16th century Dublin experienced an increase in trade with northern European ports. This gave rise to the city leasing its slips and piers to individuals and the installation of equipment aiding ship steerage, such as buoys and marks at the bar near the mouth of the Liffey. During the reign of Elizabeth I (1533-1603) the use of the first regular packet ships carrying official correspondence between Dublin and Liverpool and Chester was instigated (Gilligan, 1988).

3.2.31 The 17th century saw the redevelopment and modernisation of the major ports around the coast, including Dublin. Dublin Bay presented major dangers for the increasing shipping trade and in 1674 it was even described as wild, open, and exposed to every wind, and as a result shipwrecks were common (Dublin Port, 2019). In order to combat these dangers substantial stone quays were built; the Great South Wall (1715-1730) and the North Bull Wall (1815-1823). This resulted in the development of a safe harbour and dramatic changes to the bay with the formation of Bull Island (Dublin City Council, 2007). To further increase the safety of the port, Dublin Bay was mapped in 1685 and 1686 by Thomas Phillips and Captain Greville Collins respectively and a number of lighthouses were constructed, including Poolbeg Lighthouse in 1768 (O'Donoghue, 2004).

3.2.32 By 1804 a series of Martello towers were built down the east coast from Dublin to Wexford as a line of defence (O'Sullivan and Breen, 2007). Two of these towers are situated along the coast of the southerly landfall options: one is at Killiney (DU026-014001) and is associated with an earthwork (DU026-014002); the other is at Shanganagh (DU026-055001) and is associated with a defensive redoubt (DU026-055002) that has since been removed by coastal erosion. Further defensive structures exist along the coastline including gun batteries in Dublin South City (SMR no. DU019-028), Dalkey Island (SMR no. DU023-029011) and Killiney (SMR no. DU026-012).

3.2.33 The shipping industry and traffic into Dublin Port increased significantly throughout the 19th and 20th centuries, with linen being one of the major exports (Friel, 2003). The increased shipping traffic resulted in higher numbers of wrecks, detailed further in Section 3.5 below.

3.3 Wrecks, aviation, and documented losses

3.3.1 Multiple datasets were used in the compilation of this updated baseline assessment. The locations of the wrecks identified below are shown in **Figure 2**. The reference number for each entry is written in bold (e.g., **W10597** or **GSI 289**) for ease of identification. Seven wrecks were found during surveying that did not previously have reference numbers. They were assigned MA ID numbers and reported to the Underwater Archaeology Unit (UAU) within three days of finding. Six of the seven wrecks are labelled **MA02, MA03, MA04, MA05, MA07 and MA08** and the seventh wreck, **MA01**, has since been related to an unknown charted wreck (**W09300**). The wrecks **MA06 and MA09** were also reported to UAU, but their locations have been attributed to the known wrecks, *Sir Charles Napier* and *Glenorchy*, respectively.

3.3.2 There are a total of 61 known, unknown and uncharted wrecks. This total is divided into nine known records, 46 unknown records, and six uncharted records within the Foreshore Licence area as described below. All wrecks discussed here are also detailed in **Figure 2** and **Annex A**.

3.3.3 There are also over 3000 documented losses off the coastal waters of Dublin, however only a small percentage have been located as detailed below.

Known wrecks

3.3.4 There are nine known wreck (identified wrecks) records within the Foreshore Licence area as described below (**Figure 2** and **Annex A**).

3.3.5 Two identified wrecks are the bow and stern sections from the same vessel, the *MV Bolivar* (**W09480** and **W09846**), a Norwegian motor-powered cargo ship built in 1946 by Akers Mekaniske Verksted A/S, Oslo. The vessel was owned by Olsen Fred, had a gross tonnage of 5320 and measured 135.7 x 17.5 x 8.3 m. On the 4 March 1947, *MV Bolivar* was on its maiden voyage to South America, via Dublin and Liverpool, however it ran aground in a snowstorm off the Kish Bank and sank. The vessel's extant remains are laden with explosives. The status of the wreck is LIVE.

3.3.6 The *Glenorchy* (W01572) was a fully rigged sailing ship built in 1868 by McMillan A. & Son Ltd. And owned by Gow A. C. & Co., Glasgow. The vessel's gross tonnage was 1348 and it measured 60 x 20 x 5 m. The vessel wrecked after striking the Kish Bank on 1 January 1869 on its maiden voyage from Glasgow to Bombay with a cargo of iron, coal, and spirits.

3.3.7 The *Loch Fergus* (W01828) was an iron barque, built at Glasgow by Henderson D. and W. & Co. Ltd., Meadowside and owned by J. Sproat & Co., Liverpool and the master was T. Williams. The vessel had a gross tonnage of 847 and measured 61.6 x 10.1 x 5.7 m. On 6 February 1899, *Loch Fergus* was sailing from Glasgow to Brisbane with general cargo when strong gales forced the vessel to run aground in Killiney Bay, Co. Dublin. All crew survived. The vessel is listed as LIVE by the UKHO.

3.3.8 The *Privet* (W09962) is a fishing vessel which sank while trawling 1.7km SE off Poolbeg Lighthouse in 1988.

3.3.9 The *Rose of Lough Gill* (W09984) was a fishing boat that sank in 1995 off Codling Bank.

3.3.10 The *Sir Charles Napier* (W01588) was a merchant vessel built in 1841 by Miramichi, New Brunswick, Canada and was owned by Locketts of London. The vessel's gross tonnage is 638 and measured 30 x 7.5 x 1.2 m. On 19 November 1875, the *Sir Charles Napier* ran aground on the Kish Bank due to a navigation error. One man was lost. The wreck is listed as LIVE. Another wreck on the Kish Bank has been recorded as the possible remains of the *Sir Charles Napier* (W01629).

3.3.11 The *Trustful* is the only known wreck recorded on the Bray Bank (W01593). The *Trustful* was a steam-powered fishing drifter built in 1906 by Carnegie, Peterhead. The vessel had a gross tonnage of 87 and measured 25.6 x 5.8 x 2.9 m. It was fitted with a cylinder compound engine by Hall A. & Sons Ltd. On the 29 December 1924, *Trustful* was fishing off Bray Head, Co. Wicklow when during a south-westerly gale the vessel took on a lot of water. The engine room was flooded and at approximately 17:00 pm the vessel anchored and set off flares. The crew took to a lifeboat and abandoned the vessel. The boiler then exploded and the *Trustful* foundered. After several hours, the lifeboat was picked up by Kingstown pilot boat, landed and the crew taken to Dublin. The wreck's status in the UKHO database is DEAD.

3.3.12 The *Vesper* (SS) (W01594) was an iron merchant steamer of Hartlepool, built in Dundee by Barclay Curle and Company, with a nominal horsepower of 60. Owned at the time of loss by Huntley Burne & Co. The vessel had a gross tonnage of 478 and measured 54.8 x 7.8 x 3 m. During a voyage from Glasgow to Dunkirk *SS Vesper* wrecked on the Kish Bank on January 13, 1876 and broke into two. The wreck has been listed as LIVE.

Unknown wrecks

3.3.13 There are 46 unknown wrecks within the Foreshore Licence Area (Figure 2 and Annex A).

3.3.14 One unknown wreck (W10597) is recorded offshore, approximately 6 km east of Shankill, Co. Dublin. No further information is known. The status of the wreck is unknown.

3.3.15 Five unknown wrecks have been recorded on the Codling Bank (W11360, W11361, W11365, W11366 and W11367), between 600 – 3000 m east to southeast of Shankill. Their locations are approximate and their statuses unknown.

3.3.16 An unknown wreck (W01544), with wooden frames, was discovered by a Dutch dredging company in June 1989 near Poolbeg Lighthouse while excavating for a new sewer pipe. The wreck measured c. 4.5 m in width and was evidently carrying a cargo of tightly packed, uncut slates. The vessel lies in 3-5 m of water, buried 0.5 m beneath sand. It was reburied following the completion of the sewer works.

3.3.17 An unknown wooden wreck, known as the 'Ringsend Wreck' (W01734), became exposed during dredging operations for the Dublin Bay pipeline in April 2001. The wreck was a composite build of wood and iron, with several structural pieces revealed during excavation, including: three timbers that could form part of a keelson; carvel planking, with evidence for iron and wooden fastenings in the form of treenails and dowels; an iron knee with bronze fastenings; and a number of iron concretions, musket balls and bullets (it is not clear if these were related to the wreck or were stray finds).

3.3.18 W11566, W11567, W11568, W11569 all represent ship timbers that were redeposited from 2008-2011 near the 'Ringsend Wreck' in Dublin Bay.

3.3.19 Two more records of the 'Ringsend wreck' are also recorded in the NMS (W11570 and W11571). Based on the limited information from the excavations.ie website, these refer to the same wreck above (W01734).

3.3.20 Two wrecks are marked on the Admiralty chart 1415 of Dublin (W01532 and W01533). They are described as remains of wrecks and are located in Dublin Bay, approximately 1.5 km northeast of the eastern pier head in Dun Laoghaire Harbour.

3.3.21 One of the five wrecks plotted on William Bligh's 1803 map of Dublin Bay is located just off South Bull, approximately 3km north northeast of Sandycove (W01526). The status of the wreck is unknown.

3.3.22 An unknown wooden wreck (W01630) was discovered on the Kish Bank by Marlin Sub Aqua Club in 2003. The vessel is partially exposed and upside down on the seabed. The hull of the vessel is copper sheathed and stands 1 m proud of the seabed, it measures 17 m in length.

3.3.23 Six unknown wrecks on the Kish Bank were detected in 2010 as part of the INFOMAR seabed mapping programme. Although the wrecks are unknown, dates of loss have been ascribed to two wrecks, however it is not clear where this information originated from. These wrecks are as follows:

- W08691, measuring 4 m in length and 1.8 m in maximum width and is recorded as being lost on the 15 January 1802;
- W09300, measuring 21.2 m in length and 3.7 m in maximum width and is recorded as being lost on the 4 June 1800. This wreck correlates with the coordinates for MA01;
- W11332, a wooden wreck first identified in a geophysical survey conducted in 2008 by Browne and Stokes. It measures 26.5 m in length by 4.3 m in maximum width;

- W11626, a wooden wreck, known as the 'Iron Pipe Wreck', first located in a geophysical survey conducted in 2008 by Browne and Stokes. It measures 19 m in length by 5 m in maximum width;
- W18562, measuring 13.5 m in length and 3.5 m in maximum width; and
- W11610, measuring 18.3 m in length and 4.5 m in width.

3.3.24 A further eleven wrecks were located on the Kish Bank, however these either have limited or no further information provided (e.g., measurements) (W10276, W10297, W11331, W11333, W11334, W11337, W11338, W11339, W11340, W11341 and W11581 (known as the '9.5 fathom wreck')).

3.3.25 One additional unique wreck was listed in the INFOMAR database, located on the Kish Bank; measuring 13 x 4 m (MA0181/ GSI 278). This unknown wreck could potentially be associated with historical documented losses within the Foreshore Licence area and wider area. However, there is not enough information at present to positively identify it.

Uncharted wrecks

Five uncharted wrecks (Figure 2 and Annex A) were identified during site-specific geophysical survey in 2021 and sent to MA for interpretation and then reported to UAU. Upon the archaeological assessment of the complete geophysical data set conducted by MA, these wrecks were identified in other datasets (collected during the 2021 campaign), such as SSS. A further wreck was given an MA ID (MA02). These six wrecks are further described below

3.3.26 MA02: The Development Applications Unit (DAU) highlighted the presence of further wreck sites that had not yet been logged in the WIID. One wreck site was detailed in consultation as a new wreck site centred on 53 16.200N, 05 56.500W, measuring 21.2 x 3.7 m with a recommended Archaeological Exclusion Zone (AEZ) of 300m (DAU, 2019). This wreck was not visible in the SSS, MBES or MAG data.

3.3.27 MA0140 (MA03/GM814_contact0028): An unknown possible wreck was located by the Survey Vessel Fugro Mercator 1/03/2021. The wreck was seen in the SSS data (MA2139). Linear and circular reflectors are clearly visible as well as an area that seems to indicate a snagged net. The area measures 16 x 9 m and height above the seabed was measured as 0.5 m. There is also a smaller anomaly (3 x 3 m) located 46 m west of the main target represented by semi-circular hard reflectors. If the anomaly is a wreck or anthropogenic debris the material is well buried within the sandy sediments of Kish Bank. There is a magnetic return of 24 nT (MA21210) associated with this site.

3.3.28 MA0098 (MA04/GM771_contact0102): The possible wreck is lying in a southwest to northeast position and is mostly buried within the sandy sediments. There are several objects on the seafloor around the wreck associated with the vessel which might represent part of the broken hull, propulsion mechanism and a bowsprit and/or mast. The SSS (MA2097) image suggests that the wreck might be a wooden schooner. The main part of the visible hull measures 16 m, the hard reflector anomaly west of the main site is 5 m long, the linear anomaly north of the main site measures 6 m and the linear anomaly south of the main site measures 5 m. There is a magnetic return of 3645 nT (MA21060) associated with this site.

3.3.29 MA0096 (MA05): Substantial reflector approximately 15 m long and 5 – 6 m wide (MA2095). Scour north and south at each end shows it stands proud of the seabed. This could be a 20th century vessel. The site was marked with a buoy and suggested to be a lost container. Also measured as: length: 12 m, width: 4 m, height above seabed: 2 m.

3.3.30 MA0178 (MA07): Substantial anomaly in two parts measuring 21 x 6 m and 7 x 7 m. Debris on the sea floor is clearly visible on the SSS (MA2177). Reported by the survey vessel as "Possible Uncharted Wreck (seen in mag data). Clearly a large target – wreck shaped but probably broken in two associated with a large magnetic response." The wreck location is 410 m from the unknown shipwreck (MA01/ W09300) and 916 m from unknown wreck reported to UAU by a previous survey campaign (DAU, 2019), referred to in our reports as MA02 and 440m from SS *Vesper* (W01594). There is a magnetic return of 666 nT (MA20250) associated with this site.

3.3.31 MA0171 (MA08): Oval shaped depression 12 x 7 m with linear hard reflectors, could possibly be wreck material or outcropping geology (MA2170). Reported as "A Possible Buried Wreck (NOT seen in mag data). Possibly wood due to the absence of a magnetic response. Overall, about 8 m in length and can be seen on SSS and MBES records". Not associated with any known wreck records.

Aviation remains

3.3.32 No aviation remains have been found within the Foreshore Licence area, however historical records confirm that this area has been an active flight path since and especially during the Second World War. Examples from Second World War aircraft finds in marine contexts can be found at Lough Erne, Northern Ireland where a Catalina flying boat was found in 2019 (Campbell). Unidentified anomalies as described below could potentially be associated with aviation remains.

Documented Losses

3.3.33 Within the WIID, there are over 3000 documented losses listed off the coastal waters of County Dublin and roughly 1,500 are recorded as having wrecked within or in close proximity to the Foreshore Licence area (Brady, K. 2008) (Appendix C). Examples of these wrecks include but are not limited to, 41 barques; 17 brigantines; 32 colliers; 10 ketches; 107 schooners; 78 sloops; 33 steamships; and 716 unknown vessels. The majority of documented losses within the WIID are post-1700 in date (Brady, L. 2008). This is due largely to the lack of earlier written sources, and as a result, the actual number of wrecking events is expected to far exceed the current numbers.

3.3.34 The majority of wrecking events off the coast of Dublin and county Wicklow have occurred at the entrances to ports or in other shallow waters as well as on the offshore sandbanks. Within the Foreshore Licence area there are seven major sandbanks which, from north to south include, Bennet, Rosbeg, Burford, Kish, Frazer, Bray, and Codling. There are also shallow areas such as the North Bull and South Bull where ships have become stranded in the past. The entrances to Dublin Bay and its harbour are a challenge to navigate due to the sandbanks which run parallel to the coast and the strong tidal currents contributing to the high number of documented losses (Lowth 2002).

3.3.35 There are 379 records that are defined as having been lost within the general area of Dublin Bay. Furthermore, there are additional records within Dublin Bay stretching from Howth Peninsula to Dalkey Island within the Foreshore Licence area that are listed with more specific locations (Appendix C) These current number estimates are listed below in coastline order from north to south;

- 24 recorded off Bailey Lighthouse located on the tip of Howth Peninsula;
- An additional 111 listed as lost off Howth;
- 161 records off the North Bull and 3 more specified as lost at Bull Wall;
- 23 records off Clontarf;
- 44 Recorded as lost off Poolbeg Lighthouse;
- 63 records on the South Bull with an additional 2 off Booterstown, and 10 off Blackrock;
- 229 documented losses off Dun Laoghaire and its harbour;
- 14 records off Sandy Cove and 2 off Bolluck; and
- 31 records off Dalkey and Dalkey Island with an addition 10 off the Muglins Lighthouse.

3.3.36 Within County Dublin south of Dalkey there are additional records which include 17 documented losses off Killiney and 7 off Shankill (Appendix C).

3.3.37 Along the coastline of County Wicklow (Appendix C) (within the Foreshore Licence area) from north to south documented losses are as follows;

- There are 110 recorded loses off Bray, and Bray Head;

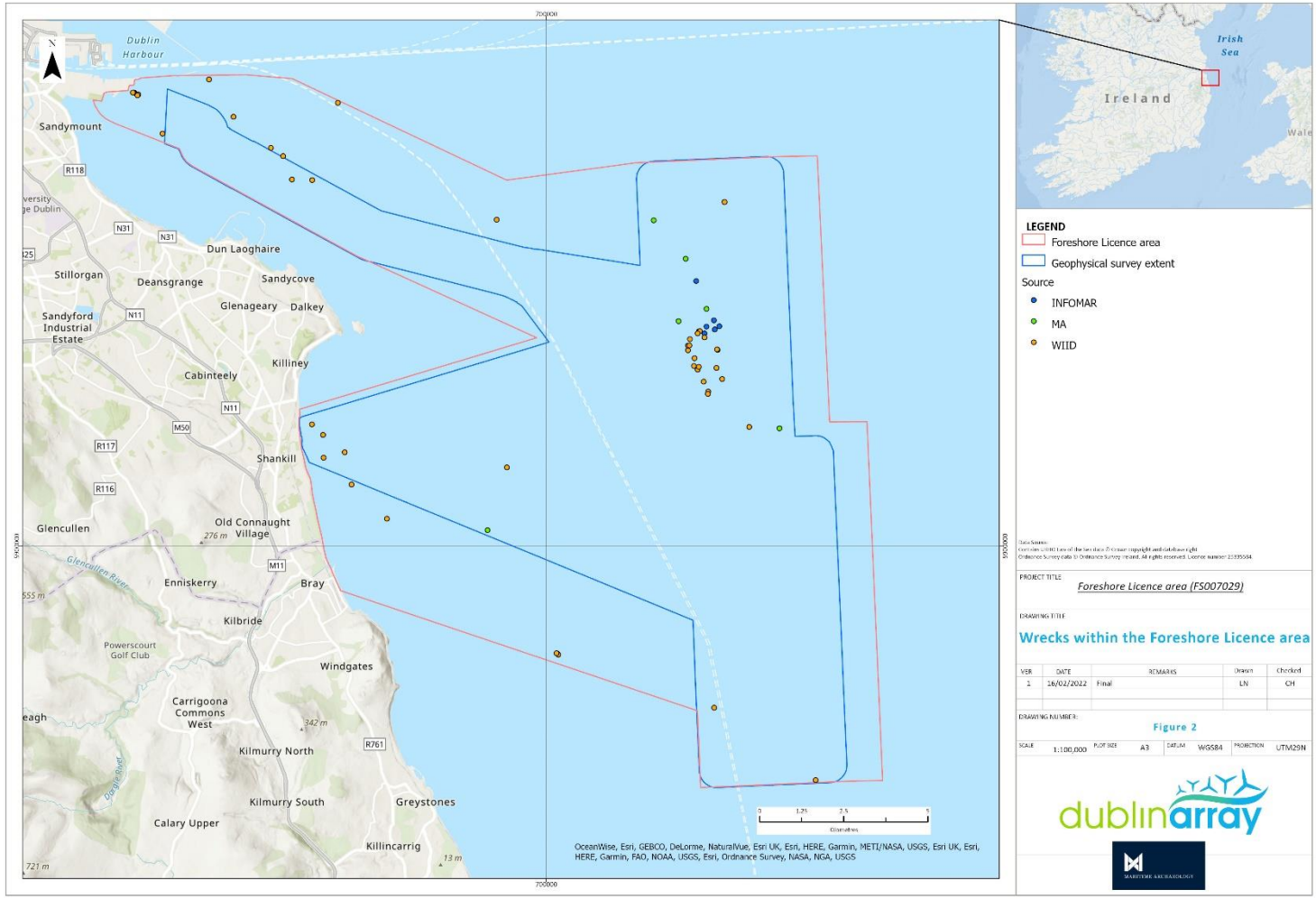
- 34 recorded losses off Greystones;
- 7 recorded losses off Glen Strand;
- 6 recorded losses off Kilcoole;
- 4 recorded off Six Mile Point; and
- 14 records off Five Mile Point.

3.3.38 The sand banks within the Foreshore Licence area have been an additional cause of shipping losses. They are further outlined in Appendix C and the current estimated casualties are listed below from north to south;

- 2 recorded off Bennet Bank;
- 9 records on Burford Bank;
- 141 records on the Kish Bank (believed to be only half the actual number (Brady, L. 2008);
- 3 records on the Bray Bank; and
- 48 records off Codling Bank.

3.3.39 The unknown and uncharted wrecks outlined previously in Section 3.2 could potentially be associated with any of the historical documented losses within the Foreshore Licence area and wider area, however, there is not enough information at present to positively relate or identify them. There is also the potential for earlier wrecks to have occurred in the study area, for which no documentation survives, and which await discovery.

Figure 2: Wrecks within the foreshore Licence area



3.4 Assessment of geophysical data

3.4.1 The results following the archaeological assessment of geophysical data are presented below and summarised in **Table 4**.

Table 4 : Archaeological categories identified in the geophysical data

Archaeological category	No of records
Wreck	22
Potential wreck or wreck debris	21
Anchors	9
Archaeological anomalies	52
Magnetic anomalies	118

Wrecks

3.4.2 22 records, as identified from the assessment of geophysical data, were classed as known or reported wrecks and apparent shipwreck or aviation material as described below and illustrated in **Figure 3** and **Annex B**.

3.4.3 **MA0275** (SSS MA2274; **W01533**; MBES MA4192; MAG MA9351), (Figure C- 9), an unknown wreck described in the NMS and INFOMAR data as one of four wrecks marked on a chart (Admiralty Chart 1415) of Dublin. Noted in the SSS data as a depression in the seabed measuring 10.2 x 7.2 m with two hard reflectors in the centre. Associated magnetic return of 20 nT.

3.4.4 **MA0132** (SSS MA2131; **W11334**; MBES MA4096; MAG MA21288), (Figure C- 10), an unknown wreck. Seen in the SSS data as an isolated buried ovate outline of a wreck measuring 23 x 7.5 m. Associated magnetic return of 58 nT.

3.4.5 **MA0134** (SSS MA2133; MBES MA4097; MAG MA21302), (Figure C- 11), an unknown and previously uncharted wreck. Seen in the SSS data as a wooden wreck with visible planking, measuring 10.8 x 5 m. Associated magnetic return of 37 nT.

3.4.6 **MA0098** (SSS MA2097; MA wreck ID **MA04**; MBES MA4078; MAG MA21060), (Figure C-12), an unknown wreck with visible debris in an area measuring 5.5 x 2.5 m. Previously identified in the Marine Archaeology Assessment for the Foreshore Licence application and identified in the SSS data. There is an associated magnetic return of 3645 nT.

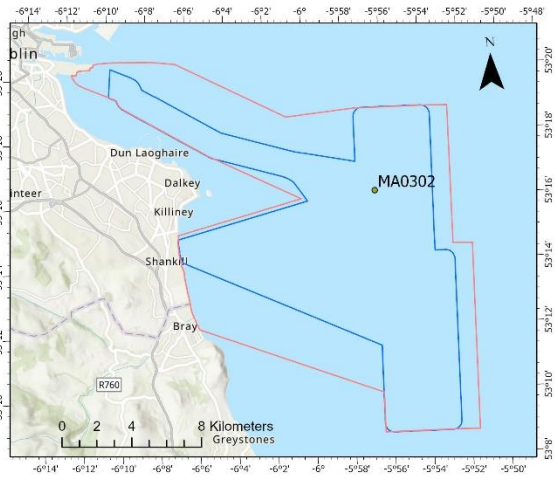
3.4.7 **MA0171** (SSS MA2170; MA wreck ID **MA08**; MBES MA4119), (Figure C- 13), an unknown wreck with visible features measuring 11 x 6.7 m. Previously identified in the Foreshore Licence data and identified in the SSS data.

3.4.8 **MA0173** (SSS MA2172; **W01572**; MBES MA4121; MAG MA20348), (Figure C- 14), the sailing vessel *Glenorchy*. Seen as a scattered wooden wreck array measuring 63 x 16.7 m with a height of 1 m in the SSS data. An upstanding mast measuring 3.5m above the seabed was visible on the forward facing sonar as well. Associated magnetic return of 3525 nT.

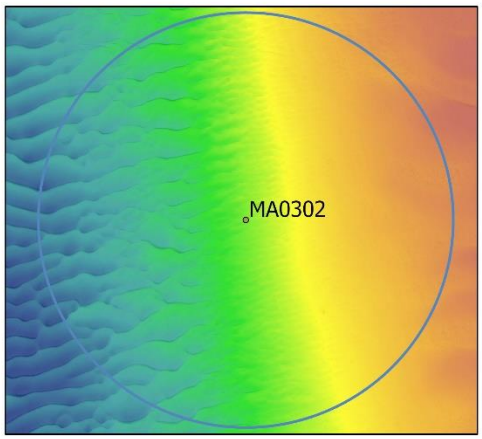
3.4.9 MA0178 (SSS MA2177; MA wreck ID MA07; MBES MA4123; MAG MA20250), (Figure C-15), an unknown wreck with visible features measuring 20 x 14.5 m. Previously identified in the Foreshore Licence data and identified in the SSS data. Possibly associated with MA0180 and MA0179, which appear as wreck debris in the SSS data and are located 19 m southeast and 21 m south southeast, respectively. Associated magnetic return of 665.5 nT.

3.4.10 MA0181 (SSS MA2180; GSI 278; MBES MA4125; MAG MA20278), (Figure C- 16), an unknown wreck measuring 13 x 4 m. Seen in the SSS as an isolated collection of cylindrical hard reflectors with pronounced shadows measuring 12 x 10 m and sitting 1.4 m above the seabed. Associated magnetic return of 428 nT.

3.4.11 MA0302 (MA wreck ID MA02), (



Location	Vertical Coordinates (m)	Longitude: 703924; Latitude: 5906680
Wreck IDs	MA ID	**MA0302**
	Wreck ID	**MA02**
	SSS ID	N/A
	MBES ID	N/A
	MAG ID	N/A
Geophysical notes		**MA0302** is an unknown and previously uncharted wreck that was discovered by the DAU and was recorded as measuring 21.2 x 3.7 m with a recommended AEZ of 300m This wreck was not visible in the SSS, MBES or MAG data collected in 2021.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown



Multibeam bathymetry image of MA0302 and AEZ

3.4.12 Figure C- 17), a new wreck discovered by the Development Applications Unit (DAU) that had not been logged in the WIID. The wreck is centred on 53 16.200N, 05 56.500W, measuring 21.2 x 3.7 m with a recommended AEZ of 300m (DAU, 2019). This wreck was not visible in the SSS, MBES or MAG data.

3.4.13 MA0185 (SSS MA2184; W09480, MBES MA4128; MAG MA20195) (Figure C- 18), *MV Bolivar* (bow); seen in the SSS data as a hard reflector in an area of 3 m scour measuring 2.8 x 0.3 m and 0.6 m above the seabed. The wreck is listed in INFOMAR as a 5320-ton cargo vessel with the stern (MA0182/W09846) recorded approximately 160 m southwest of the bow. Associated magnetic return of 15165 nT.

3.4.14 MA0120 (SSS MA2119; W01594; MBES MA4090; MAG MA21101), (Figure C- 19), the iron merchant steamer *SS Vesper*. Seen in the SSS data the scattered remains of a wooden composite wreck with an array of linear reflectors measuring 30.7 x 9.5 m and sitting 2 m above the seabed. Associated with a magnetic return of 9015 nT.

3.4.15 MA0108 (SSS MA2107; W01630 or W11331; MBES MA4083), (Figure C- 20), seen in the SSS data as an isolated curved hard reflector with shadow and 2.9 m scour, measuring 8.8 x 2.9 m and a height of 0.6 m above the seabed. W01630 is recorded as an unknown wooden wreck lying upside down with a copper sheathed hull, measuring 17 m long and is located 174 m SE from the feature seen in the SSS data. W11331 is recorded as an unknown wreck with no further details and is located 173 m SSE from the feature seen in the SSS data.

3.4.16 MA0182 (SSS MA2181; W09846, MBES MA4126; MAG MA20351), (Figure C- 21), *MV Bolivar* (stern); seen in the SSS data as a partially buried wooden composite wreck measuring 68 x 17 m and sitting 1.6 m above the seabed. Associated magnetic return of 18427 nT.

3.4.17 MA0106 (SSS MA2105; W11626; MBES MA4081; MAG MA20526), (Figure C- 22), an unknown wreck. Described in the INFOMAR data as a wooden wreck known as the 'Iron Pipe Wreck,' measuring 19 x 5 m. Seen in the SSS data as a linear scattering of hard reflectors measuring 20 x 9.2 m. There is an associated magnetic return of 736 nT.

3.4.18 MA0127 (SSS MA2126; W01629 or W01588; MBES MA4095; MAG MA21117), (Figure C-23), seen in the SSS data as a scattered array of angular reflectors over an area of 29 x 8 m with a height of 1 m above the seabed. W01629 lies 7.4 m west of the feature seen in the SSS and is listed as the remains of a 300-400 ton wooden wreck, partially exposed with a number of anchors, pottery, clay pipes, iron pots, a capstan and winch recorded on the wreck site. W01588 is the recorded site for the *Sir Charles Napier*, a 638 ton merchant sailing vessel carrying a cargo of iron pots and iron hoops. Associated magnetic return of 106 nT.

3.4.19 MA0107 (SSS MA2106; W11333; MBES MA4082), (Figure C- 24), an unknown wreck. Seen in the SSS data as an isolated rectangular buried feature measuring 3.8 x 3.9 m.

3.4.20 MA0110 (SSS MA2109; W11610; MBES MA4083), (Figure C- 25), an unknown wreck. Seen in the SSS data as a linear reflector measuring 25 x 2.5 m with a pronounced shadow sitting 1.1 m above the seabed. MA0109 and MA0111 are both seen as banded features in the SSS data, likely planking and wreck debris associated with MA0110 and are located 12 m north west and 14.9 m east, respectively, from the main wreck assemblage.

3.4.21 MA0115 (SSS MA2114; W11332; MBES MA4087; MAG MA20534), (Figure C- 26), an unknown wooden wreck recorded as measuring 26.5 x 4.3 m in the 2010 INFOMAR seabed mapping programme. Seen in the SSS data as a partially buried linear feature measuring 30 x 5.6 m and sitting 0.6 m above the seabed. MA0114 and MA0116 are likely associated wreck debris located 9m south west and 12.5 m due north, respectively. Associated magnetic return of 21.72 nT.

3.4.22 MA0118 (SSS MA2117; W09300; MBES MA4089; MAG MA20528), (Figure C- 27), an unknown wreck previously described as 21 m long and 3.7 m wide and recorded in the INFOMAR mapping programme. Seen in the SSS data as the buried outline of a wreck measuring 20 x 3.3 m. There is an associated magnetic return of 56 nT.

3.4.23 MA0192 (SSS MA2191; W18562; MBES MA4129; MAG MA21127), (Figure C- 28), an unknown wreck. Described in the INFOMAR data as measuring 13.5 x 3.5 m. Seen in the SSS data as a collection of liner hard reflectors associated with a potential wooden wreck, measuring 19 x 28 m and sitting 1 m above the seabed. Associated magnetic return of 1951 nT.

3.4.24 MA0140 (SSS MA2139; MA wreck ID MA03; MBES MA4104; MAG MA21210), (Figure C-29), an unknown wreck measuring 15.6 x 7.5 m. Previously identified in the Foreshore Licence data and identified in the SSS data. Associated magnetic return of 24 nT.

3.4.25 MA0096 (SSS MA2095; MA wreck ID MA05; MBES MA4076), (Figure C- 30), an unknown wreck with visible features measuring 15 m long and 5 – 6 m wide. Previously identified in the Foreshore Licence data and identified in the SSS data.

Possible wreck or wreck debris

3.4.26 21 records as identified from the assessment of geophysical data were not previously recorded as wrecks or aviation remains but have been considered likely to be wrecks or associated debris (Figure 3 and Annex B). At this stage none of the anomalies have been identified as potential aviation remains. The identified records are described below;

3.4.27 MA0213 (SSS MA2212; MBES MA4134; MAG MA7801) is an isolated hard reflector measuring 3.8 x 2 m and sitting 0.9 m above the seabed, potentially a wreck or wreck debris. Associated magnetic reading of 248 nT.

3.4.28 MA0216 (SSS MA2215; MBES MA4136; MAG MA7880) is a cluster of incoherent hard reflectors measuring 8 x 4.8 m, potentially a wreck or wreck debris. Associated magnetic return of 95 nT.

3.4.29 MA0258 (SSS MA2257; MBES MA4175) is a linear hard reflector with perpendicular, regularly spaced lines to one side. The feature measures 4 x 2 m and is interpreted as a potential wreck or wreck debris.

3.4.30 MA0027 (SSS MA2026; MBES MA4019; MAG MA10143) is an isolated linear reflector at the end of a longer linear feature, potentially an anchor attached to rope or chain. The total feature measures 27.6 x 3.4 m and sits 0.15 m above the seafloor. There is a magnetic reading of 3619 nT associated with this feature.

3.4.31 MA0159 (SSS 2158; MBES MA4115; MAG 21159) is an isolated pair of partially buried linear reflectors measuring 3.9 x 2.1 m, with 0.9 m of associated scour; potentially a wreck or wreck debris. Associated magnetic return of 1648 nT.

3.4.32 MA0046 (SSS MA2045; MBES MA4038; MAG MA10800) is an isolated linear hard reflector measuring 21.6 x 0.8 m, potentially a wreck or wreck debris. Associated magnetic return of 24 nT.

3.4.33 MA0091 (SSS MA2090; MBES MA4074; MAG MA15865) is an isolated linear hard reflector sitting in a patch of scour measuring 58 x 38 m seen in the MBES. The feature seen in the SSS measures 36.8 x 0.25 m and is interpreted as a potential wreck. Associated magnetic return of 50 nT.

3.4.34 MA0305 (MBES MA4217; MAG MA12959) is a high magnetic anomaly that can be seen as a raised linear feature measuring 50 x 7 m in the MBES data. This feature is located 183 m northwest of the NMS location for the Loch Fergus (W01828) and is potentially the correct location of this wreck. Associated magnetic reading is 14051 nT.

3.4.35 MA0156 (SSS MA2155; MBES MA4113) is a pile of hard reflectors containing some linear features, with a long, linear cable-like feature extending from the main feature. The visible extent of the feature measures: 24 x 6.3 m, sits 1.4 m above the seabed, and lies 100 m south of MA0098.

3.4.36 MA0180 (SSS MA2179) is partially buried reflectors, likely debris associated with MA0178 which is located 20 m northwest. The feature measures 3.7 x 0.5 m and has a potentially associated magnetic return of 416 nT, 21 m south southeast.

3.4.37 MA0179 (SSS MA2178; MBES MA4124) is a scattering of partially buried linear reflectors, likely planking associated with MA0178 which is located 21 m northwest. The feature measures 8 x 2.6 m and has a potentially associated magnetic return of 416 nT, 20 m southeast.

3.4.38 MA0176 (SSS MA2175; MAG MA20356) is a partially buried reflector measuring 8.9 x 1.6 m, potentially rigging associated with MA0178, which lies 46 m west southwest. Two other associated features of wreck debris, MA0179 and MA0180, are located 20 m south southeast and southeast respectively. There is an associated magnetic reading of 90 nT and a potentially associated return of 416 nT 58 m to the east.

3.4.39 MA0160 (SSS MA2159; MBES 4116) is a feature of multiple linear hard reflectors at intersecting angles measuring 9.2 x 3.7 m and sitting 0.3 m above the seabed. The feature is located 41 m northwest of MA0161 and is potentially associated wreck debris.

3.4.40 MA0161 (SSS MA2160; MBES MA4117) is a linear feature with 1.2 m of associated scour. The feature measures 4.4 x 1.7 m and sits 0.27 m above the seabed, adjacent to a large sand wave that can be seen in the MBES.

3.4.41 MA0164 (SSS MA2163) is a feature of multiple linear hard reflectors measuring 4.3 x 4.3 m and potentially associated with the wreck MA0178 which is located 400 m northeast.

3.4.42 MA0158 (SSS MA2157; MBES MA4114; MAG MA20535) is an isolated hard reflector measuring 5.6 x 6.7 m and sitting 0.65 m above the seabed. The feature is located 83 m northwest of MA0105 (a feature interpreted as low significance debris). Associated magnetic return of 128 nT.

3.4.43 MA0109 (SSS MA2108; MBES MA4084) is a partially buried banded feature measuring 24 x 2 m, potentially planking associated with MA0110 which lies 12 m southeast.

3.4.44 MA0111 (SSS MA2110; MBES MA4085) is a partially buried banded feature measuring 3.7 x 0.9 m, potentially planking associated with the wreck MA0110 which lies 15 m west northwest.

3.4.45 MA0116 (SSS MA2115; MBES MA4087; MAG MA20534) is a linear partially buried hard reflector with pronounced shadow and scour measuring 10.5 x 1.7 m, sitting 0.5 m above the seabed with 1.8 m of associated scour. There is a magnetic reading of 21 nT associated with this feature. This feature is likely wreck debris associated with MA0115 which is located 15.5 m to the south.

3.4.46 MA0114 (SSS MA2113; MBES MA4087; MAG 20534) is an isolated partially buried reflector measuring 21 x 2.5 m, sitting 0.7 m above the seabed with 2.5 m of associated scour. There is a magnetic reading of 21 nT associated with this feature. This feature is likely wreck debris associated with MA0115 which is located 9 m northeast.

3.4.47 MA0136 (SSS MA2135; MBES MA4098) is a linear hard reflector measuring 0.8 x 0.5 m. The feature is probable wreck debris associated with MA0192, which is located 31 m east. Associated magnetic return of 15 nT.

Anchors

3.4.48 Nine records within the geophysical data have been interpreted as potential anchors (Figure 3 and Annex B) and are described below.

3.4.49 MA0262 (SSS MA2261; MBES MA4179; MAG MA9632) is an isolated reflector with a shank feature measuring 4 m and arm span of 1.1 m, sitting 0.5 m above the seabed. There are two potentially associated magnetic readings within 11 m measuring 18 nT and 10 nT, to the northeast and southwest respectively.

3.4.50 MA0053 (SSS MA2052; MBES MA4041; MAG MA9733) is an isolated reflector with a shank feature measuring 1.2 m and arm span of 1.9 m with 0.5 m of associated scour. There is a magnetic reading of 9.6 nT associated with is feature.

3.4.51 MA0039 (SSS MA2038; MBES MA4031; MAG MA10235) is an isolated reflector with a shank feature measuring 3.8 m and arm span of 2.5 m, sitting 0.16 m above the seabed. There is a magnetic reding of 191 nT associated with this feature. A feature interpreted as an archaeological anomaly, MA0037, is located 69 m southwest with an associated magnetic reading of 150 nT.

3.4.52 MA0033 (SSS MA2032; MBES MA4025; MAG MA10652) is an isolated reflector, with a shank feature measuring 3.1 m and arm span of 1.9 m, sitting 0.19 m above the seabed. A magnetic reading of 22 nT was noted 14 m south west, potentially associated with this feature. Another potential anchor, MA0034, is located 63.5 m south east and is also potentially associated with this anchor feature.

3.4.53 MA0034 (SSS MA2033; MBES MA4026; MAG MA10607) is an isolated reflector with a shank feature measuring 1 m and arm span of 1.8 m sitting 0.1 m above the seabed. There is a magnetic reading of 14 nT 11 m north northeast, and another reading 102 nT 22.5 m east southeast, potentially associated with this anchor feature.

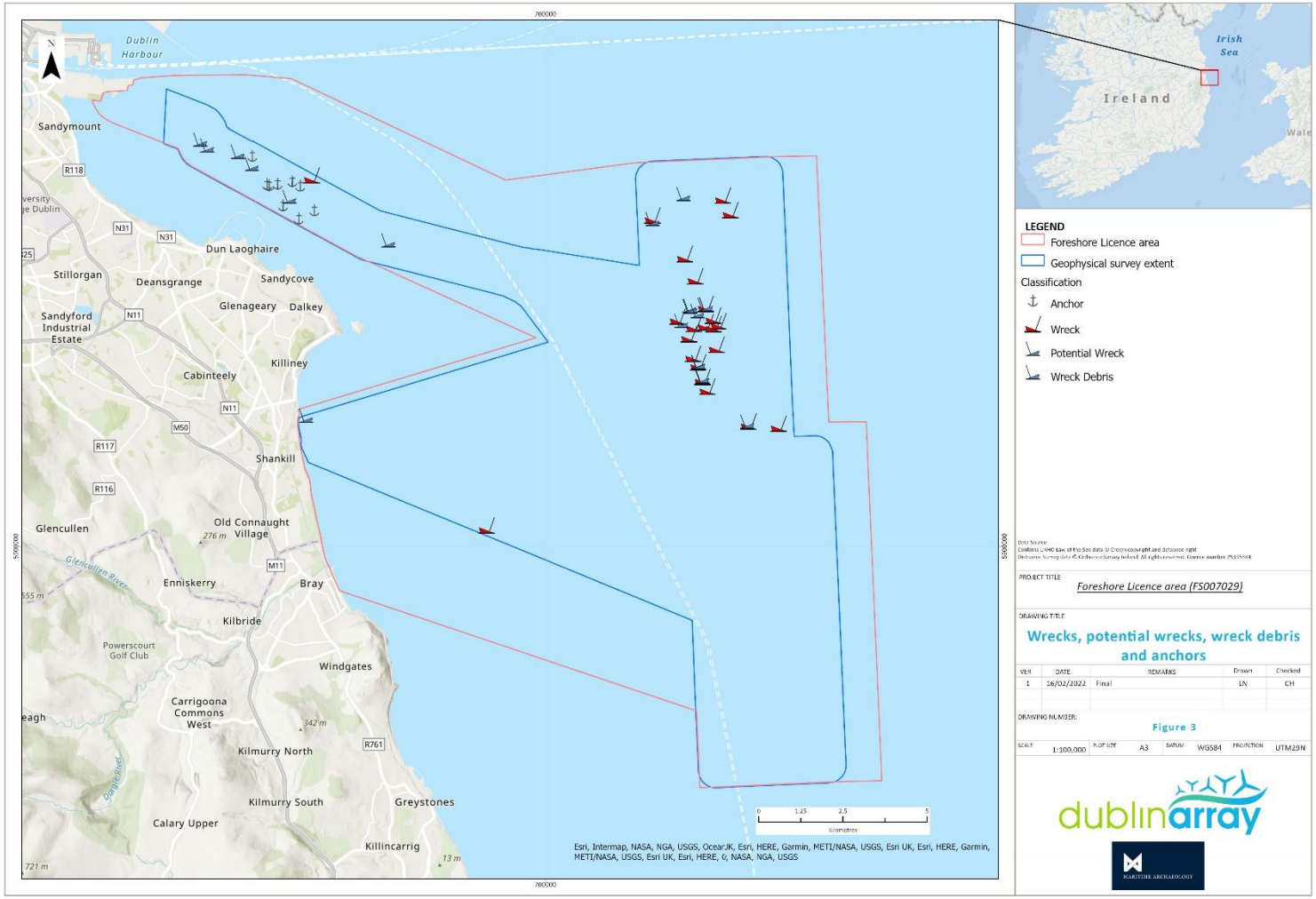
3.4.54 MA0061 (SSS MA2060; MBES MA4048; MAG MA9730) is an isolated reflector with a shank feature measuring 3.4 m and arm span of 2 m, with 0.4 m of associated scour. There is a potentially associated magnetic reading of 8.3 nT 12 m north of this feature.

3.4.55 MA0041 (SSS MA2040; MBES MA4033; MAG MA11293) is an isolated reflector with a shank feature measuring 2.4 m and arm span of 1.5 m, sitting 0.27 m above the seabed. There is a magnetic reading of 72 nT associated with this feature. The potential wreck MA0046 is located 234 m to the northeast.

3.4.56 MA0073 (SSS MA2072; MBES MA4060; MAG MA15988) is an isolated reflector with a shank feature measuring 3.5 m and arm span of 1.4 m, with 0.8 m of associated scour. There are two potentially associated magnetic readings of 29nT and 23 nT within 24 m, to the northeast and southwest respectively.

3.4.57 MA0058 (SSS MA2057; MBES MA4046; MAG MA16135) is an isolated reflector with a shank feature measuring 5.3 m and arm span of 1.8 m, with 0.5 m of associated scour. There is a magnetic reading of 138 nT associated with this feature.

Figure 3: Wrecks, wreck material and anchors



Archaeological anomalies

3.4.58 53 anomalies seen in the SSS data have been considered to map material of archaeological potential such as buried and confirmed palaeolandscapes, or locations where a wreck has been recorded but is not clearly defined in the other geophysical datasets. The records have been included in **Annex B** and illustrated on **Figure 4**.

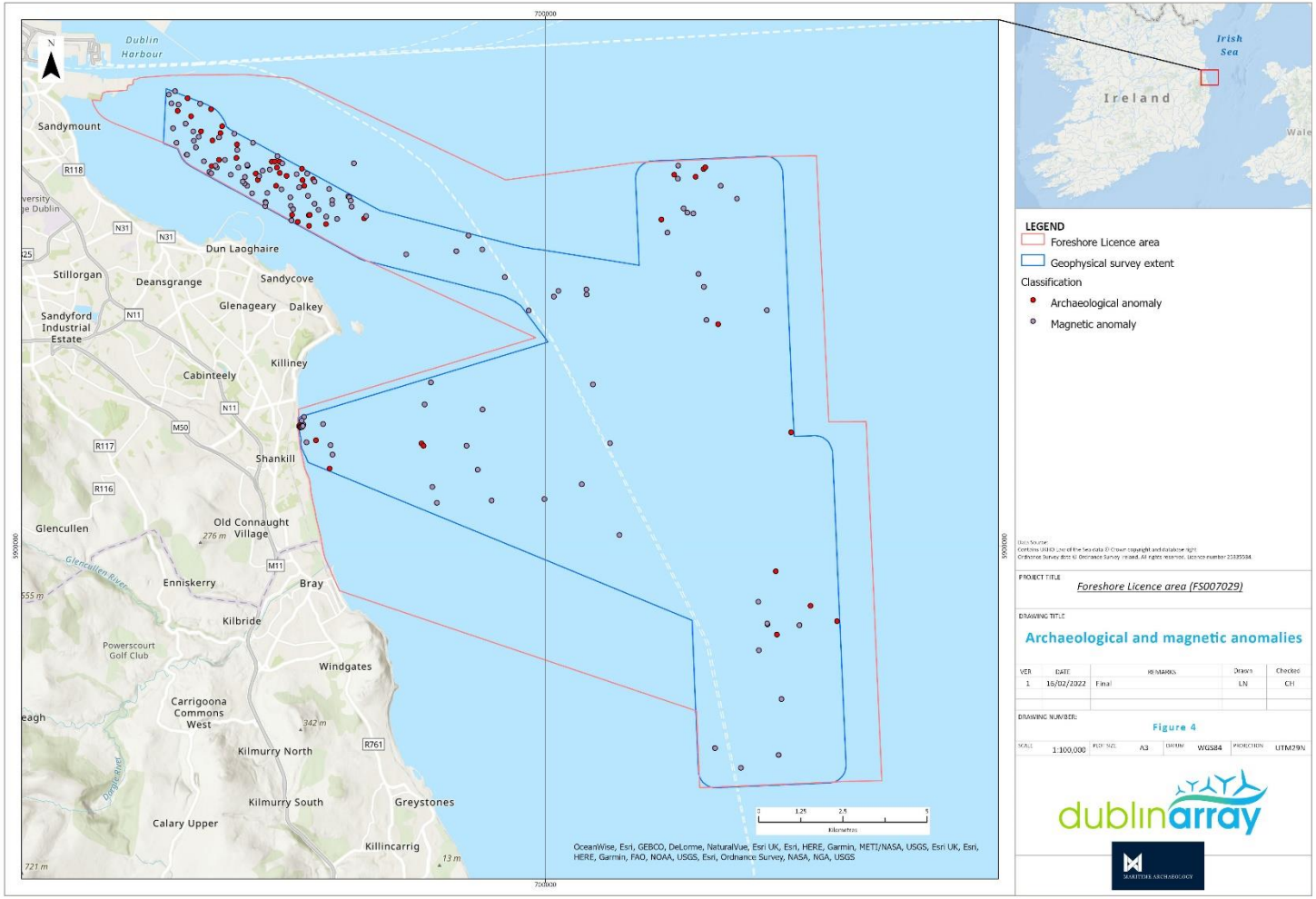
Magnetic anomalies

3.4.59 120 magnetic anomalies with a return of 100 nT or larger have been considered to map material of archaeological potential such as buried wrecks or wreck material that was not seen or clearly defined in the other geophysical datasets. 23 of these records were identified within the MBES data but no the SSS data so they have remained classified as magnetic anomalies due to the limited information. All records have been included in **Annex B** and illustrated on **Figure 4**.

Geophysical targets

1.1.1 16,250 anomalies considered to be of anthropogenic origin but likely associated with contemporary activity with little or no archaeological significance such as modern debris, ropes, chains or fishing gear and magnetic returns under 100 nT with no other corresponding geophysical indication have not been included here.

Figure 4: Archaeological and magnetic anomalies

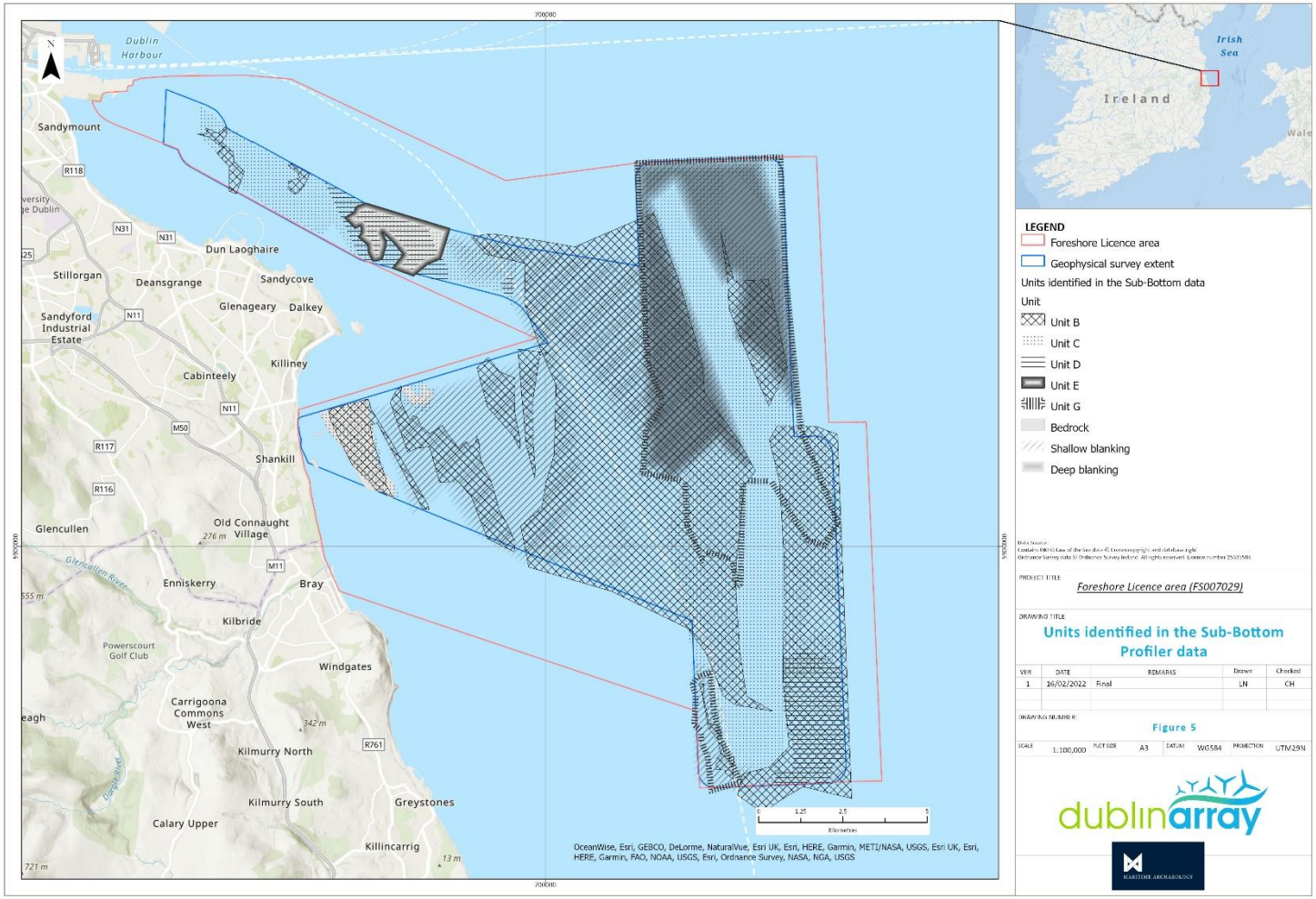


Palaeogeographic assessment of geophysical data

3.4.60 The geoarchaeological assessment of sub-bottom data to a depth of about 5 m BSB was undertaken on a line-by-line basis with focus on relict palaeochannels underlying the seafloor sediments.

3.4.61 The results from the assessment have been combined with the results from the assessment of both sub-bottom data and interpretation of the UHRS data undertaken in the eastern extent of the Foreshore Licence area by Fugro to provide higher resolution information on the Quaternary geology, the units identified are illustrated in Figure 5.

Figure 5: Units identified in the Sub-Bottom Profiler data



3.4.62 The substrate of the Foreshore Licence area is mainly made up of sand, possibly silty sand, and silt (Unit A). Areas of outcropping bedrock are noted seaward of Dalkey and in Killiney Bay, stretching south towards Shankill. The main depositional features are sand dunes making up the Kish and Bray Banks as also seen from the bathymetric data.

3.4.63 Unit B shows a complicated system of channel features and a shallow riverine pattern which is interpreted to represent an intertidal /estuarine to shallow marine / coastal environment with sediment likely to have been deposited in the early to mid-Holocene. Unit B has been located across the Foreshore Licence area as illustrated on Figure 6. Unit B (MA3005-MA3014) is of high geoarchaeological potential and could contain prehistoric human, animal, and plant material.

3.4.64 Unit C (MA3015-MA3018) is found mostly across the eastern extent of the Foreshore Licence area (Figure 7) and is likely to represent prograded late glacial marine / glaciolacustrine sediments. In places the unit seems to infill deeper channels. One borehole, collected during Glover Site Investigations in 2008 (Glover Site Investigations, 2008), has confirmed this to be composed of clay which would have a high potential for preservation of micro and macro fossils that can be used to further date the deposit and understand its relationship with human interaction.

3.4.65 Unit D appears as sandy gravel and may represent a complex coastal environment with a braided glacial delta or an outwash plain. The deposit may have been laid down between periods of submergence. Unit D is found in the north and southeast sections of the Foreshore Licence area (Figure 7)(MA3019-MA3021). The Unit looks chaotic in places but well-bedded / highly structured in others across the Foreshore Licence area. The complex cross bedding could derive from its position close to the oscillating ice margin. The unit is of limited archaeological potential due to the likelihood that it is re-worked making a secure date difficult. Should organics be found within a secure context it is likely that the material would be outside the limit for c14 dating where samples generally older than 55-60,000 years BP cannot be securely dated as the amount of c14 remaining is negligible. The sandy, gravelly deposit can possibly be dated using optically stimulated luminescence (OSL) where the time since the sediment grains were deposited to light is measured. Should OSL dating be used it is paramount that the samples are collected in opaque liners and opened in a OSL laboratory to prevent light or heat resetting the luminescence.

3.4.66 Unit E is represented by a high amplitude, localised erosional unconformity and channel features (MA3022) with a localised presence across the survey area. The unit may be made up of glaciomarine or glaciolacustrine to subglacial channel infill of clay or sand. The potential for macro or micro fossils or material suitable for dating is presently unknown but it is likely that the time scale for depositions is not contemporary with hominin presence in the area.

3.4.67 Unit F is a complex geophysical unit which is likely to be glaciogenic in origin and could be linked to Cardigan Bay Formation Upper till. The unit shows many internal incisions including more prominent channel features. As with Unit E, the potential for macro or micro fossils or material suitable for dating is presently unknown but it is likely that the time scale for the deposition is not contemporary with hominin presence in the area.

3.4.68 Unit G is a well bedded deposit with strong internal reflectors. It is consistently visible at the base of the deepest mapped channels across the site and in some areas where the bedrock is closer to the seafloor (MA3023, MA3024). The potential for macro or micro fossils or material suitable for dating is presently unknown but it is likely that the time scale for depositions is not contemporary with hominin presence in the area.

3.4.69 Bedrock (MA3000-MA3004) is represented by a low to moderate to high amplitude faulted and folded reflector present across the site and seen in both the SBP and UHRS data. The bedrock is thought to be made up of either Mid-Tertiary sandstones or Permo-Triassic mudstone. The bedrock as a deposit is not of geoarchaeological potential.

3.4.70 Data blanking is evident across large areas of the Foreshore Licence area, the blanking may represent biogenic origin shallow gas or thermogenic gas which blanks out the signal below resulting in lack of information on any potential channels below.

Figure 6: Unit B as identified in the Sub-Bottom Profiler data

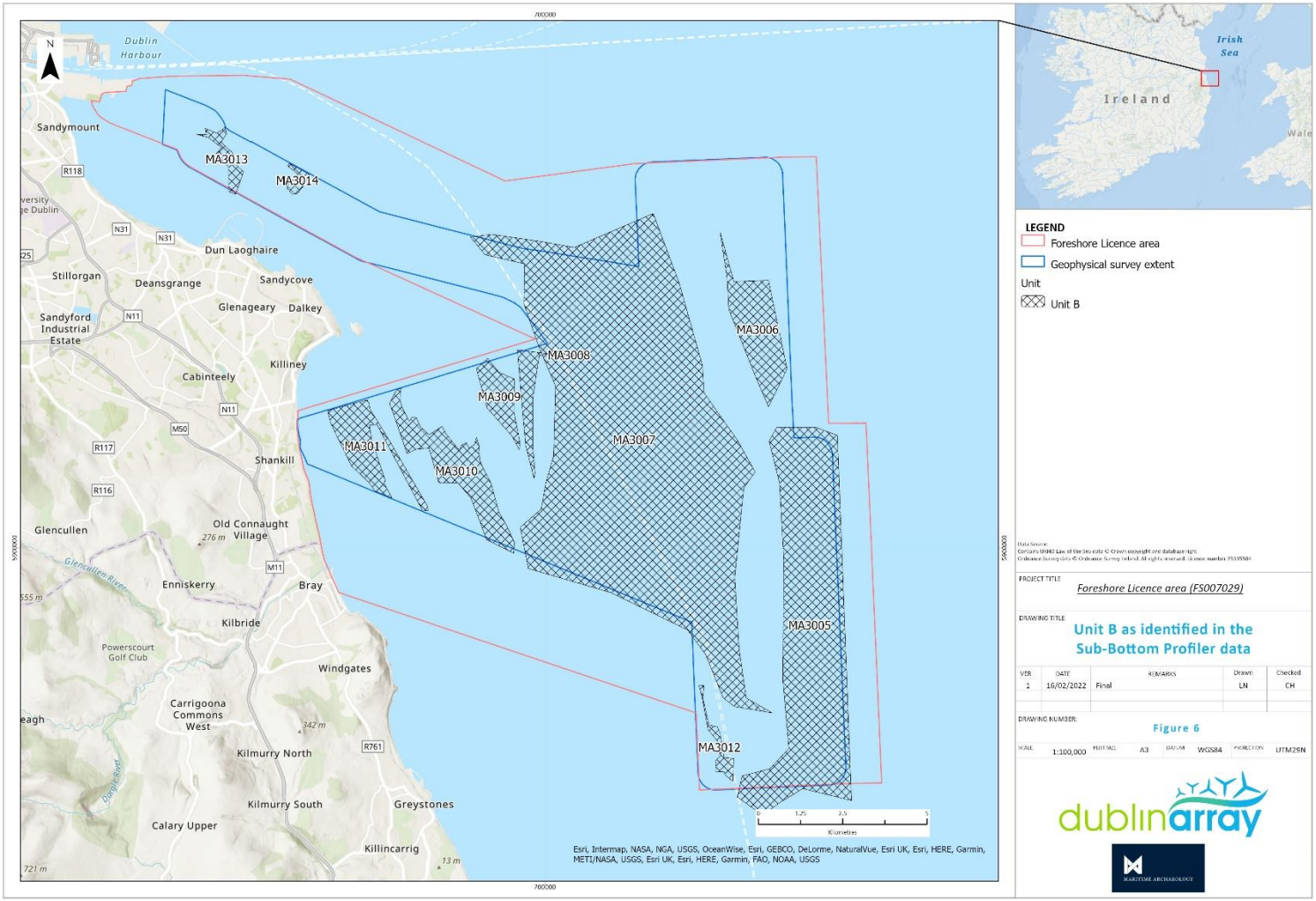
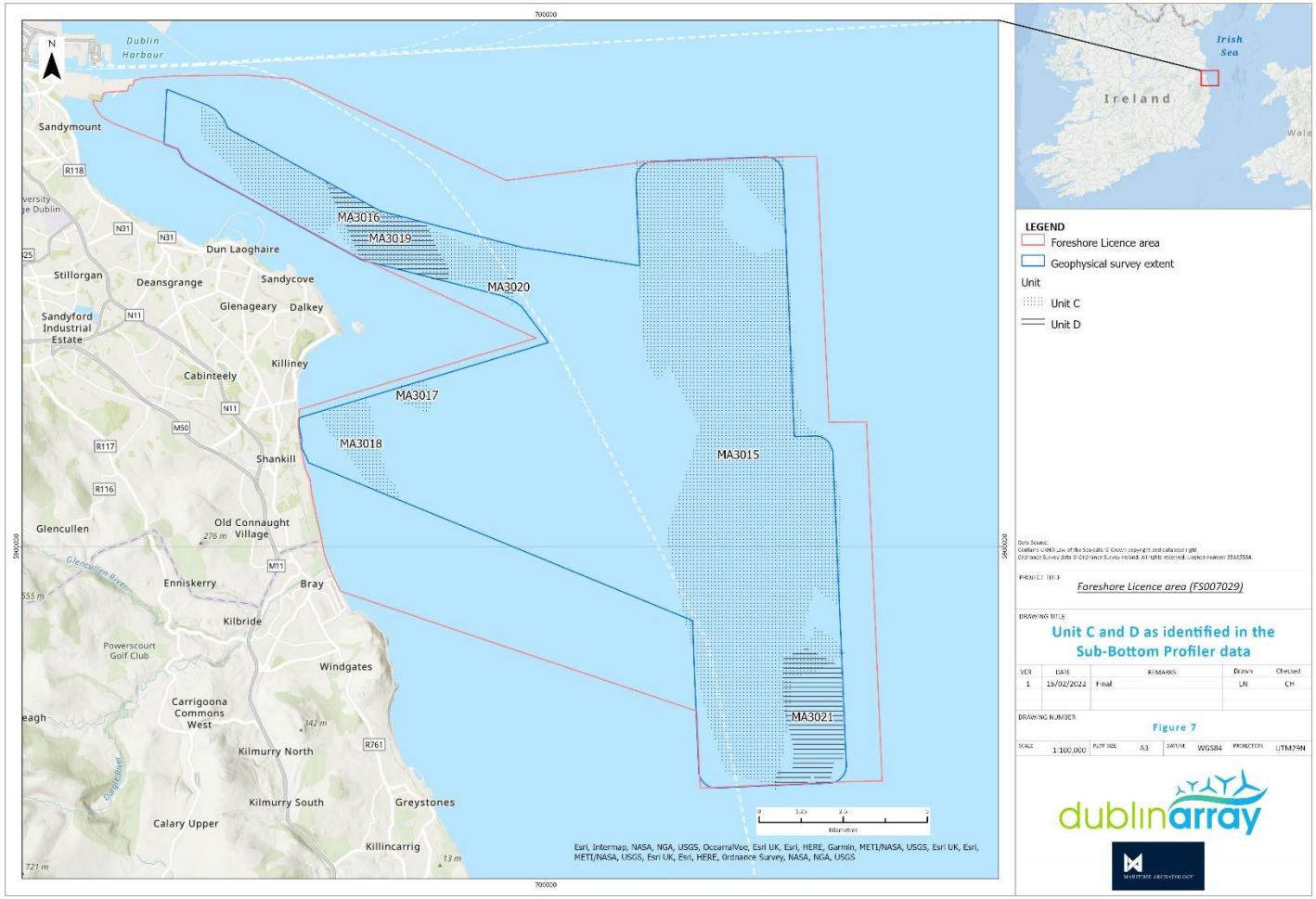


Figure 7: Unit C and D as identified in the Sub-Bottom Profiler data



Environmental context

3.4.71 During the Quaternary, much of Northern Europe experienced extensive ice-sheet cover during a number of glaciation events. The most recent of these glacial events was in the LGM, c. 34,000 Before Present (BP) to 12,000 BP (Clark *et al*., 2012; Chiverrell *et al*., 2013). During this event, an ice sheet, known as the British-Irish Ice Sheet (BIIS) merged across much of Britain and Ireland. The BIIS began forming in the northern and upland area before advancing across the landscape, marine and terrestrial, creating various glacial environments where sediments were deposited or eroded depending on the stage of ice sheet advance or retreat (Scourse *et al*., 2019).

3.4.72 The BIIS extended into the Celtic Sea to reach its maximum limits c. 25.3-24.5 ka before collapsing with rapid marginal retreat to the northern Irish Sea Basin (ISB) (Chiverrell *et al*., 2018). This retreat was largely a result of the Irish Sea Ice Stream (ISIS), the largest marine terminating ice stream draining the former BIIS. The main axis of the ISIS flowed from north to south through the ISB, with catchment areas in southern Scotland, northern England, Ireland, and Wales (Scourse *et al*., 2019).

3.4.73 The retreat of the ISIS is the single agent responsible for the glacial stratigraphy and geomorphology of the current ISB (Chiverrell *et al*., 2013). Significant amounts of sediment were eroded and reworked with variable thicknesses of glaciogenic deposits formed, referred to as 'Irish Sea Till,' (Eyles and McCabe, 1989). These deposits are composed of shelly, grey and muddy, unsorted sediments with some angular clasts. By approximately 22,500 – 21,200 years BP ice had retreated to a line just south of the Foreshore Licence area. Ice sheet decay slowed thereafter with episodic meltwater discharge (Chiverrell *et al*., 2013).

3.4.74 Following the retreat of the BIIS, relative sea-level rose c. 120 m globally and the climate warmed at the beginning of the Holocene period, approximately 11,200 BP. Large areas of habitable land emerged and palaeogeographic and relative sea-level (RSL) models have indicated that the Foreshore Licence area could have been terrestrial landscape as early as 11,000 BP (Sturt *et al*., 2013) through to 7500 BP (Shennan *et al.,* 2008).

3.4.75 Previous studies have shown that the area of land exploited by humans and animals was subsequently inundated and the palaeolandscapes were preserved beneath the Irish Sea. Within the study area, intertidal mud deposits have previously been recorded buried beneath the Kish Bank c. -30 m to -35 m below Chart Datum (CD), indicating the presence of palaeoshorelines (Westley and Edwards, 2017: 265). These mud deposits may correlate with Unit E or Unit F as described above.

3.4.76 Evidence for in situ intertidal peat beds and a submerged forest have been recorded c. 1 km south of the Foreshore Licence area, near Bray Harbour, Co. Wicklow. The remains of the submerged forest were first discussed by Praegar (1896), in which he describes 'some stumps and boughs of trees […] embedded in a compact layer of peat' (Praegar, 1896: 155). Bolton re-surveyed this submerged forest in 1999, however only three trees were partially exposed. Samples obtained from the trees returned a radiocarbon date of 6,180 (+/- 80) years BP (early Neolithic). In 2001, the beach levels dropped by an average of 1 m and this time 35 trees were exposed at low tide. However, no samples were taken. This site was also listed in Brooks and Edwards (2006) Irish sea-level database, with samples taken dated to 7432-7832 cal. BP (late Mesolithic) and the palaeoshore mean sea level listed as -3.6 m (Mitchell, 1976). Both positions are outside the extent of the covered survey area which is why no comparison with the geophysical data can be made.

3.4.77 Known instances of subtidal or intertidal assemblages with prehistoric evidence have been compiled in a database of submerged archaeological sites around Ireland for the SPLASHCOS project (Bailey and Sakellariou, 2012). The database does not include any sites within the Foreshore Licence area, however two worked undiagnostic lithics were discovered within seabed sand and gravel during dredge monitoring c. 10 km offshore during works associated with the Arklow Bank wind park and one polished stone axe was found by a sport diver at the base of Muglins Rock, Dalkey Sound in 1991 (http://www.splashcos-viewer.eu/).

3.4.78 Further to this, a SSS and MAG survey conducted in 2009 to inform the preparation of the Environmental Impact Statement (Saorgus Energy Limited, 2012; 2013a; 2013b) indicated a dark area that may represent a relict submerged landscape such as former soil profiles and/or peat deposits within the Foreshore Licence area (Headland Archaeology, 2009). The area is outside the extent of the 2021 geophysical coverage, however the assessment of geophysical data collected in 2021 shows that the nearshore area where the dark area was located shows increased presence of bedrock protruding through the overlying sediments. Table 5 summarises the outcome from the assessment.

Table 5 : Summary of Units identified in Sub Bottom Profiler data.

Unit	Lithology	Stratigraphy	Geoarchaeological potential
Unit A	Mobile, unconsolidated sediments. Present across most of the site but mostly associated with the presence of large sandwaves and sandbanks with clear bedding in some areas.	Seabed sediment, assumed to be deposited during the Flandrian transgression and reworked from the underlying units.	The deposit could contain archaeological artefacts but is not of geoarchaeological potential.
Unit B	Fine to medium silty SAND, medium amplitude reflectors, chaotic to sub-parallel with erosion surfaces.	Possibly subtidal to estuarine sediments deposited in the early to mid-Holocene.	Unit B is of high geoarchaeological potential and could contain prehistoric human, animal, and plant material.

Unit	Lithology	Stratigraphy	Geoarchaeological potential
Unit C	Low to moderate amplitude, parallel internal reflectors with a high amplitude basal reflector. Associated with data blanking.	Interpreted as glaciolacustrine/glaciomarine prograded deposits.	High potential for the preservation of micro and macro fossils.
Unit D	SAND and GRAVEL, chaotic in places but well-bedded/highly structured in others.	Complex coastal environment with a braided glacial delta or an outwash plain.	The unit is of limited archaeological potential due to re-working but can possibly be dated using OSL.
Unit E	Silty CLAY or silty SAND, wavy parallel, low amplitude internal reflectors. The basal reflector within the deep channel is high amplitude.	Glaciomarine/glaciolacustrine to subglacial channel infill.	The deposit is not likely to be contemporary with hominin presence in the area.
Unit F	Chaotic – low to high amplitude internal reflector.	Subglacial till and evident channels. Likely to be glaciogenic in origin.	The deposit is not likely to be contemporary with hominin presence in the area.
Unit G	Consistent layer at base of large channels across the site, well bedded with strong internal reflectors.	Identified at the base of the deepest mapped channels below all other Quaternary units.	The deposit is not likely to be contemporary with hominin presence in the area.
Bedrock	Low to moderate to high amplitude reflector present across the site in SBP and UHRS.	Either Mid-Tertiary sandstones or Permo-Triassic mudstones.	Not of geoarchaeological potential.

4 Recommendations

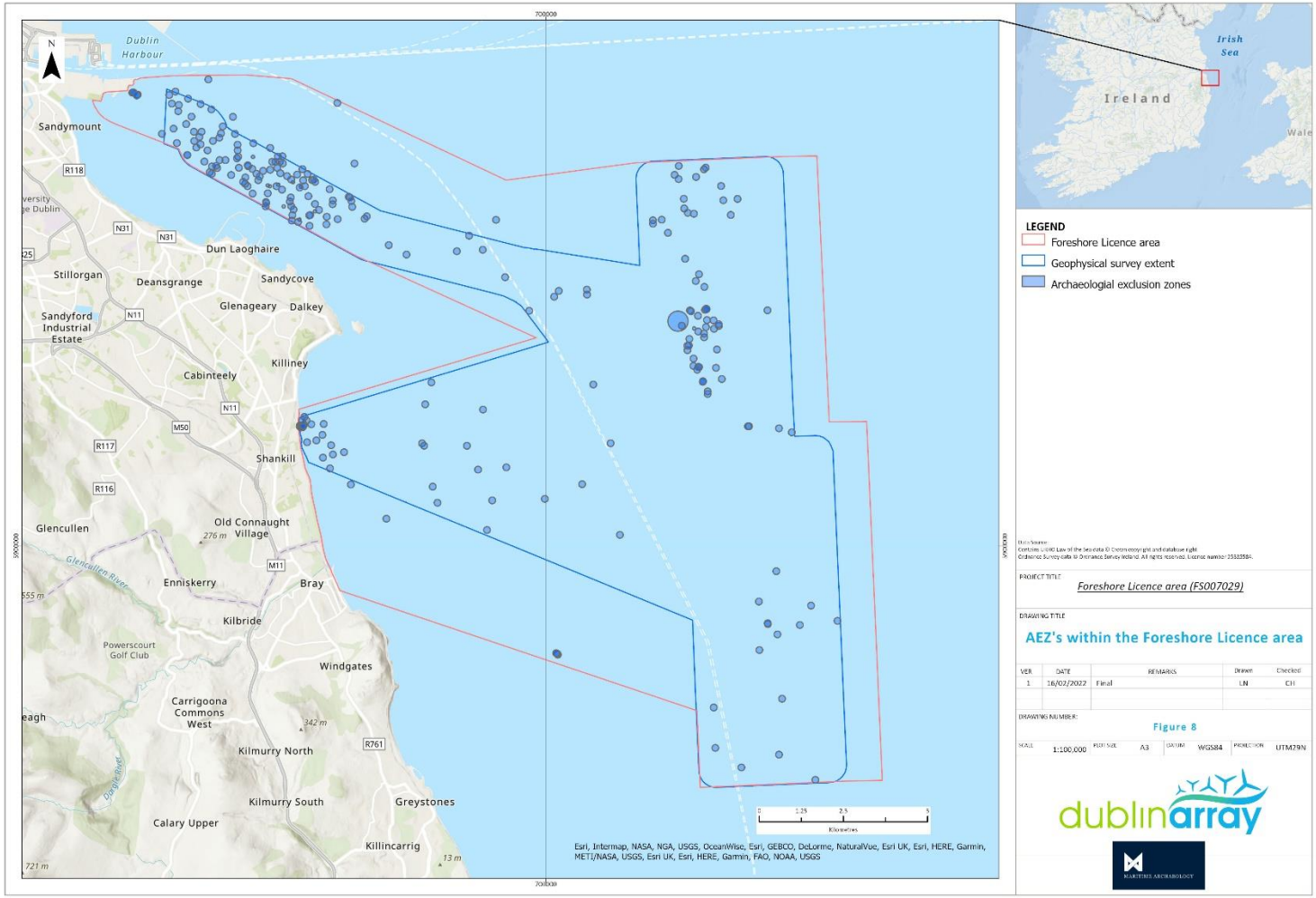
4.1.1 The subtidal Foreshore Licence area includes the Kish and Bray Banks and extends west and north west to the shoreline. This area demonstrates extensive use from the Palaeolithic to modern day which can be seen in both the data collected for the baseline review and the site-specific geophysical data.

4.1.2 AEZs around known wrecks and potential receptors, as identified in the archaeological assessment of baseline and geophysical data are recommended as illustrated on **Figure 8.** All activities interfering with the seabed during all project phases must be micro sited to avoid the AEZs which may be altered, increased, reduced, or removed as more information on the receptor becomes available.

4.1.3 All wrecks, potential wrecks, archaeological anomalies and magnetic anomalies have been recommended to have 100 m AEZs with the exception of **MA02** which has been recommended to have a 300 m AEZ. 50 m AEZs are recommended for the 9 anchors.

4.1.4 Further, general interference with wrecks over 100 years old and archaeological objects underwater is prohibited under Section 3 of the National Monuments (Amendment) Act 1987.

Figure 8: AEZ's in the foreshore Licence area



5 References

Bailey, G., Sakellariou, D., & SPLASHCOS network, M. O. T. (2012). SPLASHCOS: Submerged Prehistoric Archaeology and Landscapes of the Continental Shelf. *Antiquity*, *334*(86)

Brady, N. (2002), 'Archaeological Monitoring and Excavation: Gas 2025 Irish Subsea Interconnector Gormanstown Landfall Co. Louth – Interim Report', The Archaeological Diving Company Ltd. (ADCO).

Brady, L. (2008), 'Shipwrecks on the East Coast of Ireland', Archaeology Ireland, 42: 1-6.

Brady, K (2008), '*Shipwreck Inventory of Ireland- Louth, Meath Dublin & Wicklow*', Stationery Office Dublin.

Brady, K. (2014), 'Secrets of the lake: The Lough Corrib Logboats', Archaeology Ireland, 28/4: 34-38.

Brady, N. (2022), 'Archaeological Intertidal Survey. Shanganagh, Co. Dublin. 21D0046, 21R0071', The Archaeological Diving Company Ltd. (ADCO)

Brooks, A. and Edwards, R. (2006), 'The development of a sea-level database for Ireland', Irish Journal of Earth Sciences, 24/24: 13-27.

Camidge, K, Holt, P, Johns, C, Randall, L and Schmidt, A, 2009. Developing magnetometer techniques to identify submerged archaeological sites project design (5671 PD), HE Projects, Truro.

Campbell, Jessica (2019) Three bodies 'still on-board lost Sunderland'. The Impartial Reporter. [Online] 21 July. available from: https://www.impartialreporter.com/news/17778529.three-bodies-still-board-lost-sunderland/ [16 February, 2021].

Chiverrell, R.C., Thrasher, I.M., Thomas, G.S., Lang, A., Scourse, J.D., van Landeghem, K.J., Mccarroll, D., Clark, C.D., Cofaigh, C.Ó., Evans, D.J., Ballantyne, C.K. (2013), 'Bayesian modelling the retreat of the Irish Sea Ice Stream', Journal of Quaternary Science, 28: 200-209.

Chiverrell, R.C., Smedley, R.K., Small, D., Callantyne, C.K., Burke, M.J., Callard, S.L., Clark, C.D., Duller, G.A.T., Evans, D.J.A., Van Landeghem, K., Livingstone, S., O' Cofaigh, C., Thomas, G.S.P., Roberts, D.H., Saher, M., Scourse, J.D., Wilson, P. (2018), 'Ice margin oscillations during deglaciation of the northern Irish Sea Basin', Journal of Quaternary Science, 33: 739-762.

Clark, C.D., Hughes, A.L., Greenwood, S.L., Jordan, C., Sejrup, H.P. (2012), 'Pattern and timing of retreat of the last British-Irish Ice Sheet. Quaternary Science Reviews, 44: 112-146.

Cunliffe, B. (2001), 'Facing the Ocean: The Atlantic and Its Peoples, 8000 BC to AD 1500', (Oxford: Oxford University Press).

DAU (Development Applications Unit) (2019), Letter to innogy Renewables Ireland Ltd, 25 November.

Plets, Ruth, Dix, Justin, Bates, Richard, (2013), Marine Geophysics Data Acquisition Processing and Interpretation. Historic England (2013) May 2013.

Dowd, M. and Carden, R.F. (2016), 'First Evidence of a Late Upper Palaeolithic human presence in Ireland', Quaternary Science Reviews, 139: 158-163.

Doyle, I.W. (1998), The Early Medieval Activity at Dalkey Island, Co. Dublin: A Re-assessment', The Journal of Irish Archaeology, 9: 89-103.

Dublin City Council (2007), 'Dublin Bay: An Integrated Economic, Cultural and Social Vision for Sustainable Development' (Dublin City Council).

Dublin Port (2019), 'History of the Port'. https://www.dublinport.ie/about-dublin-port/history-of-port/ [Accessed: November 2019]

Eyles, N., and McCabe, A.M. (1989), 'Glaciomarine facies within subglacial tunnel valleys: the sedimentary record of glacioisostatic downwarping in the Irish Sea Basin', Sedimentology, 36/3: 431-448.

Friel, I. (2003), 'Maritime History of Britain and Ireland c. 400-2001' (London: The British Museum Press).

Garstki, K. (2019), 'The social production of iron in first millennium BC Ireland', Oxford Journal of Archaeology, 38/4: 443-463.

Gilligan, H.A. (1988), 'A History of the Port of Dublin' (Dublin: Gill and Macmillan).

Glover Site Investigations (2008), 'Proposed Kish and Bray Banks Offshore Windfarm: Preliminary Site Investigation', Glover Site Investigations Ltd, Report no. 08-0585.
Headland Archaeology (2009), 'Archaeological Assessment for the Kish and Bray Banks Offshore Windfarm Development, Co. Dublin and Co. Wicklow'.
Liversage, G.D. (1968), 'Excavations at Dalkey Island, Co. Dublin 1956-9', Proceedings of the Royal Irish Academy, 66C: 53-233.
Loveluck, C. and O'Sullivan, A. (2016), 'Travel, transport and communication to and from Ireland c. AD 400-1100: an archaeological perspective', in R. Flechner and S. Meeder (eds.), The Irish in Early Medieval Europe: Identity, Culture and Religion (Basingstoke: Palgrave MacMillan). 19-37.
Lowth, C. (2002). 'Shipwrecks around Dublin Bay.' Dublin Historical Record, 55/1: 50-63.
McGrail, S. (1993), 'Medieval Boat and Ship Timbers from Dublin' (Dublin: Royal Irish Academy).
McGrail, S. (2001), 'Boats of the World' (Oxford: Oxford University Press).
McQuade, M. and O'Donnell, L. (2007), 'Late Mesolithic fish traps from the Liffey Estuary, Dublin, Ireland', Antiquity, 81/313: 569-584.
Mitchell, G.F. (1956), 'An early kitchen midden at Sutton, Co. Dublin', Journal of the Royal Society of Antiquaries of Ireland, 86: 1-26.
Mitchell, G.F. (1972), 'Further excavations of the early kitchen middens at Sutton, Co. Dublin', Journal of the Royal Society of Antiquaries, 102: 151-159.
Mitchell, G.F. (1976), 'The Irish Landscape' (Collins: London).
Monaghan N.T. (2017), 'Irish Quaternary Vertebrates', in P. Coxon, S. McCarron and F. Mitchell (eds.) Advances in Irish Quaternary Studies, Advances in Quaternary Science, vol 1. (Paris: Atlantis Press). 255-291.
O'Donoghue. J. (2004), 'Archaeological Monitoring Report, Poolbeg Yacht and Boat Club, Pigeon House Road, Ringsend, Dublin 4' (Eachtra Archaeological Projects).
O'Sullivan, A. and Breen, C. (2007), 'Maritime Ireland: An Archaeology of Coastal Communities' (Great Britain: Tempus Publishing Limited).
Praegar, R.L. (1896), 'A Submerged Pine-Forest', The Irish Naturalist, 5: 155-160.
Robertson, A., Lochrie, J. and Timpany, S. (2013), 'Built to last: Mesolithic and Neolithic settlement at two sites besides the Forth estuary, Scotland', Proceedings of the Society of Antiquaries of Scotland, 143: 73-136.
Robinson, M.E., Shimwell, D.W. and Cribbin, G. (1999), 'Reassessing the logboat from Lurgan Townland, Co. Galway, Ireland', Antiquity, 73/282: 903-908.
Saorgus Energy Limited (2012), 'Dublin Array - An Offshore Wind Farm on the Kish and Bray Banks Environmental Impact Statement Revision 1'
Saorgus Energy Limited (2013a), 'Dublin Array - An Offshore Wind Farm on the Kish and Bray Banks Environmental Impact Statement Volume 1 Non-Technical Summary'.
Saorgus Energy Limited (2013b), 'Dublin Array - An Offshore Wind Farm on the Kish and Bray Banks Environmental Impact Statement Addendum'.
Scourse, J., Saher, M., Van Landeghem, K.J.J., Lockhart, E., Purcell, C., Callard, L., Roseby, Z., Allinson, B., Pieńkowski, A.J., O'Cofaigh, C., Praeg, D., Ward, S., Chiverrell, R., Moreton, S., Fabel, D. and Clark, C.D. (2019), 'Advance and retreat of the marine-terminating Irish Sea Ice Stream into the Celtic Sea during the Last Glacial: Timing and maximum extent', Marine Geology, 412: 53-68.
Shennan, I., Brooks, A.J., Bradley, S.L., Edwards, R.J., Milne, G.A. and Horton, B. (2008), 'Postglacial relative sea-level observations from Ireland and their role in glacial rebound modelling'. Journal of Quaternary Science, 23 :175-192.
Sturt, F., Garrow, D. and Bradley, S. (2013), 'New models of North West European Holocene palaeogeography and inundation', Journal of Archaeological Science, 40: 3963-3976.
Waddell, J. (1998), 'The prehistoric archaeology of Ireland' (Galway: Galway University Press).

Waddington, C., Bailey, G., Milner, N. and Clarke, A. (2007), 'Howick: Discussion and Interpretation', in C. Waddington (ed.), Mesolithic Settlement in the North Sea Basin (Oxford: Oxbow). 189-202.
Waddington, C. and Wicks, K. (2017), 'Resilience or wipe out? Evaluating the convergent impacts of the 8.2 ka event and Storegga tsunami on the Mesolithic of northeast Britain,' Journal of Archaeological Science: Reports, 14: 692-714.
Wallace, P.F. (1981), 'Dublin's waterfront at Wood Quay: 900-1317', in G. Milne and B. Hobley (eds.), Waterfront Archaeology in Britain and Northern Europe, CBA Research Report, No 41 (The Council for British Archaeology).
Warren G.M. (2017), 'The Human Colonisation of Ireland in Northwest European Context', in P. Coxon, S. McCarron and F. Mitchell (eds.), Advances in Irish Quaternary Studies, Atlantis Advances in Quaternary Science, vol 1 (Paris: Atlantis Press). 293-316.
Westley, K and Edwards, R. (2017), 'Irish Sea and Atlantic Margin', in N.C. Flemming, J. Harff, D. Moura, A. Burgess and G.N. Bailey (eds.), Submerged landscapes of the European Continental Shelf: Quaternary Palaeoenvironments (Wiley: Oxford).
Wooding, J. (2002), 'Trade as a factor in the transmission of texts between Ireland and the Continent in the Sixth and Seventh Centuries', in P.N. Chatháin and M. Richter (eds.), Ireland and Europe in the Early Middle Ages: Texts and Transmission (Dublin). 14-26.
Woodman, P.C. (1985), 'Excavations at Mount Sandel 1973-77', Northern Ireland Archaeological Monographs No. 2 (Department of the Environment for Northern Ireland).

6 Annexes

Annex A: Gazetteer of all known, unknown and uncharted wrecks

Wreck ID	Wreck Name	Classification	Description	Date of Loss	AEZ (m)	Longitude/ Latitude
W09480	*MV Bolivar* (bow)	Cargo Ship	The *MV Bolivar* was a 5,320-ton cargo vessel and at the time of its loss was owned by the Norwegian shipping company, Fred Olsen. The cargo ship was laid down in the yard of Akers Mekaniske Verksted of Oslo in 1939 and was launched, ready for fitting out, in 1940. The Bolivar was finally completed in 1946, setting out on her maiden voyage, to South America, in December of that year. It was upon her return from Buenos Aires to Dublin via Liverpool in early March 1947, with a cargo of grain and bales of leather, that the diesel-powered vessel ran aground on the Kish Bank during a snow storm.	1947	100	-5.9238, 53.2683
W09846	*MV Bolivar* (stern)	Cargo Ship	The *MV Bolivar* was a 5,320-ton cargo vessel and at the time of its loss was owned by the Norwegian shipping company, Fred Olsen. The cargo ship was laid down in the yard of Akers Mekaniske Verksted of Oslo in 1939 and was launched, ready for fitting out, in 1940. The Bolivar was finally completed in 1946, setting out on her maiden voyage, to South America, in December of that year. It was upon her return from Buenos Aires to Dublin via Liverpool in early March 1947, with a cargo of grain and bales of leather, that the diesel-powered vessel ran aground on the Kish Bank during a snow storm.	1947	100	-5.9258, 53.2675
W01572	*Glenorchy*	Sailing Ship	1,285-ton vessel of Glasgow, official no. 60,391. The master was Thomas Meiklejohn. En route from Greenock to Mumbai (Bombay) (maiden voyage), cargo of coal, railway sleepers. Struck the Kish Bank, became a wreck. Crew saved. Four tugs saved materials off the wreck.	1869	100	-5.93317, 53.28058
W01828	*Loch Fergus*	Barque	UKHO wreck no. 009000318. 818/ 874 ton, 23/24-year-old Iron barque of Liverpool / Glasgow. Classed as 100 A1 by Lloyd's. Owned	1899	100	-6.10667, 53.24667

			by J. Sproat & Co., Liverpool, the master was T. Williams. En route from Glasgow to Brisbane, seventeen crew, three passengers, general cargo. Went ashore during SSE force 7 gale.			
W09962	*Privet*	Fishing boat	Fishing vessel sank. Mapped by INSS in 2003.	1988	100	-6.13603, 53.32952
W09984	*Rose of Lough Gill*	Fishing boat	Fishing boat sank.	1995	100	-6.00176, 53.18279
W01588	*Sir Charles Napier*	Ship	The *Sir Charles Napier* was a 638-ton merchant vessel built in Miramichi, New Brunswick, Canada, and owned by Locketts of London. The sailing ship was en route from Liverpool to Sierra Leone, carrying a cargo that included 6,000 iron pots and iron hoops, when it was stranded and wrecked on the Kish Bank during a force 6 wind.	1857	100	-5.925, 53.262
W01593	*Trustful*	Fishing drifter	Sprang a leak during a SW gale while fishing off Bray Head. Crew took to the lifeboat and were picked up by the Dun Laoghaire Pilot boat a few hours later.	1924	100	-5.93333, 53.16667
GSI_278	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.926, 53.2699
GSI_281	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.933, 53.2671
GSI_285	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9305, 53.2665
MA02	Unknown	Unknown	Descriptive details of this record not available.	-	300	-5.9418343, 53.2700941
MA03	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.8989959, 53.2403312
MA04	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9508502, 53.2972627
MA05	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.0305888, 53.2165457
MA07	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9290853, 53.2730765
MA08	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9374636, 53.286664

W01526	Unknown	Unknown	One of five wrecks plotted on William Bligh's 1803 map of Dublin Bay. It is located in shallow water just off the South Bull.	1803	100	-6.11471, 53.31846
W01532	Unknown	Unknown	One of 4 wrecks marked on a chart (Admiralty Chart 1415) of Dublin. It is described as "remains of wrecks" and is located in about 10m of water.	1869	100	-6.11119, 53.31217
W01533	Unknown	Unknown	One of four wrecks marked on a chart (Admiralty Chart 1415) of Dublin. It is described as "remains of wrecks" and is located in about 10m of water.	1869	100	-6.10214, 53.3118
W01543	Unknown	Yacht	UKHO wreck no. 009000045. Chart symbol NDW. Sunken yacht reported in September 1946 as being dangerous to navigation. In October 1946 Irish Lights Commissioners' reported mast of wreck visible at low water. In November 1946 wreck was dispersed, no longer considered dangerous to navigation.	1946	100	-6.02083, 53.29917
W01544	Unknown	Unknown	Dutch dredging company discovered a wreck in June 1989 while excavating route for new sewerage pipe. Wreck lay exposed in the southern bank of the trench, measuring c. 15ft across and consisting of a 'wooden framework'. Cargo of tightly packed, uncut slates was also evident.		100	-6.16793, 53.32575
W01551	Unknown	Unknown	Possible wreck (INSS No. G160) identified during the National Seabed Survey. Wreck measures L. 3m, W. 3m with a height of 3m off the seabed. It lies in a general sea depth of 9m.	-	100	-6.0893, 53.33208
W01629	Unknown	Unknown	Remains of a 300–400-ton vessel (approx.) wooden wreck. Discovered by Marlin Sub Aqua Club in 2003. The vessel is partially exposed on the seabed in 8-10m of water. Pottery, clay pipes, iron pots, a number of anchors, a capstan and a winch were recorded on the wreck site.	-	100	-5.92517, 53.2621
W01630	Unknown	Unknown	Wooden wreck discovered by Marlin Sub Aqua Club in 2003. The wreck is partially exposed on the seabed in 8–10m of water and is upside-down. Hull is copper sheeted. The wreck rises approximately 1m in height off the seabed and measure 17m long.	-	100	-5.9325, 53.26722
W01734	Unknown	Unknown	Wooden wreck, known as the 'Ringsend Wreck,' became exposed during dredging operations for the Dublin Bay pipeline in April 2001. A test excavation conducted on the wreck by Lar Dunne and Emer	-	100	-6.17844, 53.33625

			Dennehy (01E0402) revealed the wreck is orientated E–W and is a composite structure built of timber and metal.			
W08691	Unknown	Unknown	Wreck surveyed by the *RV Keery* in 2010 as part of the INFOMAR seabed mapping programme. Wreck measures 4m long, 1.8m in maximum width and lies in 10m of water. GSI Wreck No_285.	1802	100	-5.9305, 53.2655
W09300	Unknown	Unknown	Wreck surveyed by the *RV Keery* in 2010 as part of the INFOMAR seabed mapping programme. Wreck measures 21m long, 3.7m in maximum width and lies in 15m of water. GSI Wreck No_288.	1800	100	-5.93, 53.251
W10276	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.92347, 53.25417
W10297	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.92583, 53.25722
W10596	Unknown	Unknown	Anchor and cable.	-	100	-6.12, 53.32083
W10597	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.02083, 53.23305
W11331	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93355, 53.2666
W11332	Unknown	Unknown	Wooden wreck identified by Browne & Stokes during a geophysical survey in 2008. The wreck was surveyed by the *RV Keery* in 2010 as part of the INFOMAR seabed mapping programme. Wreck measures 26.5m long, 4.3m in maximum width and lies in 15m of water. GSI Wreck No_287.	-	100	-5.93183, 53.25367
W11333	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93542, 53.26
W11334	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9191, 53.30132
W11337	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93818, 53.26226
W11338	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93812, 53.26346
W11339	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.9342, 53.25694

W11340	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93581, 53.258
W11341	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93744, 53.26349
W11350	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.88965, 53.14619
W11360	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.10193, 53.24372
W11361	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.09263, 53.23887
W11362	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.00147, 53.18252
W11363	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.00218, 53.18295
W11365	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.07505, 53.22067
W11366	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.10212, 53.23766
W11367	Unknown	Unknown	Descriptive details of this record not available.	-	100	-6.0902, 53.23018
W11566	Unknown	Unknown	Re-deposited ship timbers.	-	100	-6.1798, 53.33704
W11567	Unknown	Unknown	Re-deposited ship timbers.	-	100	-6.18, 53.33705
W11568	Unknown	Unknown	Re-deposited ship timbers.	-	100	-6.18016, 53.33704
W11569	Unknown	Unknown	Re-deposited ship timbers.	-	100	-6.18041, 53.33703
W11581	Unknown	Unknown	Wooden wreck known as the '9.5 fathom wreck'.	-	100	-5.93005, 53.25038
W11610	Unknown	Unknown	Descriptive details of this record not available.	-	100	-5.93365, 53.25767

W11626	Unknown	Unknown	Wooden wreck known as the 'Iron Pipe Wreck' located by Browne and Stokes in 2008. The wreck was surveyed by the RV Keery in 2010 as part of the INFOMAR seabed mapping programme. Wreck measures 19m long, 5m in maximum width and lies in 14m of water. GSI Wreck NO_282.	-	100	-5.93708, 53.26517
W18522	Unknown	Unknown	Wooden wreck measuring 16.4m long, 5.5m wide, standing 20cm proud of the seabed. The wreck was identified during a geophysical survey for the Dublin Bay Pipeline Project.	-	100	-6.1463, 53.33976
W18562	Unknown	Unknown	Wreck surveyed by the Celtic Voyager in 2010 as part of the INFOMAR seabed mapping programme. Wreck measures 13.5m long, 3.5m in maximum width and lies in 10m of water. GSI Wreck No_289.	-	100	-5.91233, 53.2411
W11571	Unknown (Ringsend Wreck)	Unknown	Wooden wreck.	-	100	-6.17801, 53.33646
W11570	Unknown (Ringsend Wreck)	Unknown	Wooden wreck.	-	100	-6.17844, 53.33625
W01594	*SS Vesper*	Screw Steamer	The *SS Vesper* was a 478-ton (gross tonnage) iron merchant steamer of Hartlepool, built in Dundee by Barclay Curle & Company, with a nominal horsepower of 60. Benjamin R. Huntley of Hartlepool was one of the vessel's owners. The ship's master was Jacob Tolsen and under his command the *SS Vesper* left Glasgow on 11 January 1876, en route to Dunkirk in France, carrying 600 tonnes of coal and sugar. All was going well until the early hours of the morning of 13 January, when the vessel struck the Kish Bank and became stranded.	1876	100	-5.9295, 53.2683

Annex B: Gazetteer of geophysical data

MA ID	Name	Description	Wreck ID	Geophysical Data IDs	nT	Classification	AEZ (m)	Longitude/ Latitude
MA0275	Unknown	Known wreck (NMS: 1525). A depression in seabed measuring 10x7.2m with two hard reflectors in the centre.	**W01533**	SSS: MA2274, MBES: MA4192, MAG: MA9351	20.05	Wreck	100	693061.3, 5910875
MA0132	Unknown	Isolated ovate hard reflector; partially buried outline of a wreck.	**W11334**	SSS: MA2131, MBES: MA4096, MAG: MA21288	58.72	Wreck	100	705269.6, 5910273
MA0134	Unknown	Isolated soft reflector; wooden wreck or wreck debris with visible planking.	-	SSS: MA2133, MBES: MA4097, MAG: MA21302	37.2	Wreck	100	705492.1, 5909837
MA0098	Unknown	Cluster of hard reflectors with pronounced shadow; probable wreck debris. Correlates with the known coordinates for **MA04**.	**MA04**	SSS: MA2097, MBES: MA4078, MAG: MA21060	3644.87	Wreck	100	703179.6, 5909679
MA0171	Unknown	Patch of seafloor disturbance; possible buried anthropogenic feature or low reef; correlates with the known coordinates for **MA08**.	**MA08**	SSS: MA2170, MBES: MA4119,	-	Wreck	100	704137.4, 5908535
MA0173	*Glenorchy*	Scattered array of wreck; potential wooden wreck. Correlates with the known coordinates for *Glenorchy.*	**W01572**	SSS: MA2172, MBES: MA4121, MAG: MA20348	9684.64	Wreck	100	704451.5, 5907874

MA0178	Unknown	Hard reflector with large shadow; correlates with the known coordinates for **MA07**.	**MA07**	SSS: MA2177, MBES: MA4123, MAG: MA20250	665.5	Wreck	100	704758.5, 5907052
MA0181	Unknown	Isolated collection of cylindrical hard reflectors with pronounced shadows; potential barrels. Feature correlates with coordinates for wreck GSI 278.	**GSI 278**	SSS: MA2180, MBES: MA4125, MAG: MA20278	428.74	Wreck	100	704981.1, 5906705
MA0302	Unknown	Newly discovered wreck highlighted by the UAU.	**MA02**	-	-	Wreck	300	703924, 5906680
MA0185	*MV Bolivar* (bow)	Isolated hard reflector with shadow and scour; potential anthropogenic debris. Correlates with coordinates for the bow section of *MV Bolivar.*	**W09480**	SSS: MA2184, MBES: MA4128, MAG: MA20195	15165.03	Wreck	100	705137.1, 5906540
MA0120	*SS Vesper*	Scattered array of linear reflectors with pronounced scour; scattered remains of wooden or composite wreck. Correlates with coordinates for the *SS Vesper.*	**W01594**	SSS: MA2119, MBES: MA4090, MAG: MA21101	9015.67	Wreck	100	704755.8, 5906507
MA0108	Unknown	Isolated curved hard reflector with shadow and scour; potential wreck debris or boulder.	**W01630/ W11331**	SSS: MA2107, MBES: MA4083,	-	Wreck	50	704404.2, 5906465
MA0182	*MV Bolivar* (stern)	Large partially buried wreck with pronounced shadow and scour; probable wooden or composite wreck. Correlates with coordinates for the stern section of *MV Bolivar*.	**W09846**	SSS: MA2181, MBES: MA4126, MAG: MA20351	18427.46	Wreck	100	704994.2, 5906455

MA0106	Unknown	Linear scatter of hard reflectors; probable wreck or wreck debris.	**W11626**	SSS: MA2105, MBES: MA4081, MAG: MA20526	736.1	Wreck	100	704261.8, 5906153
MA0127	*Sir Charles Napier* (potentially)	Scattered array of angular reflectors with shadow and scour; probable wreck or collection of wreck debris.	**W01588/ W01629**	SSS: MA2126, MBES: MA4095, MAG: MA21117	106.77	Wreck	100	705080.6, 5905840
MA0107	Unknown	Isolated square buried soft reflector; possible buried anthropogenic debris or sandwaves. Feature correlates with location of **W11333**.	**W11333**	SSS: MA2106, MBES: MA4082,	-	Wreck	100	704384.8, 5905571
MA0110	Unknown	Isolated linear reflector with pronounced shadow; probable wreck.	**W11610**	SSS: MA2109, MBES: MA4084,	-	Wreck	100	704534.3, 5905318
MA0115	Unknown	Isolated linear partially buried reflector; probable wreck.	**W11332**	SSS: MA2114, MBES: MA4087, MAG: MA20534	21.72	Wreck	100	704665, 5904886
MA0118	Unknown	Soft reflector with some shadow; outline of buried wreck.	**W09300/ MA01**	SSS: MA2117, MBES: MA4089, MAG: MA20528	56.08	Wreck	100	704804.8, 5904596
MA0192	Unknown	Collection of linear hard reflectors with scour and extended shadow; probable wooden wreck.	**W18562**	SSS: MA2191, MBES: MA4129, MAG: MA21127	1951.11	Wreck	100	706031.3, 5903559
MA0140	Unknown	Isolated hard reflector with shadow; possible anthropogenic debris or reef; correlates with the known coordinates for MA03.	**MA03**	SSS: MA2139, MBES: MA4101, MAG: MA21210	24.67	Wreck	100	706920.9, 5903499
MA0096	Unknown	Seen in the SSS data as an isolated hard reflector with extended shadow; possible	**MA05**	SSS: MA2095, MBES: MA4076,	-	Wreck	100	698255.4, 5900476

		anthropogenic debris or boulder. Seen in the MBES data as a large linear raised feature surrounded by associated scour.						
MA0213	-	Triangular Hard reflector with cross feature and pronounced shadow; probable anthropogenic debris or potential wreck.	-	SSS: MA2212, MBES: MA4134, MAG: MA7801	248.21	Potential Wreck	100	689754.3, 5911933
MA0216	-	Cluster of incoherent linear hard reflectors; probable anthropogenic debris or potential wreck.	-	SSS: MA2215, MBES: MA4136, MAG: MA7880	95.71	Potential Wreck	100	689958, 5911756
MA0258	-	Linear hard reflector with perpendicular regularly spaced lines to one side; probable partially buried anthropogenic structure or potential wreck.	-	SSS: MA2257, MBES: MA4175,	-	Potential Wreck	100	690872, 5911568
MA0027	-	Isolated linear hard reflector with linear reflector at end of longer line; possible anchor attached to rope or cable.	-	SSS: MA2026, MBES: MA4019, MAG: MA10143	3619.78	Potential Wreck	100	691286.7, 5911208
MA0159	-	Isolated buried pair of linear reflectors; possible anthropogenic debris or potential wreck.	-	SSS: MA2158, MBES: MA4115, MAG: MA21159	1648.22	Potential Wreck	100	704097.3, 5910317
MA0046	-	Isolated linear hard reflector; possible anthropogenic debris or potential wreck.	-	SSS: MA2045, MBES: MA4038, MAG: MA10800	24.28	Potential Wreck	100	692403, 5910236

MA0091	-	Seen in the SSS data as an isolated linear hard reflector with extended scour; probable cable or rope. Seen in the MBES data as a pair of raised pointed features with associated scour.	-	SSS: MA2090, MBES: MA4074, MAG: MA15865	50.73	Potential Wreck	100	695340.3, 5908941
MA0305	*Loch Fergus* (potentially)	High magnetic anomaly; potentially the wreck of the *Loch Fergus*.	**W01828**	MBES: MA4217, MAG: MA12959	14051.18	Potential Wreck	100	692897.1, 5903732
MA0156	-	Pile of hard reflectors with some linear reflectors with extended shadow and linear cable-like reflector extending from main reflector; probable anthropogenic debris or potential wreck debris.	-	SSS: MA2155, MBES: MA4113,	-	Wreck Debris	100	703180.4, 5909578
MA0180	-	Partially buried hard reflector; probable wreck debris associated with wreck **MA0178**.	-	SSS: MA2179,	-	Wreck Debris	100	704776.4, 5907041
MA0179	-	Scattering of linear partially buried hard reflectors; probable planking from wreck **MA0178**.	-	SSS: MA2178, MBES: MA4124,	-	Wreck Debris	100	704771.4, 5907035
MA0176	-	Partially buried reflector; potential cable or rigging associated with **MA0178.**	-	SSS: MA2175, MAG: MA20356	90.15	Wreck Debris	100	704725.8, 5907017
MA0160	-	Linear hard reflectors at intersecting potentially associated with **MA0161**; probable anthropogenic debris, potential wreck debris.	-	SSS: MA2159, MBES: MA4116,	-	Wreck Debris	100	704278.8, 5907001

MA0161	-	Isolated parallel pair of linear hard reflectors with extended shadow and scour; probable wreck or anthropogenic debris.	-	SSS: MA2160, MBES: MA4117,	-	Wreck Debris	100	704310.5, 5906974
MA0164	-	Isolated linear hard reflectors; probable anthropogenic debris or potential wreck debris.	-	SSS: MA2163,	-	Wreck Debris	100	704516.6, 5906841
MA0158	-	Isolated hard reflector with extended shadow; probable wreck debris.	-	SSS: MA2157, MBES: MA4114, MAG: MA20535	128.8	Wreck Debris	100	704037, 5906547
MA0109	-	partially buried banded feature measuring **MA0110**.	**W11610**	SSS: MA2108, MBES: MA4084,	-	Wreck Debris	100	704534.3, 5905326
MA0111	-	Partially buried banded anomaly probably associated with **MA0110**; possible planking.	-	SSS: MA2110, MBES: MA4085,	-	Wreck Debris	100	704549.1, 5905316
MA0116	-	Linear partially buried hard reflector with pronounced shadow and scour; probable debris associated with a wreck.	**W11332**	SSS: MA2115, MBES: MA4087, MAG: MA20534	21.72	Wreck Debris	100	704665.5, 5904898
MA0114	-	Isolated partially buried hard reflector with shadow and scour; probable wreck.	**W11332**	SSS: MA2113, MBES: MA4087, MAG: MA20534	21.72	Wreck Debris	100	704660.1, 5904878
MA0136	-	Linear hard reflector; probable wreck debris associated with **MA0192**.	-	SSS: MA2135, MBES: MA4098,	-	Wreck Debris	100	705999.7, 5903558
MA0262	-	Linear hard reflector ending in curved hook, probable anchor or anthropogenic debris.	-	SSS: MA2261, MBES: MA4179, MAG: MA9632	18.61	Anchor	50	691307.9, 5911562

MA0053	-	Isolated curved hard reflector with linear protrusion at right angle from centre of curve; potential anchor with arm span of 1.9m.	-	SSS: MA2052, MBES: MA4041, MAG: MA9733	9.67	Anchor	50	692494.1, 5910810
MA0039	-	Isolated curved hard reflector with linear reflector protruding at right angle from centre of curved area; large anchor with arm span of 2.5m.	-	SSS: MA2038, MBES: MA4031, MAG: MA10235	191.54	Anchor	50	692058.1, 5910735
MA0033	-	Isolated curved hard reflector with protruding linear hard reflector at right angle to centre of curve; partially buried anchor with 1.9m arm span.	-	SSS: MA2032, MBES: MA4025, MAG: MA10652	22.85	Anchor	50	691748.1, 5910715
MA0034	-	Isolated curved hard reflector with linear hard reflector at right angle to centre of curve; partially buried large anchor with arm span of 1.8m.	-	SSS: MA2033, MBES: MA4026, MAG: MA10607	101.92	Anchor	50	691806.8, 5910691
MA0061	-	Isolated curved hard reflector with linear protrusion at a right angle to the centre of the curve; large anchor with 2m arm span.	-	SSS: MA2060, MBES: MA4048, MAG: MA9730	8.31	Anchor	50	692730.8, 5910676
MA0041	-	Isolated liner reflector with curved end and shadow; large anchor with 1.5m arm span.	-	SSS: MA2040, MBES: MA4033, MAG: MA11293	72.55	Anchor	50	692220.3, 5910089
MA0073	-	Linear hard reflector with curved end with scour; probable anchor with arm span of 1.4m.	-	SSS: MA2072, MBES: MA4060, MAG: MA15988	29.92	Anchor	50	693149.3, 5909946

MA0058	-	Isolated linear hard reflector with curved end in patch of scour; large anchor partially buried sharp angle of arms with 1.8m span.	-	SSS: MA2057, MBES: MA4046, MAG: MA16135	138.22	Anchor	50	692686.7, 5909701
MA0007	-	Pair of hard reflectors; possible anthropogenic debris or boulders.	-	SSS: MA2006, MBES: MA4001,	-	Archaeological anomaly	100	689381.6, 5913293
MA0008	-	Pair of circular hard reflectors with shadow and pronounced scour; probable wheels or fishing pots.	-	SSS: MA2007, MBES: MA4002,	-	Archaeological anomaly	100	689483.7, 5912757
MA0015	-	Isolated circular hard reflector with shadow and scour; probable wheel or fishing pot.	-	SSS: MA2014, MBES: MA4007,	-	Archaeological anomaly	100	690073.3, 5912974
MA0020	-	Isolated circular hard reflector with pronounced shadow and scour; probable wheel or fishing pot.	-	SSS: MA2019, MBES: MA4012,	-	Archaeological anomaly	100	690850.7, 5911922
MA0029	-	Isolated circular hard reflector; probable wheel or fishing pot.	-	SSS: MA2028, MBES: MA4021, MAG: MA10305	173.29	Archaeological anomaly	100	691409.2, 5911062
MA0030	-	Isolated circular reflector with shadow and scour; possible wheel anthropogenic debris or boulder.	-	SSS: MA2029, MBES: MA4022,	-	Archaeological anomaly	100	691463.7, 5910868
MA0037	-	Scattered array of at least ten hard reflectors; potential anthropogenic debris associated with anchor **MA0039**.	-	SSS: MA2036, MBES: MA4029,	150	Archaeological anomaly	100	692005.1, 5910692

MA0047	-	Isolated angled hard reflector; potential anthropogenic debris.	-	SSS: MA2046,	-	Archaeological anomaly	100	692694.2, 5903555
MA0048	-	Linear hard reflector with pronounced shadow; potential anthropogenic debris associated with **MA0047**.	-	SSS: MA2047, MAG: MA11957	25.85	Archaeological anomaly	100	692697.7, 5903581
MA0049	-	Tapering linear hard reflector with pronounced shadow; potential anthropogenic debris or boulder possibly associated with **MA0047**.	-	SSS: MA2048,	-	Archaeological anomaly	100	692714, 5903536
MA0050	-	Tapering linear hard reflector with pronounced shadow; potential anthropogenic debris possibly associated with **MA0047**.	-	SSS: MA2049, MBES: MA4039, MAG: MA11953	5104.1	Archaeological anomaly	100	692726, 5903523
MA0051	-	Isolated circular hard reflector with shadow; probable wheel or fishing trap.	-	SSS: MA2050, MBES: MA4040,	-	Archaeological anomaly	100	692478.7, 5909832
MA0052	-	Square hard reflector with circle hard reflector in centre; potential anthropogenic debris associated with **MA0047**.	-	SSS: MA2051,	-	Archaeological anomaly	100	692737.9, 5903533
MA0056	-	Isolated linear hard reflector with shadow and scour; potential anthropogenic debris associated with **MA0058** (anchor).	-	SSS: MA2055, MBES: MA4044, MAG: MA16159	56.94	Archaeological anomaly	100	692647.5, 5909631
MA0063	-	Isolated angular hard reflector with pronounced shadow;	-	SSS: MA2062, MBES: MA4050, MAG: MA13009	13.44	Archaeological anomaly	100	693189.7, 5903138

		possible anthropogenic debris or boulder.						
MA0064	-	Isolated linear hard reflector with curved end in patch of scour; possible anchor or anthropogenic debris.	-	SSS: MA2063, MBES: MA4051,	-	Archaeological anomaly	100	692988, 5909512
MA0065	-	Isolated cluster of hard reflectors in patch of scour; possible anthropogenic debris or boulders.	-	SSS: MA2064, MBES: MA4052,	-	Archaeological anomaly	100	692979.6, 5909824
MA0068	-	Isolated circular reflector in patch of scour; probable wheel or fishing pot.	-	SSS: MA2067, MBES: MA4055, MAG: MA16066	18.23	Archaeological anomaly	100	693004.4, 5909835
MA0072	-	Isolated circular hard reflector; probable wheel or fishing pot.	-	SSS: MA2071, MBES: MA4059, MAG: MA9327	14.36	Archaeological anomaly	100	693110.1, 5910886
MA0075	-	Isolated angular hard reflector with extended shadow; possible anthropogenic debris or boulder.	-	SSS: MA2074, MBES: MA4061,	-	Archaeological anomaly	100	693594.6, 5902306
MA0078	-	Isolated circular hard reflector; possible wheel or fishing pot.	-	SSS: MA2077, MBES: MA4064,	-	Archaeological anomaly	100	693487.1, 5909557
MA0087	-	Isolated hard reflector with shadow; possible anthropogenic debris or boulder.	-	SSS: MA2086, MBES: MA4071,	-	Archaeological anomaly	100	694621.8, 5909726
MA0093	-	Isolated circular hard reflector; probable wheel or fishing pot.	-	SSS: MA2092, MAG: MA17600	20.66	Archaeological anomaly	100	696326.6, 5903053
MA0094	-	Isolated circular hard reflector; probable wheel or fishing pot.	-	SSS: MA2093,	-	Archaeological anomaly	100	696386.6, 5902980

MA0099	-	Buried ovate softer reflector with scour; potential wreck debris cable chain or rope.	-	SSS: MA2098,	-	Archaeological anomaly	100	703442, 5909696
MA0104	-	Angular hard reflector with shadow and scour; possible anthropogenic debris.	-	SSS: MA2103, MBES: MA4079,	-	Archaeological anomaly	100	703823.3, 5911028
MA0117	-	Isolated patch of hard reflector; possible anthropogenic debris or reef.	-	SSS: MA2116, MBES: MA4088,	-	Archaeological anomaly	100	704460.8, 5910966
MA0122	-	Isolated trio of curved hard reflectors with shadow and scour; possible anthropogenic debris or boulders.	-	SSS: MA2121, MBES: MA4092,	-	Archaeological anomaly	100	704696.6, 5911193
MA0124	-	Isolated cluster of hard reflectors with pronounced shadow; possible anthropogenic debris reef or boulders.	-	SSS: MA2123, MBES: MA4093,	-	Archaeological anomaly	100	704747.2, 5911244
MA0144	-	Isolated linear hard reflector; collection of cables or rigging.	-	SSS: MA2143, MBES: MA4102,	-	Archaeological anomaly	100	707301.3, 5903379
MA0149	-	Scattered collection of six hard reflectors with scour and shadow; possible anthropogenic debris or boulders.	-	SSS: MA2148, MBES: MA4106,	-	Archaeological anomaly	100	707873.3, 5898231
MA0155	-	Pair of isolated hard reflectors with shadow and scour; possible anthropogenic debris or boulders.	-	SSS: MA2154, MBES: MA4112,	-	Archaeological anomaly	100	708659.8, 5897776
MA0184	-	Isolated linear hard reflector with lines of shadow and pronounced scour; probable anthropogenic debris.	-	SSS: MA2183, MBES: MA4127, MAG: MA20196	688.47	Archaeological anomaly	100	705130.5, 5906591

MA0201	-	Isolated linear hard reflectors with sitting above seafloor; probable anthropogenic debris potential planking or frame pieces from a wreck.	-	SSS: MA2200, MAG: MA20385	31.13	Archaeological anomaly	100	706874.6, 5897376
MA0204	-	Isolated area of seabed disturbance with shadow; possible buried anthropogenic debris or sandwaves.	-	SSS: MA2203, MBES: MA4130,	-	Archaeological anomaly	100	706842.5, 5899253
MA0214	-	Isolated curvilinear reflector with two parts forming a rough circle; probable anthropogenic debris.	-	SSS: MA2213, MBES: MA4135, MAG: MA7117	40.68	Archaeological anomaly	100	689782.7, 5912310
MA0218	-	Curvilinear hard reflector; probable lobster pot or debris.	-	SSS: MA2217, MBES: MA4138,	-	Archaeological anomaly	100	690090.4, 5911278
MA0222	-	Isolated circular hard reflector; probable anthropogenic debris.	-	SSS: MA2221, MBES: MA4142,	-	Archaeological anomaly	100	690119.2, 5912037
MA0231	-	A linear and a curvilinear reflector; probable partially buried debris.	-	SSS: MA2230, MBES: MA4151,	-	Archaeological anomaly	100	690316.9, 5911467
MA0257	-	Series of dark curvilinear reflectors with shadows; possible debris field in proximity to **MA0258**.	-	SSS: MA2256, MBES: MA4174,	-	Archaeological anomaly	100	690833.2, 5911520
MA0264	-	Linear arrangement of small curvilinear anomalies; probable fishing debris. Target is larger than measurements.	-	SSS: MA2263, MBES: MA4181,	-	Archaeological anomaly	100	691878.6, 5911416
MA0265	-	Linear arrangement of small curvilinear anomalies; probable fishing debris. Target is larger than measurements.	-	SSS: MA2264, MBES: MA4182,	-	Archaeological anomaly	100	691971.9, 5911414

MA0267	-	Curvilinear hard reflector; possible anthropogenic debris.	-	SSS: MA2266, MBES: MA4184, MAG: MA9686	7.69	Archaeological anomaly	100	692120.2, 5911077
MA0268	-	Linear spread of multiple curvilinear hard reflectors; possible anthropogenic structure.	-	SSS: MA2267, MBES: MA4185,	-	Archaeological anomaly	100	692107.1, 5911415
MA0271	-	Linear alignment of small anomalies; possible anthropogenic debris or partially buried structure. Target is longer than measurements.	-	SSS: MA2270, MBES: MA4188,	-	Archaeological anomaly	100	692776.2, 5911200
MA0272	-	Linear arrangement of small curvilinear anomalies; probable fishing debris.	-	SSS: MA2271, MBES: MA4189, MAG: MA9512	7.72	Archaeological anomaly	100	692797.9, 5910864
MA0273	-	Linear hard reflector; probable anthropogenic debris.	-	SSS: MA2272, MBES: MA4190,	-	Archaeological anomaly	100	692847, 5910692
MA0292	-	Isolated target possibly debris.	-	SSS: MA2291, MBES: MA4208, MAG: MA6671	15.08	Archaeological anomaly	100	690359.1, 5912261
MA0293	-	Isolated circular target possibly debris.	-	SSS: MA2292, MBES: MA4209, MAG: MA6312	6.93	Archaeological anomaly	100	690409.4, 5912466
MA0006	-	Isolated ovate hard reflector with pronounced shadow and scour; probable anthropogenic debris.	-	SSS: MA2005, MBES: MA4000, MAG: MA5449	1399.08	Archaeological anomaly	100	689087.6, 5912919
MA0043	-	Isolated curved hard reflector with linear protrusion at right angle from centre of curved area partially buried with	-	SSS: MA2042, MBES: MA4035,	-	Archaeological anomaly	100	692319.3, 5910992

		shadow and scour; large anchor with 2.7m arm span.						
MA0266	-	Complex feature: curvilinear seabed disturbance to NW. 9m SW hard linear reflector and associated shadow. Trail of faint seabed disturbance to the west running EW. Target is larger than measurements. Probable anthropogenic debris.	-	SSS: MA2265, MBES: MA4183,	-	Archaeological anomaly	100	692028.1, 5911238
MA0306	-	Magnetic anomaly	-	MAG: MA5324	8556.55	Magnetic anomaly	100	689005.6, 5913503
MA0307	-	Magnetic anomaly	-	MAG: MA11275	7000	Magnetic anomaly	100	691148.2, 5910692
MA0308	-	Magnetic anomaly	-	MAG: MA6326	1751.7	Magnetic anomaly	100	690774.3, 5912246
MA0309	-	Magnetic anomaly	-	MAG: MA11016	1683.96	Magnetic anomaly	100	692443.3, 5910102
MA0310	-	Magnetic anomaly	-	MAG: MA21305	1440.11	Magnetic anomaly	100	706581.4, 5907005
MA0311	-	Magnetic anomaly	-	MAG: MA8875	1128.1	Magnetic anomaly	100	690025.8, 5911108
MA0312	-	Magnetic anomaly	-	MAG: MA21141	1080.26	Magnetic anomaly	100	704109.6, 5910030
MA0313	-	Magnetic anomaly	-	MBES: MA4218, MAG: MA12098	822.44	Magnetic anomaly	100	692777.6, 5903528
MA0314	-	Magnetic anomaly	-	MAG: MA7873	498.83	Magnetic anomaly	100	690491.1, 5911468
MA0315	-	Magnetic anomaly	-	MBES: MA4219, MAG: MA9927	491.12	Magnetic anomaly	100	691609.4, 5911147
MA0316	-	Magnetic anomaly	-	MBES: MA4220, MAG: MA18214	443.78	Magnetic anomaly	100	698410.2, 5901357

MA0317	-	Magnetic anomaly	-	MAG: MA9237	428.39	Magnetic anomaly	100	691318.7, 5911969
MA0318	-	Magnetic anomaly	-	MBES: MA4221, MAG: MA8067	399.92	Magnetic anomaly	100	689627, 5911840
MA0319	-	Magnetic anomaly	-	MAG: MA8596	390.66	Magnetic anomaly	100	689355.8, 5911619
MA0320	-	Magnetic anomaly	-	MAG: MA8452	379.35	Magnetic anomaly	100	690245.5, 5911233
MA0321	-	Magnetic anomaly	-	MAG: MA15155	372.8	Magnetic anomaly	100	694152.1, 5910378
MA0322	-	Magnetic anomaly	-	MAG: MA15342	360.51	Magnetic anomaly	100	694320.9, 5911366
MA0323	-	Magnetic anomaly	-	MAG: MA9437	350.16	Magnetic anomaly	100	692192.9, 5911366
MA0324	-	Magnetic anomaly	-	MAG: MA7804	346.85	Magnetic anomaly	100	689564.3, 5912036
MA0325	-	Magnetic anomaly	-	MBES: MA4222, MAG: MA15908	333.18	Magnetic anomaly	100	693821.8, 5909713
MA0326	-	Magnetic anomaly	-	MAG: MA11464	332.41	Magnetic anomaly	100	691297.4, 5910471
MA0327	-	Magnetic anomaly	-	MAG: MA15153	324.44	Magnetic anomaly	100	694185.6, 5910359
MA0328	-	Magnetic anomaly	-	MBES: MA4223, MAG: MA11695	323.37	Magnetic anomaly	100	692461.1, 5909669
MA0329	-	Magnetic anomaly	-	MAG: MA17489	319.96	Magnetic anomaly	100	696785.6, 5901287
MA0330	-	Magnetic anomaly	-	MAG: MA14008	308.6	Magnetic anomaly	100	693627.5, 5902995
MA0331	-	Magnetic anomaly	-	MBES: MA4224, MAG: MA10176	304.63	Magnetic anomaly	100	691163.8, 5911285
MA0332	-	Magnetic anomaly	-	MAG: MA20425	291.68	Magnetic anomaly	100	706325.4, 5898351

MA0333	-	Magnetic anomaly	-	MAG: MA16466	285.1	Magnetic anomaly	100	695865.9, 5908660
MA0334	-	Magnetic anomaly	-	MAG: MA5143	285	Magnetic anomaly	100	688821.5, 5913401
MA0335	-	Magnetic anomaly	-	MAG: MA18107	269.72	Magnetic anomaly	100	697990.5, 5902270
MA0336	-	Magnetic anomaly	-	MAG: MA8422	266.77	Magnetic anomaly	100	690660.9, 5911023
MA0337	-	Magnetic anomaly	-	MAG: MA8477	259.12	Magnetic anomaly	100	689865, 5911423
MA0338	-	Magnetic anomaly	-	MAG: MA18512	249.28	Magnetic anomaly	100	700385, 5907579
MA0339	-	Magnetic anomaly	-	MBES: MA4225, MAG: MA6932	248.63	Magnetic anomaly	100	690310.6, 5912134
MA0340	-	Magnetic anomaly	-	MAG: MA5465	240.23	Magnetic anomaly	100	689049, 5911973
MA0342	-	Magnetic anomaly	-	MBES: MA4226, MAG: MA8595	237.52	Magnetic anomaly	100	689361.4, 5911616
MA0343	-	Magnetic anomaly	-	MAG: MA17961	235.79	Magnetic anomaly	100	696603.6, 5904863
MA0344	-	Magnetic anomaly	-	MAG: MA21151	234.08	Magnetic anomaly	100	704213.7, 5909902
MA0345	-	Magnetic anomaly	-	MBES: MA4227, MAG: MA10362	227.27	Magnetic anomaly	100	691505.4, 5910980
MA0346	-	Magnetic anomaly	-	MAG: MA16318	211.16	Magnetic anomaly	100	698128.1, 5908803
MA0347	-	Magnetic anomaly	-	MAG: MA16269	211.03	Magnetic anomaly	100	697723.6, 5909222
MA0348	-	Magnetic anomaly	-	MAG: MA9244	210.4	Magnetic anomaly	100	692929.7, 5911055
MA0349	-	Magnetic anomaly	-	MBES: MA4228, MAG: MA10523	207.9	Magnetic anomaly	100	690890.4, 5911239

MA0350	-	Magnetic anomaly	-	MAG: MA21166	207.37	Magnetic anomaly	100	703940.5, 5910904
MA0351	-	Magnetic anomaly	-	MAG: MA15264	206.23	Magnetic anomaly	100	693581.9, 5910602
MA0352	-	Magnetic anomaly	-	MAG: MA20328	201.97	Magnetic anomaly	100	706591.3, 5897683
MA0353	-	Magnetic anomaly	-	MAG: MA8383	193.61	Magnetic anomaly	100	690213.7, 5911297
MA0354	-	Magnetic anomaly	-	MAG: MA9441	193.21	Magnetic anomaly	100	692619.5, 5911038
MA0355	-	Magnetic anomaly	-	MAG: MA21189	193.14	Magnetic anomaly	100	703947.3, 5911293
MA0356	-	Magnetic anomaly	-	MAG: MA8919	191.98	Magnetic anomaly	100	690085.3, 5911064
MA0357	-	Magnetic anomaly	-	MAG: MA21392	189.44	Magnetic anomaly	100	705033.2, 5894003
MA0358	-	Magnetic anomaly	-	MAG: MA21313	185.81	Magnetic anomaly	100	705690.1, 5910313
MA0359	-	Magnetic anomaly	-	MBES: MA4229, MAG: MA10396	183.35	Magnetic anomaly	100	692170, 5910589
MA0360	-	Magnetic anomaly	-	MAG: MA20247	177.92	Magnetic anomaly	100	704707.9, 5907700
MA0361	-	Magnetic anomaly	-	MAG: MA20096	177.9	Magnetic anomaly	100	704784, 5906716
MA0362	-	Magnetic anomaly	-	MBES: MA4230, MAG: MA15422	171.32	Magnetic anomaly	100	694254.5, 5910078
MA0363	-	Magnetic anomaly	-	MBES: MA4231, MAG: MA16388	171.18	Magnetic anomaly	100	697359.6, 5908760
MA0364	-	Magnetic anomaly	-	MAG: MA20400	169.8	Magnetic anomaly	100	706588.2, 5897707
MA0365	-	Magnetic anomaly	-	MAG: MA7156	167.53	Magnetic anomaly	100	689325.1, 5912538

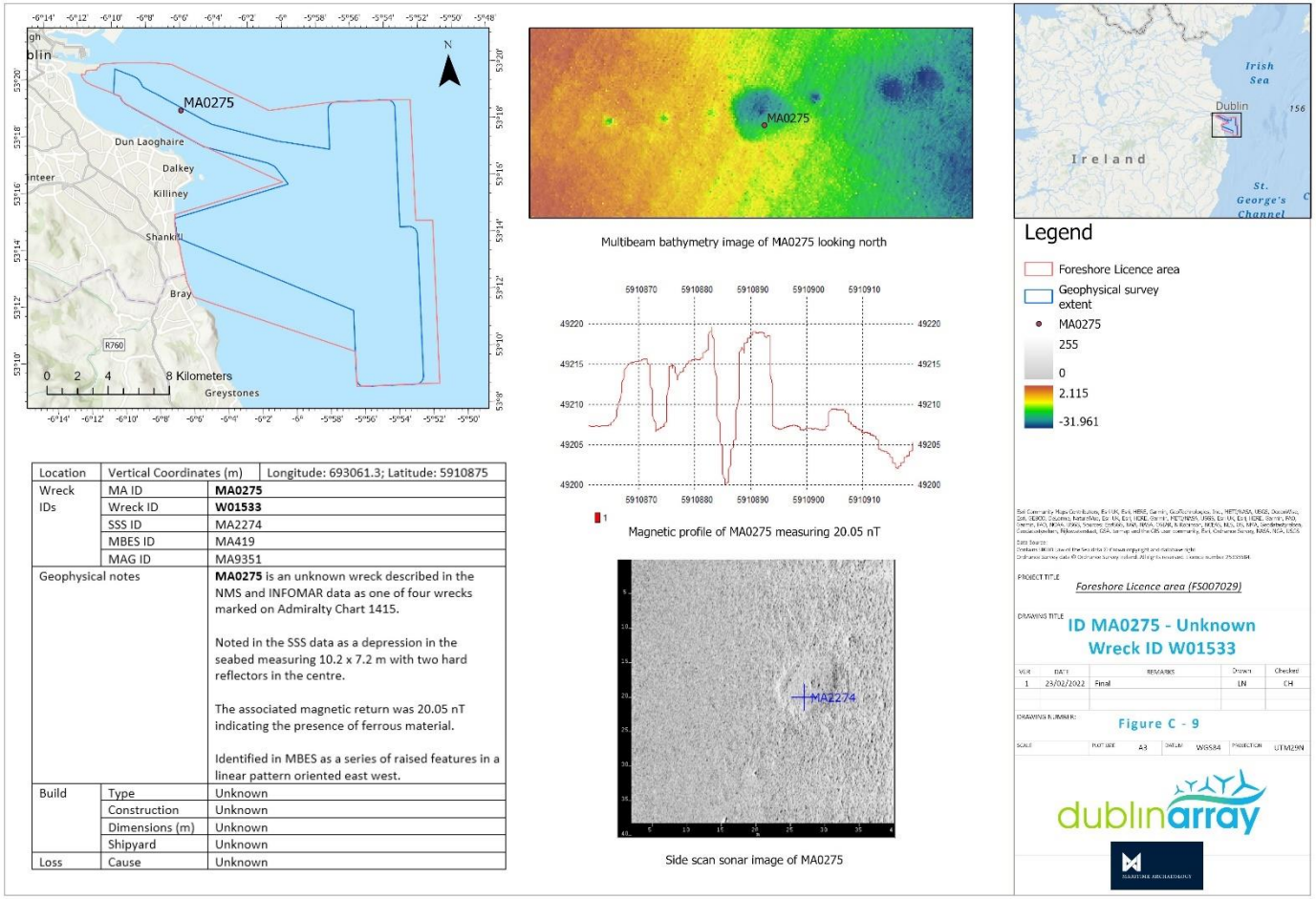
MA0366	-	Magnetic anomaly	-	MAG: MA18387	159.57	Magnetic anomaly	100	699971.8, 5901401
MA0367	-	Magnetic anomaly	-	MAG: MA15655	154.5	Magnetic anomaly	100	693671, 5910157
MA0368	-	Magnetic anomaly	-	MAG: MA20285	153.6	Magnetic anomaly	100	704546.9, 5908076
MA0369	-	Magnetic anomaly	-	MAG: MA12336	149.31	Magnetic anomaly	100	692819, 5903604
MA0370	-	Magnetic anomaly	-	MBES: MA4232, MAG: MA11231	148.87	Magnetic anomaly	100	691078.5, 5910763
MA0371	-	Magnetic anomaly	-	MBES: MA4233, MAG: MA9228	147.84	Magnetic anomaly	100	692045.1, 5911573
MA0372	-	Magnetic anomaly	-	MAG: MA15943	145.99	Magnetic anomaly	100	693267.3, 5909986
MA0373	-	Magnetic anomaly	-	MAG: MA17498	144.22	Magnetic anomaly	100	696643.2, 5901765
MA0374	-	Magnetic anomaly	-	MAG: MA21178	143.02	Magnetic anomaly	100	704397.5, 5909874
MA0375	-	Magnetic anomaly	-	MAG: MA5313	141.77	Magnetic anomaly	100	688950.1, 5912402
MA0376	-	Magnetic anomaly	-	MAG: MA17841	139.64	Magnetic anomaly	100	696421.5, 5904211
MA0377	-	Magnetic anomaly	-	MAG: MA11130	139.4	Magnetic anomaly	100	692513.1, 5909999
MA0378	-	Magnetic anomaly	-	MAG: MA9744	138.84	Magnetic anomaly	100	691819.2, 5911180
MA0379	-	Magnetic anomaly	-	MBES: MA4234, MAG: MA15454	138.53	Magnetic anomaly	100	694685.4, 5909795
MA0380	-	Magnetic anomaly	-	MAG: MA19569	135.92	Magnetic anomaly	100	693680.9, 5902721
MA0381	-	Magnetic anomaly	-	MAG: MA10827	134.94	Magnetic anomaly	100	691082.1, 5910953

MA0382	-	Magnetic anomaly	-	MAG: MA6070	132.87	Magnetic anomaly	100	689754.6, 5913133
MA0383	-	Magnetic anomaly	-	MAG: MA11194	132.68	Magnetic anomaly	100	691016.5, 5910820
MA0384	-	Magnetic anomaly	-	MAG: MA5483	131	Magnetic anomaly	100	689107, 5913104
MA0385	-	Magnetic anomaly	-	MAG: MA18926	131	Magnetic anomaly	100	701218.2, 5907618
MA0386	-	Magnetic anomaly	-	MAG: MA20643	130.06	Magnetic anomaly	100	706923.5, 5893802
MA0387	-	Magnetic anomaly	-	MBES: MA4235, MAG: MA11484	128.39	Magnetic anomaly	100	691693.3, 5910222
MA0388	-	Magnetic anomaly	-	MAG: MA12225	128.07	Magnetic anomaly	100	692803.1, 5903566
MA0389	-	Magnetic anomaly	-	MAG: MA16463	126.86	Magnetic anomaly	100	698793.8, 5907988
MA0390	-	Magnetic anomaly	-	MBES: MA4236, MAG: MA19024	126.57	Magnetic anomaly	100	702199, 5900333
MA0391	-	Magnetic anomaly	-	MAG: MA11027	126.53	Magnetic anomaly	100	691746.6, 5910481
MA0392	-	Magnetic anomaly	-	MAG: MA15251	126.51	Magnetic anomaly	100	694228.4, 5910252
MA0393	-	Magnetic anomaly	-	MAG: MA15991	126.25	Magnetic anomaly	100	693498, 5909783
MA0394	-	Magnetic anomaly	-	MAG: MA9349	124.55	Magnetic anomaly	100	693152.9, 5910822
MA0395	-	Magnetic anomaly	-	MBES: MA4237, MAG: MA18925	124.22	Magnetic anomaly	100	701224.5, 5907472
MA0396	-	Magnetic anomaly	-	MAG: MA10095	122.9	Magnetic anomaly	100	691152.2, 5911314
MA0397	-	Magnetic anomaly	-	MAG: MA19002	121.35	Magnetic anomaly	100	701923.4, 5903054

MA0398	-	Magnetic anomaly	-	MAG: MA18467	120.92	Magnetic anomaly	100	700249.6, 5907409
MA0399	-	Magnetic anomaly	-	MAG: MA7307	119.88	Magnetic anomaly	100	689555, 5912309
MA0400	-	Magnetic anomaly	-	MAG: MA21084	119.36	Magnetic anomaly	100	703625.5, 5909307
MA0401	-	Magnetic anomaly	-	MAG: MA15856	116.82	Magnetic anomaly	100	693149.1, 5910163
MA0402	-	Magnetic anomaly	-	MAG: MA18020	116.69	Magnetic anomaly	100	697658.9, 5902979
MA0403	-	Magnetic anomaly	-	MAG: MA18930	116.14	Magnetic anomaly	100	701409.2, 5904800
MA0404	-	Magnetic anomaly	-	MAG: MA15551	114.61	Magnetic anomaly	100	693677.9, 5910269
MA0405	-	Magnetic anomaly	-	MAG: MA9829	114.16	Magnetic anomaly	100	692694.1, 5910652
MA0406	-	Magnetic anomaly	-	MAG: MA20454	114.06	Magnetic anomaly	100	705806.1, 5893422
MA0407	-	Magnetic anomaly	-	MBES: MA4238, MAG: MA7042	113.68	Magnetic anomaly	100	690852.5, 5911757
MA0408	-	Magnetic anomaly	-	MAG: MA16584	112.39	Magnetic anomaly	100	693407.7, 5903627
MA0409	-	Magnetic anomaly	-	MAG: MA21296	111.79	Magnetic anomaly	100	705203.3, 5910698
MA0410	-	Magnetic anomaly	-	MBES: MA4239, MAG: MA20826	110.72	Magnetic anomaly	100	707542, 5897655
MA0411	-	Magnetic anomaly	-	MAG: MA12715	110.29	Magnetic anomaly	100	692833.9, 5903839
MA0412	-	Magnetic anomaly	-	MAG: MA7428	108.47	Magnetic anomaly	100	689716, 5912152
MA0413	-	Magnetic anomaly	-	MAG: MA11910	108.07	Magnetic anomaly	100	692914, 5903084

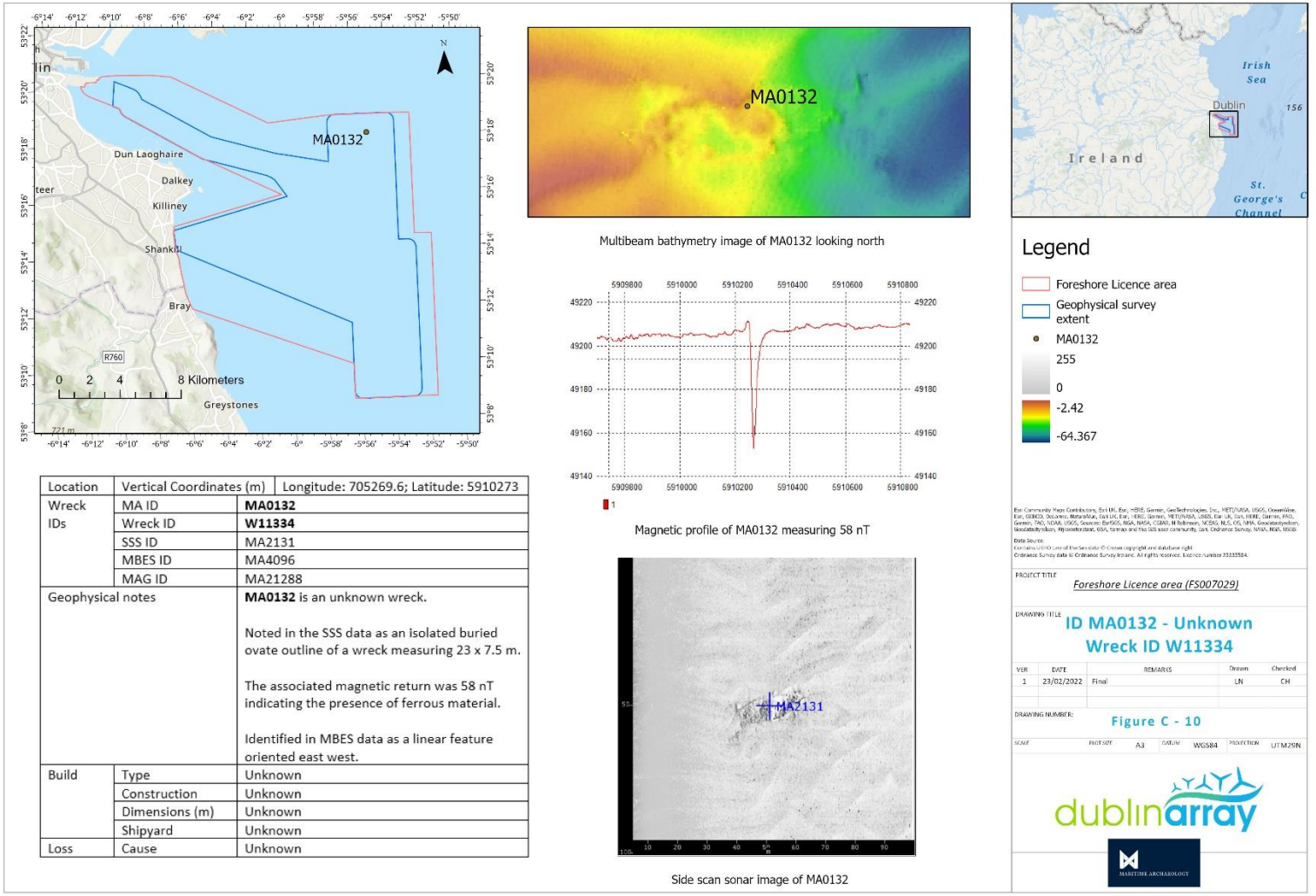
MA0414	-	Magnetic anomaly	-	MAG: MA5233	108.03	Magnetic anomaly	100	688899.8, 5913145
MA0415	-	Magnetic anomaly	-	MAG: MA10601	107.75	Magnetic anomaly	100	692429.8, 5910356
MA0416	-	Magnetic anomaly	-	MAG: MA20381	107.45	Magnetic anomaly	100	706340.8, 5896911
MA0418	-	Magnetic anomaly	-	MAG: MA20695	105.67	Magnetic anomaly	100	707013.8, 5895465
MA0419	-	Magnetic anomaly	-	MAG: MA15751	105.04	Magnetic anomaly	100	692953.2, 5910395
MA0420	-	Magnetic anomaly	-	MBES: MA4240, MAG: MA18171	105.04	Magnetic anomaly	100	698136.4, 5904056
MA0421	-	Magnetic anomaly	-	MAG: MA12232	103.54	Magnetic anomaly	100	692771.5, 5903728
MA0422	-	Magnetic anomaly	-	MAG: MA11704	102.53	Magnetic anomaly	100	691687.1, 5910091
MA0423	-	Magnetic anomaly	-	MAG: MA11525	102.25	Magnetic anomaly	100	691700.4, 5910194
MA0424	-	Magnetic anomaly	-	MAG: MA18369	102.03	Magnetic anomaly	100	699508.6, 5906991
MA0425	-	Magnetic anomaly	-	MAG: MA18592	101.61	Magnetic anomaly	100	701079.4, 5901838

Annex C: Figures of wrecks identified in geophysical data



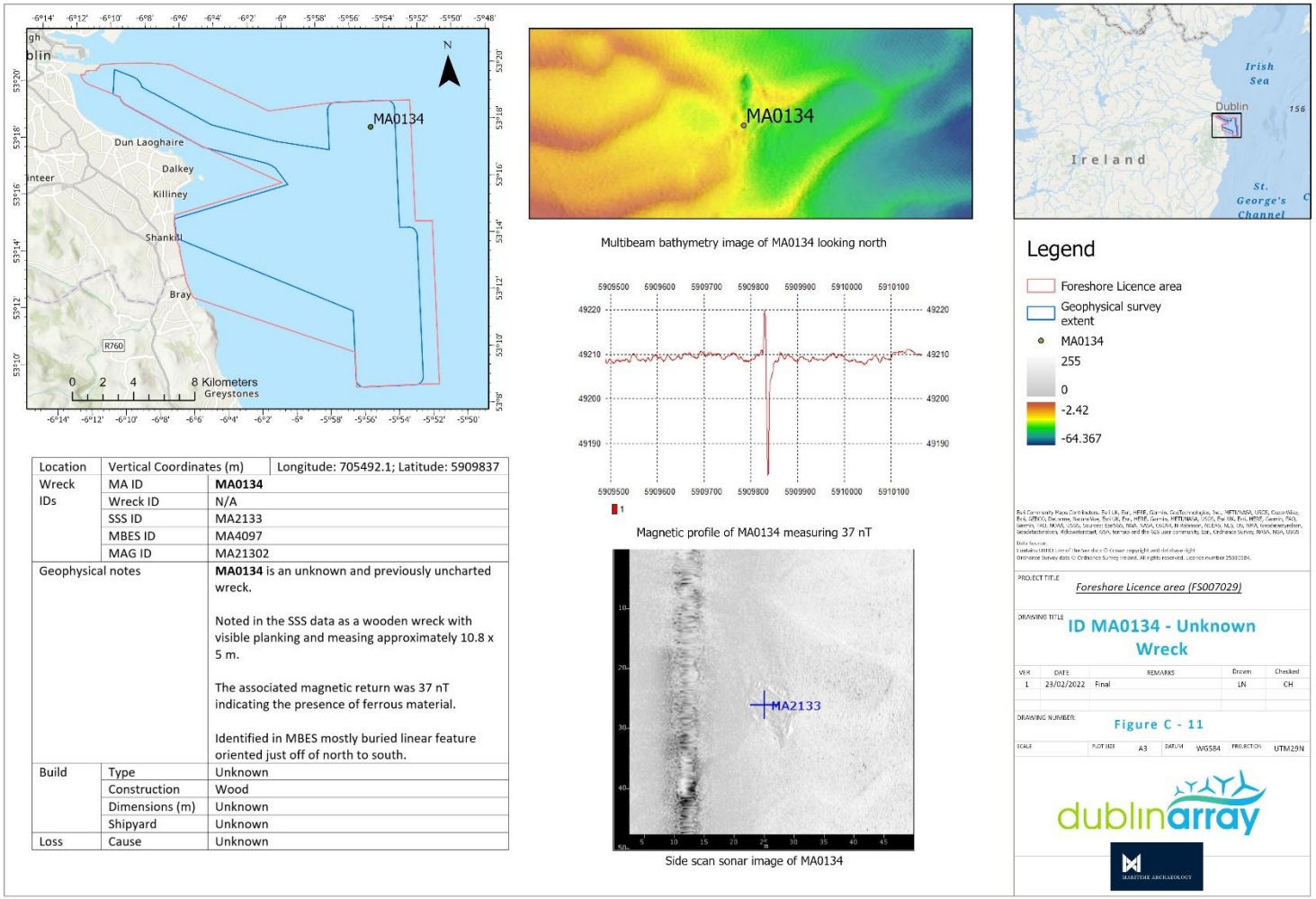
Location	Vertical Coordinates (m)	Longitude: 693061.3; Latitude: 5910875
Wreck IDs	MA ID	**MA0275**
	Wreck ID	**W01533**
	SSS ID	MA2274
	MBES ID	MA419
	MAG ID	MA9351
Geophysical notes		**MA0275** is an unknown wreck described in the NMS and INFOMAR data as one of four wrecks marked on Admiralty Chart 1415. Noted in the SSS data as a depression in the seabed measuring 10.2 x 7.2 m with two hard reflectors in the centre. The associated magnetic return was 20.05 nT indicating the presence of ferrous material. Identified in MBES as a series of raised features in a linear pattern oriented east west.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 9: MA0275, unknown wreck



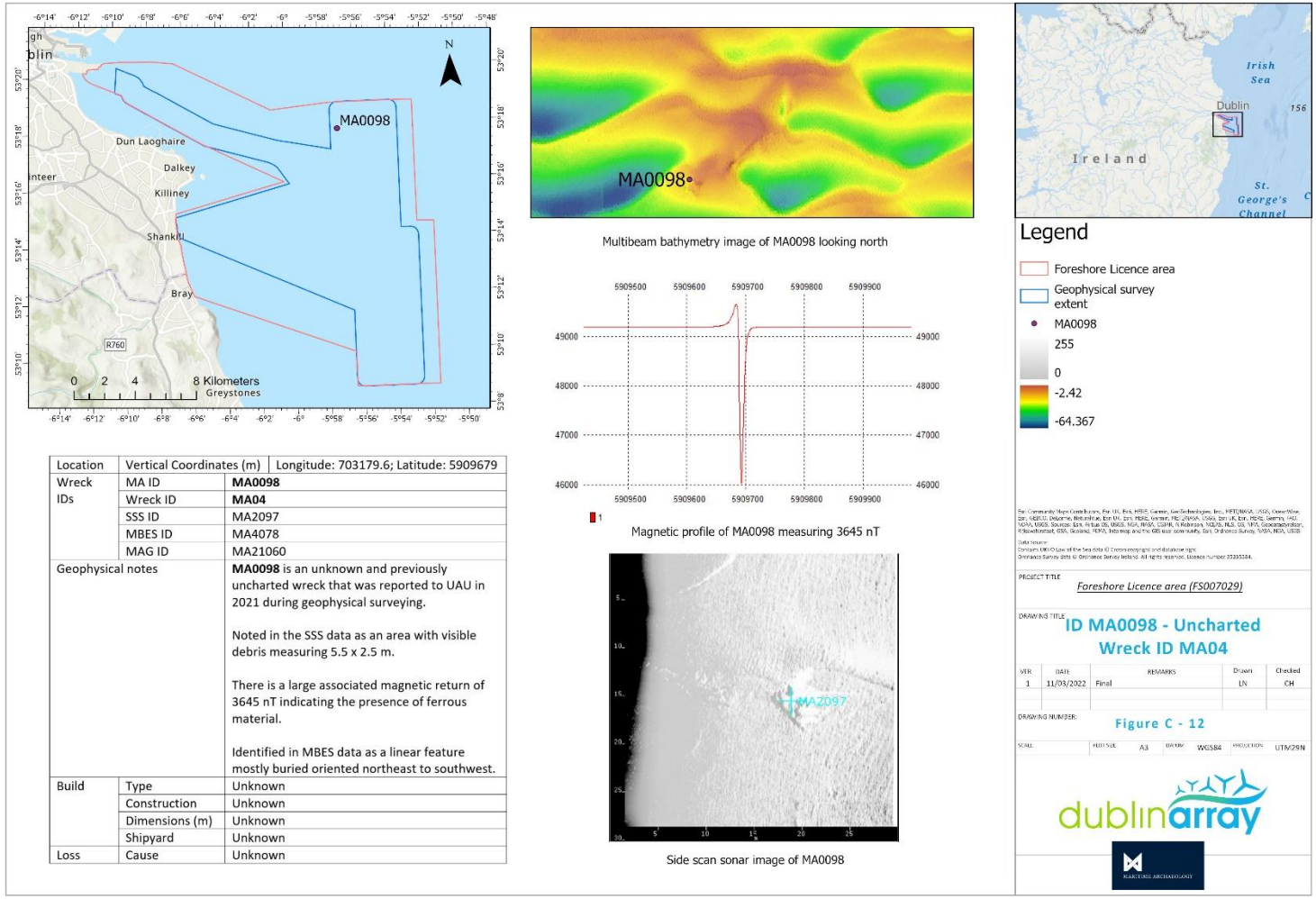
Location	Vertical Coordinates (m)	Longitude: 705269.6; Latitude: 5910273
Wreck IDs	MA ID	**MA0132**
	Wreck ID	**W11334**
	SSS ID	MA2131
	MBES ID	MA4096
	MAG ID	MA21288
Geophysical notes		**MA0132** is an unknown wreck. Noted in the SSS data as an isolated buried ovate outline of a wreck measuring 23 x 7.5 m. The associated magnetic return was 58 nT indicating the presence of ferrous material. Identified in MBES data as a linear feature oriented east west.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 10: MA0132, unknown wreck



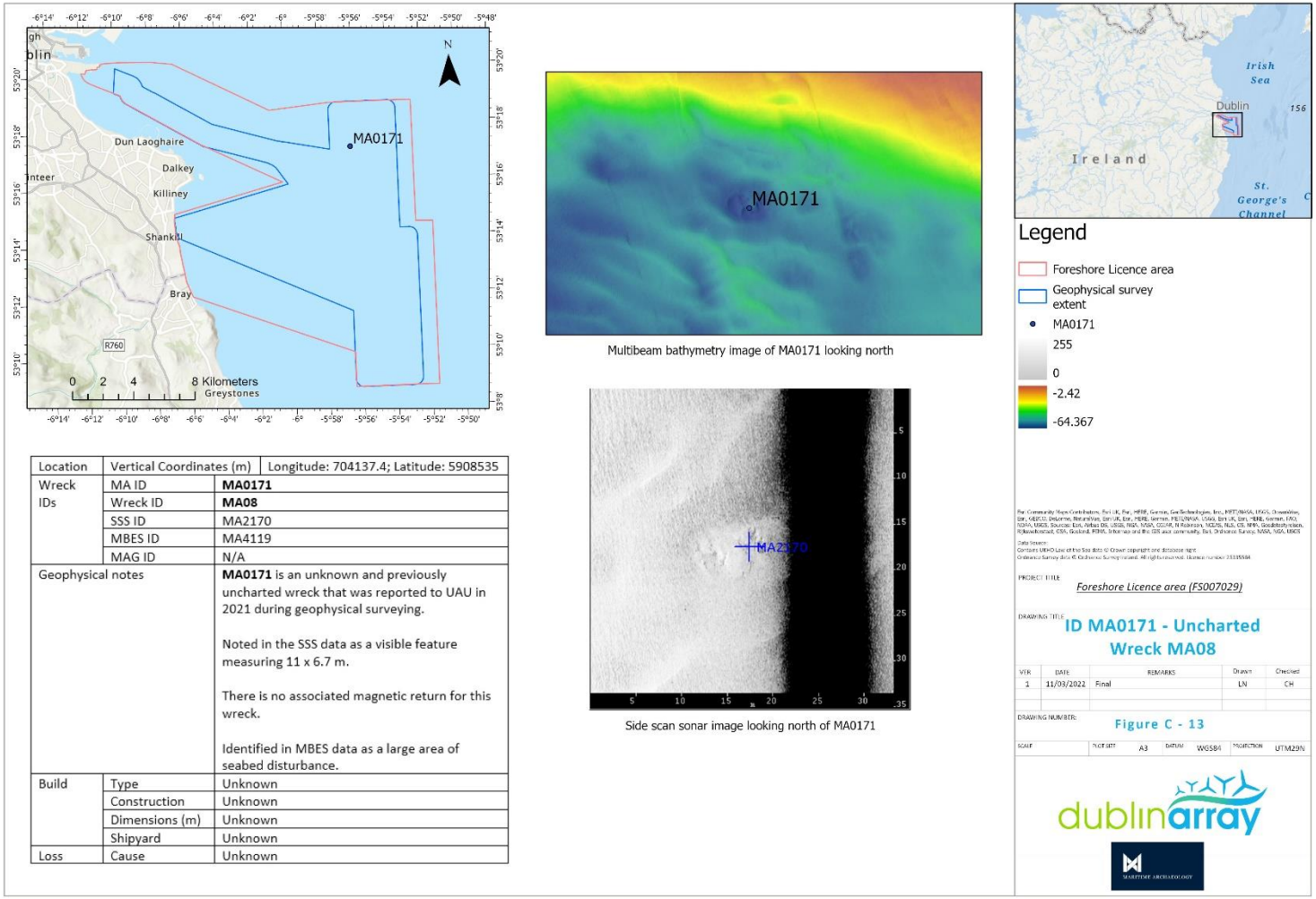
Location	Vertical Coordinates (m)	Longitude: 705492.1; Latitude: 5909837
Wreck IDs	MA ID	**MA0134**
	Wreck ID	N/A
	SSS ID	MA2133
	MBES ID	MA4097
	MAG ID	MA21302
Geophysical notes		**MA0134** is an unknown and previously uncharted wreck. Noted in the SSS data as a wooden wreck with visible planking and measing approximately 10.8 x 5 m. The associated magnetic return was 37 nT indicating the presence of ferrous material. Identified in MBES mostly buried linear feature oriented just off of north to south.
Build	Type	Unknown
	Construction	Wood
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 11: MA0134, unknown wreck



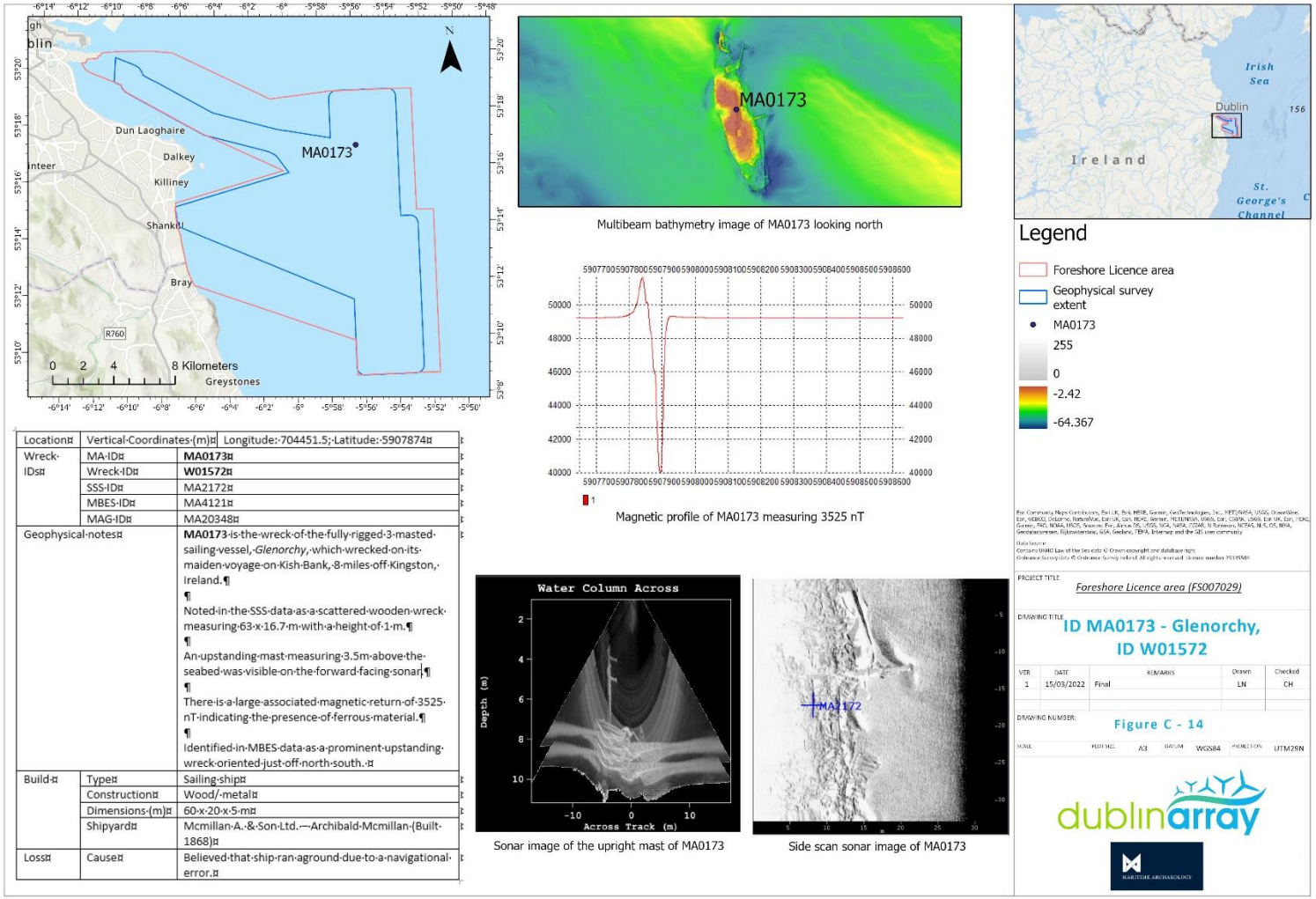
Location	Vertical Coordinates (m)	Longitude: 703179.6; Latitude: 5909679
Wreck IDs	MA ID	**MA0098**
	Wreck ID	**MA04**
	SSS ID	MA2097
	MBES ID	MA4078
	MAG ID	MA21060
Geophysical notes		**MA0098** is an unknown and previously uncharted wreck that was reported to UAU in 2021 during geophysical surveying. Noted in the SSS data as an area with visible debris measuring 5.5 x 2.5 m. There is a large associated magnetic return of 3645 nT indicating the presence of ferrous material. Identified in MBES data as a linear feature mostly buried oriented northeast to southwest.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 12: MA0098, uncharted wreck



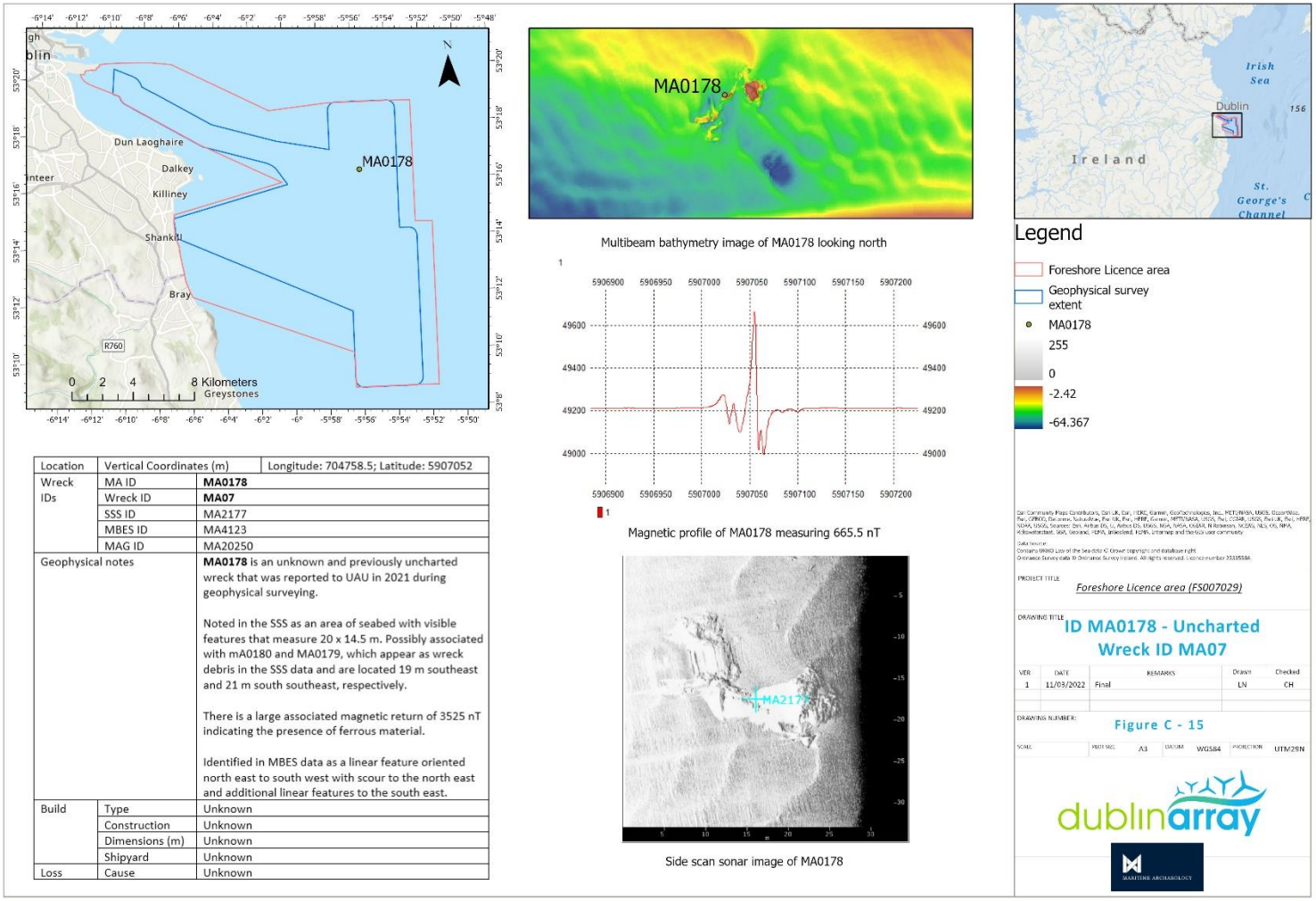
Location	Vertical Coordinates (m)	Longitude: 704137.4; Latitude: 5908535
Wreck IDs	MA ID	**MA0171**
	Wreck ID	**MA08**
	SSS ID	MA2170
	MBES ID	MA4119
	MAG ID	N/A
Geophysical notes		**MA0171** is an unknown and previously uncharted wreck that was reported to UAU in 2021 during geophysical surveying. Noted in the SSS data as a visible feature measuring 11 x 6.7 m. There is no associated magnetic return for this wreck. Identified in MBES data as a large area of seabed disturbance.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 13: MA0171, uncharted wreck



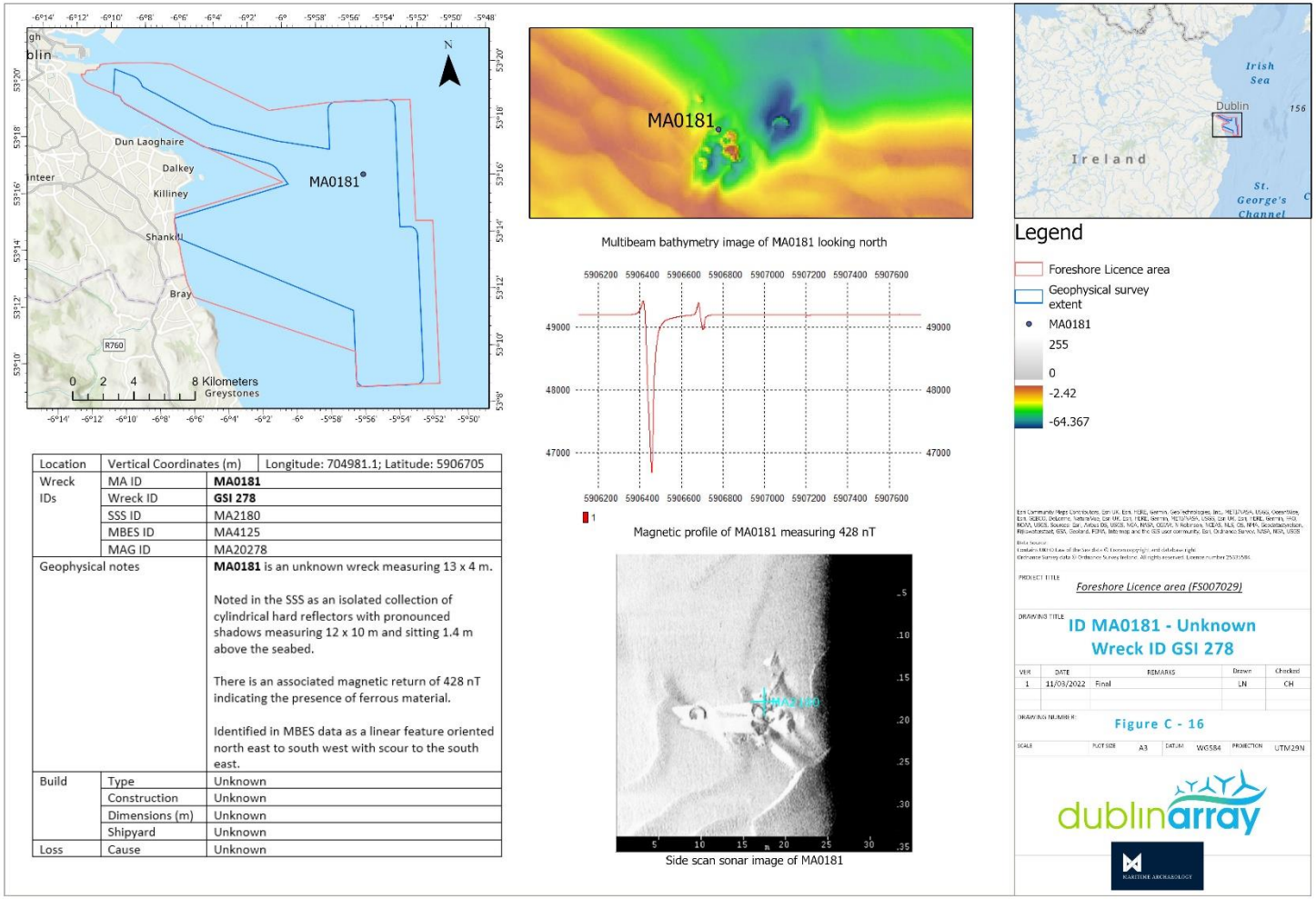
Location¤	Vertical·Coordinates·(m)¤	Longitude:·704451.5;·Latitude:·5907874¤
Wreck·IDs¤	MA·ID¤	**MA0173**¤
	Wreck·ID¤	**W01572**¤
	SSS·ID¤	MA2172¤
	MBES·ID¤	MA4121¤
	MAG·ID¤	MA20348¤
Geophysical·notes¤		**MA0173**·is·the·wreck·of·the·fully·rigged·3-masted·sailing·vessel,·*Glenorchy*,·which·wrecked·on·its·maiden·voyage·on·Kish·Bank,·8·miles·off·Kingston,·Ireland.¶ ¶ Noted·in·the·SSS·data·as·a·scattered·wooden·wreck·measuring·63·x·16.7·m·with·a·height·of·1·m.¶ ¶ An·upstanding·mast·measuring·3.5m·above·the·seabed·was·visible·on·the·forward·facing·sonar.¶ ¶ There·is·a·large·associated·magnetic·return·of·3525·nT·indicating·the·presence·of·ferrous·material.¶ ¶ Identified·in·MBES·data·as·a·prominent·upstanding·wreck·oriented·just·off·north·south.·¤
Build·¤	Type¤	Sailing·ship¤
	Construction¤	Wood/·metal¤
	Dimensions·(m)¤	60·x·20·x·5·m¤
	Shipyard¤	Mcmillan·A.·&·Son·Ltd.·—·Archibald·Mcmillan·(Built·1868)¤
Loss¤	Cause¤	Believed·that·ship·ran·aground·due·to·a·navigational·error.¤

Figure C- 14: MA0173, *Glenorchy*



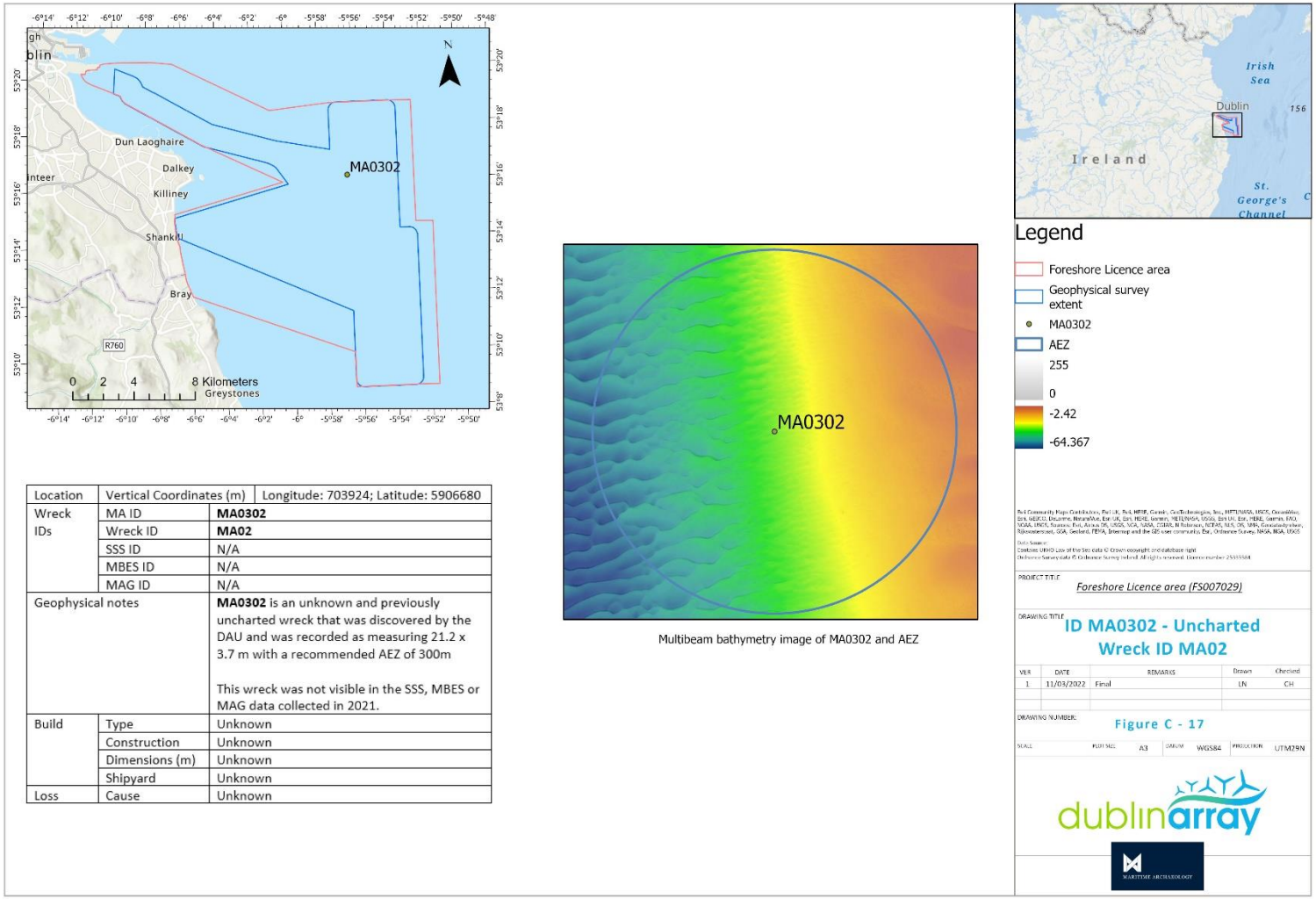
Location	Vertical Coordinates (m)	Longitude: 704758.5; Latitude: 5907052
Wreck IDs	MA ID	**MA0178**
	Wreck ID	**MA07**
	SSS ID	MA2177
	MBES ID	MA4123
	MAG ID	MA20250
Geophysical notes		**MA0178** is an unknown and previously uncharted wreck that was reported to UAU in 2021 during geophysical surveying. Noted in the SSS as an area of seabed with visible features that measure 20 x 14.5 m. Possibly associated with mA0180 and MA0179, which appear as wreck debris in the SSS data and are located 19 m southeast and 21 m south southeast, respectively. There is a large associated magnetic return of 3525 nT indicating the presence of ferrous material. Identified in MBES data as a linear feature oriented north east to south west with scour to the north east and additional linear features to the south east.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 15: MA0178, uncharted wreck



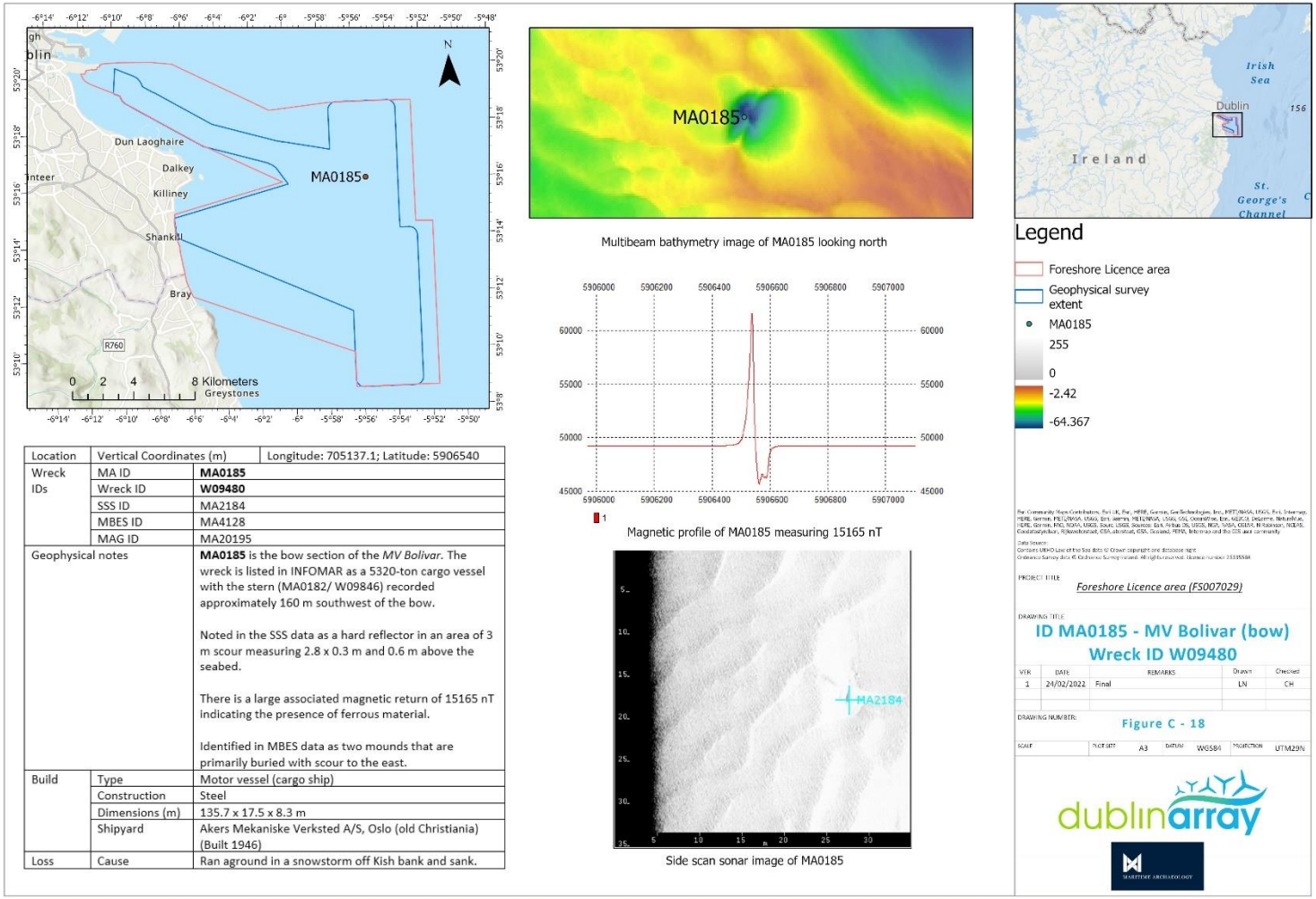
Location	Vertical Coordinates (m)	Longitude: 704981.1; Latitude: 5906705
Wreck IDs	MA ID	**MA0181**
	Wreck ID	**GSI 278**
	SSS ID	MA2180
	MBES ID	MA4125
	MAG ID	MA20278
Geophysical notes		**MA0181** is an unknown wreck measuring 13 x 4 m. Noted in the SSS as an isolated collection of cylindrical hard reflectors with pronounced shadows measuring 12 x 10 m and sitting 1.4 m above the seabed. There is an associated magnetic return of 428 nT indicating the presence of ferrous material. Identified in MBES data as a linear feature oriented north east to south west with scour to the south east.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 16: MA0181, unknown wreck



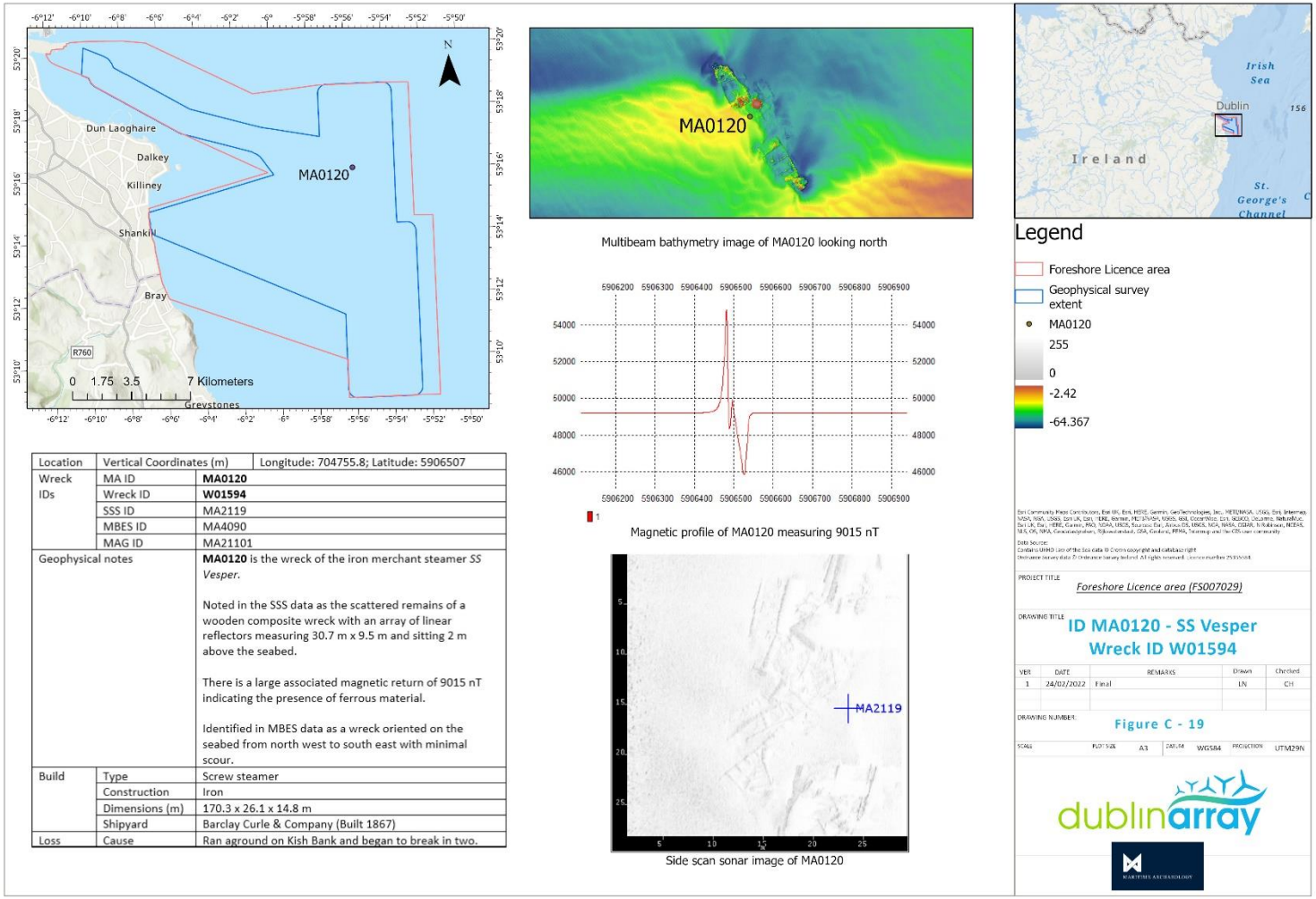
Location	Vertical Coordinates (m)	Longitude: 703924; Latitude: 5906680
Wreck IDs	MA ID	**MA0302**
	Wreck ID	**MA02**
	SSS ID	N/A
	MBES ID	N/A
	MAG ID	N/A
Geophysical notes		**MA0302** is an unknown and previously uncharted wreck that was discovered by the DAU and was recorded as measuring 21.2 x 3.7 m with a recommended AEZ of 300m This wreck was not visible in the SSS, MBES or MAG data collected in 2021.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 17: MA0302, uncharted wreck



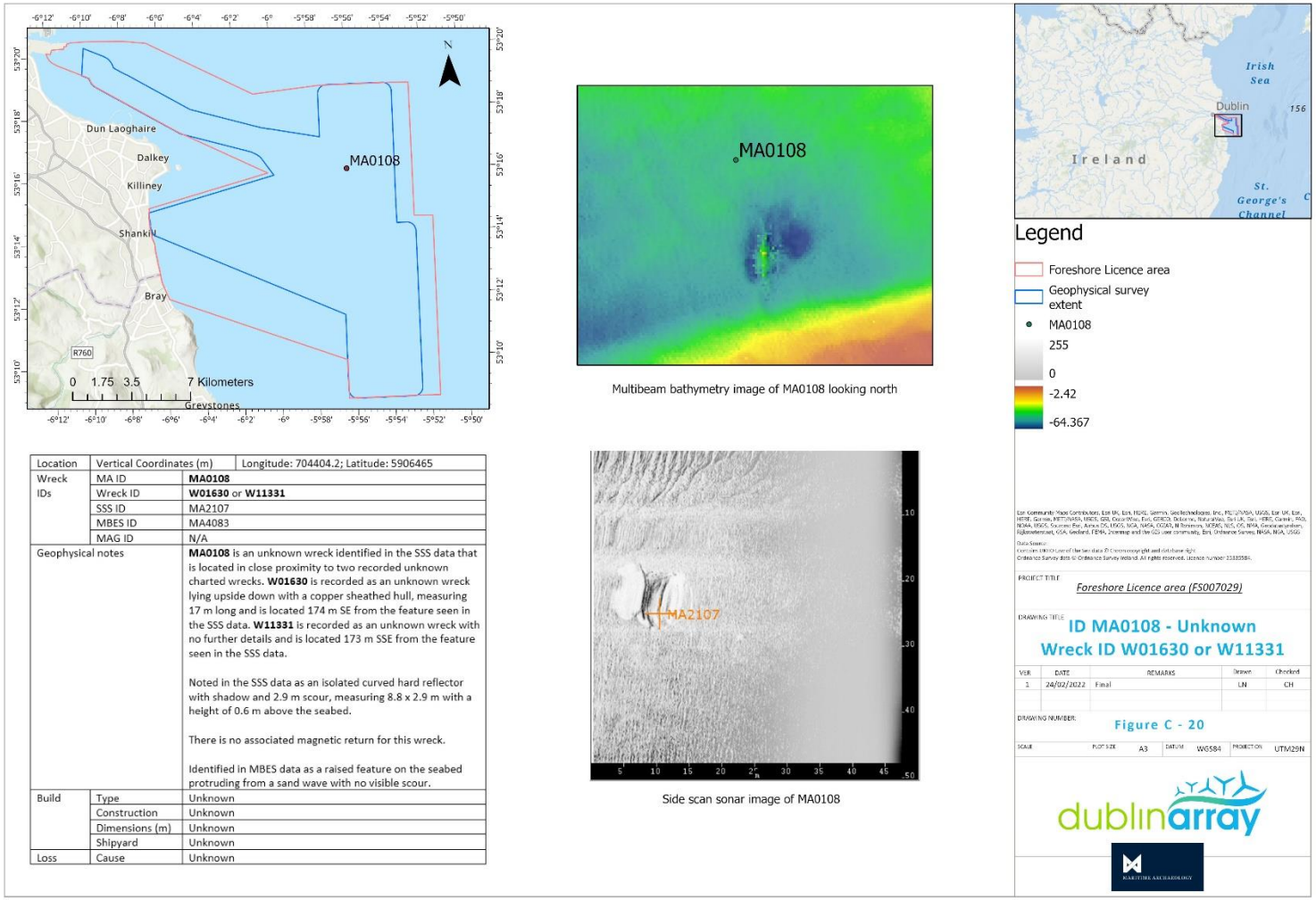
Location	Vertical Coordinates (m)	Longitude: 705137.1; Latitude: 5906540
Wreck IDs	MA ID	**MA0185**
	Wreck ID	**W09480**
	SSS ID	MA2184
	MBES ID	MA4128
	MAG ID	MA20195
Geophysical notes		**MA0185** is the bow section of the *MV Bolivar*. The wreck is listed in INFOMAR as a 5320-ton cargo vessel with the stern (MA0182/ W09846) recorded approximately 160 m southwest of the bow. Noted in the SSS data as a hard reflector in an area of 3 m scour measuring 2.8 x 0.3 m and 0.6 m above the seabed. There is a large associated magnetic return of 15165 nT indicating the presence of ferrous material. Identified in MBES data as two mounds that are primarily buried with scour to the east.
Build	Type	Motor vessel (cargo ship)
	Construction	Steel
	Dimensions (m)	135.7 x 17.5 x 8.3 m
	Shipyard	Akers Mekaniske Verksted A/S, Oslo (old Christiania) (Built 1946)
Loss	Cause	Ran aground in a snowstorm off Kish bank and sank.

Figure C- 18: MA0185, *MV Bolivar* (bow)



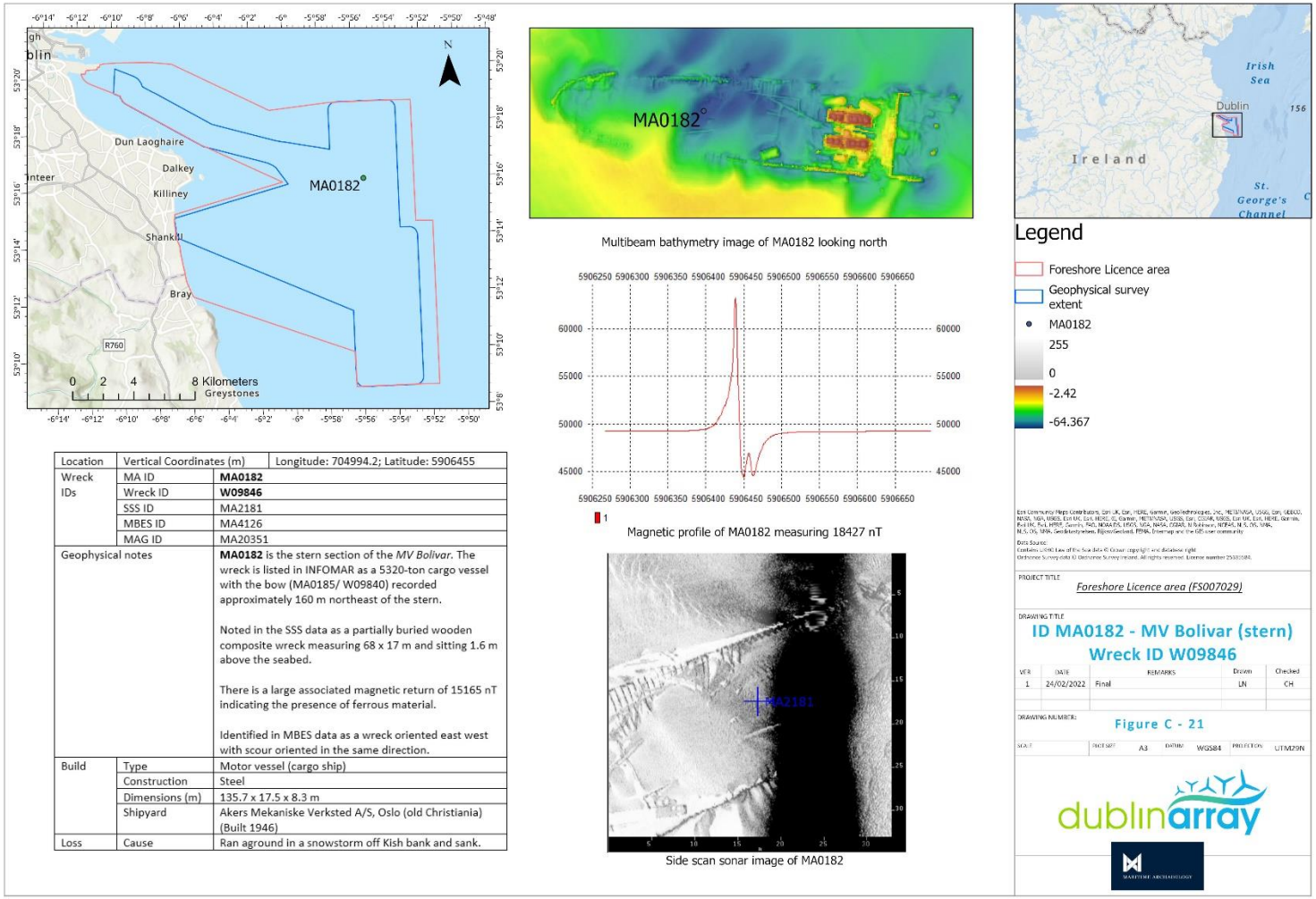
Location	Vertical Coordinates (m)	Longitude: 704755.8; Latitude: 5906507
Wreck IDs	MA ID	**MA0120**
	Wreck ID	**W01594**
	SSS ID	MA2119
	MBES ID	MA4090
	MAG ID	MA21101
Geophysical notes		**MA0120** is the wreck of the iron merchant steamer *SS Vesper*. Noted in the SSS data as the scattered remains of a wooden composite wreck with an array of linear reflectors measuring 30.7 m x 9.5 m and sitting 2 m above the seabed. There is a large associated magnetic return of 9015 nT indicating the presence of ferrous material. Identified in MBES data as a wreck oriented on the seabed from north west to south east with minimal scour.
Build	Type	Screw steamer
	Construction	Iron
	Dimensions (m)	170.3 x 26.1 x 14.8 m
	Shipyard	Barclay Curle & Company (Built 1867)
Loss	Cause	Ran aground on Kish Bank and began to break in two.

Figure C- 19: MA0120, *SS Vesper*



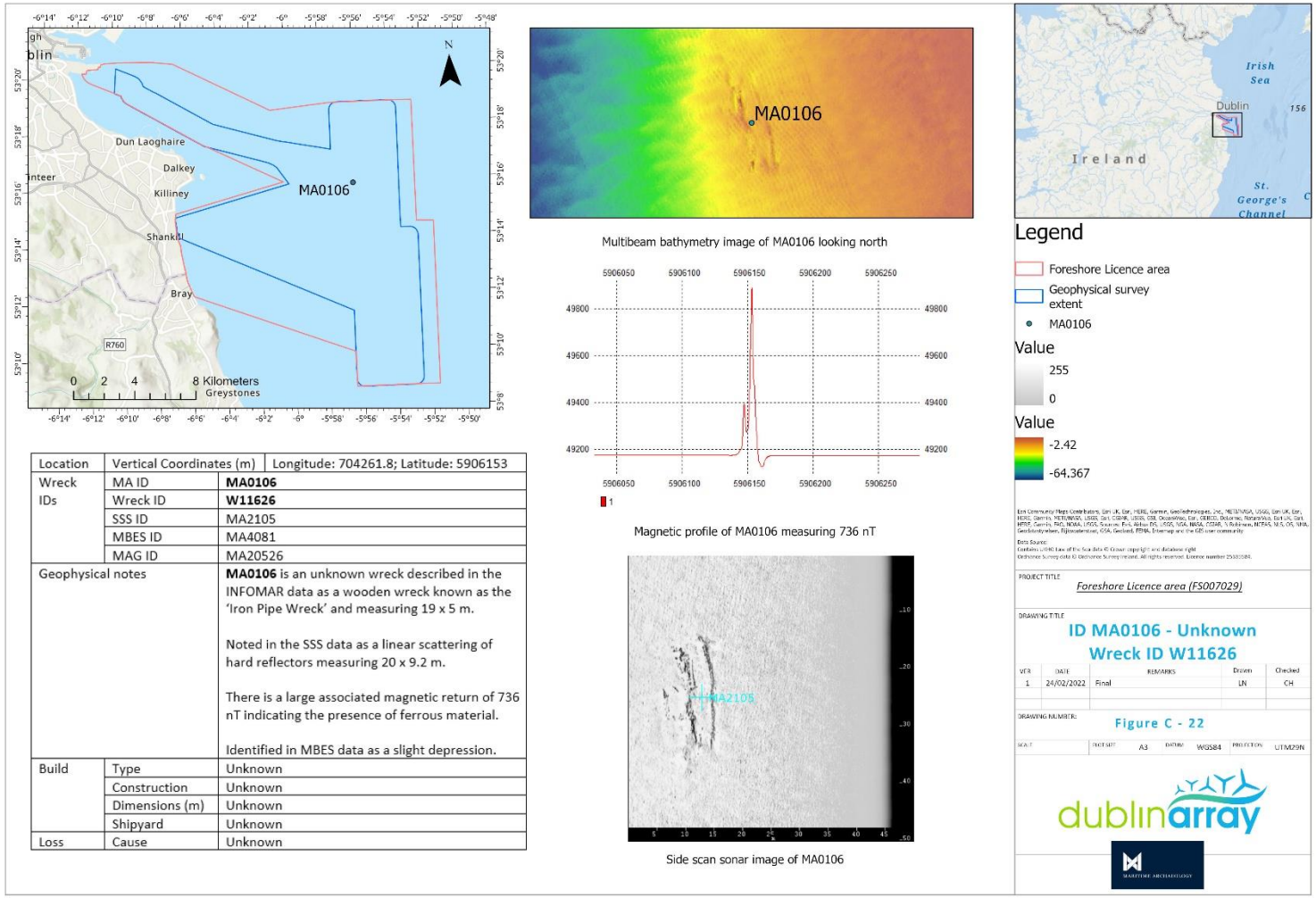
Location	Vertical Coordinates (m)	Longitude: 704404.2; Latitude: 5906465
Wreck IDs	MA ID	**MA0108**
	Wreck ID	**W01630** or **W11331**
	SSS ID	MA2107
	MBES ID	MA4083
	MAG ID	N/A
Geophysical notes		**MA0108** is an unknown wreck identified in the SSS data that is located in close proximity to two recorded unknown charted wrecks. **W01630** is recorded as an unknown wreck lying upside down with a copper sheathed hull, measuring 17 m long and is located 174 m SE from the feature seen in the SSS data. **W11331** is recorded as an unknown wreck with no further details and is located 173 m SSE from the feature seen in the SSS data. Noted in the SSS data as an isolated curved hard reflector with shadow and 2.9 m scour, measuring 8.8 x 2.9 m with a height of 0.6 m above the seabed. There is no associated magnetic return for this wreck. Identified in MBES data as a raised feature on the seabed protruding from a sand wave with no visible scour.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 20: MA0108, unknown wreck



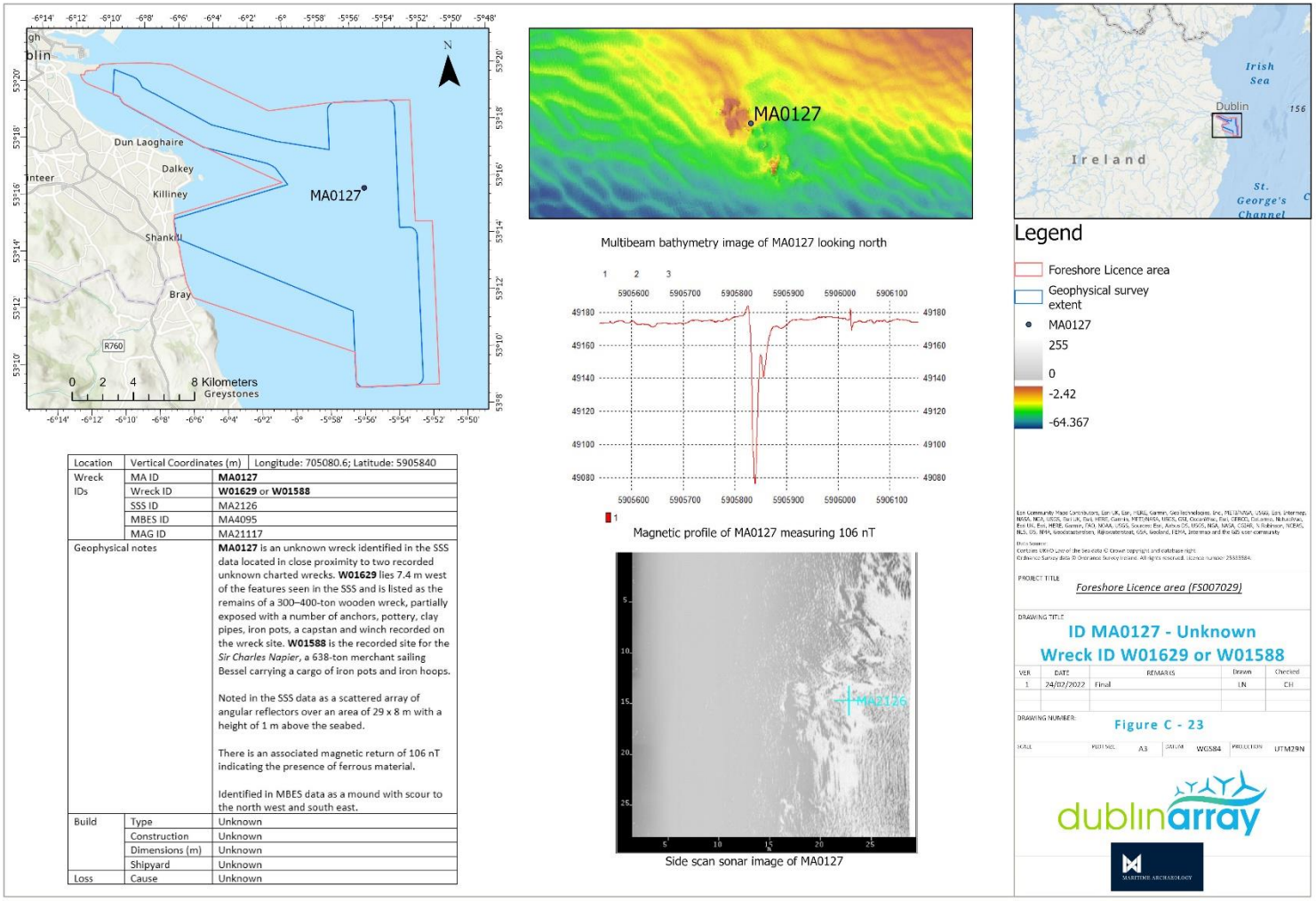
Location	Vertical Coordinates (m)	Longitude: 704994.2; Latitude: 5906455
Wreck IDs	MA ID	**MA0182**
	Wreck ID	**W09846**
	SSS ID	MA2181
	MBES ID	MA4126
	MAG ID	MA20351
Geophysical notes		**MA0182** is the stern section of the *MV Bolivar*. The wreck is listed in INFOMAR as a 5320-ton cargo vessel with the bow (MA0185/ W09840) recorded approximately 160 m northeast of the stern. Noted in the SSS data as a partially buried wooden composite wreck measuring 68 x 17 m and sitting 1.6 m above the seabed. There is a large associated magnetic return of 15165 nT indicating the presence of ferrous material. Identified in MBES data as a wreck oriented east west with scour oriented in the same direction.
Build	Type	Motor vessel (cargo ship)
	Construction	Steel
	Dimensions (m)	135.7 x 17.5 x 8.3 m
	Shipyard	Akers Mekaniske Verksted A/S, Oslo (old Christiania) (Built 1946)
Loss	Cause	Ran aground in a snowstorm off Kish bank and sank.

Figure C- 21: MA0182, *MV Bolivar* (stern)



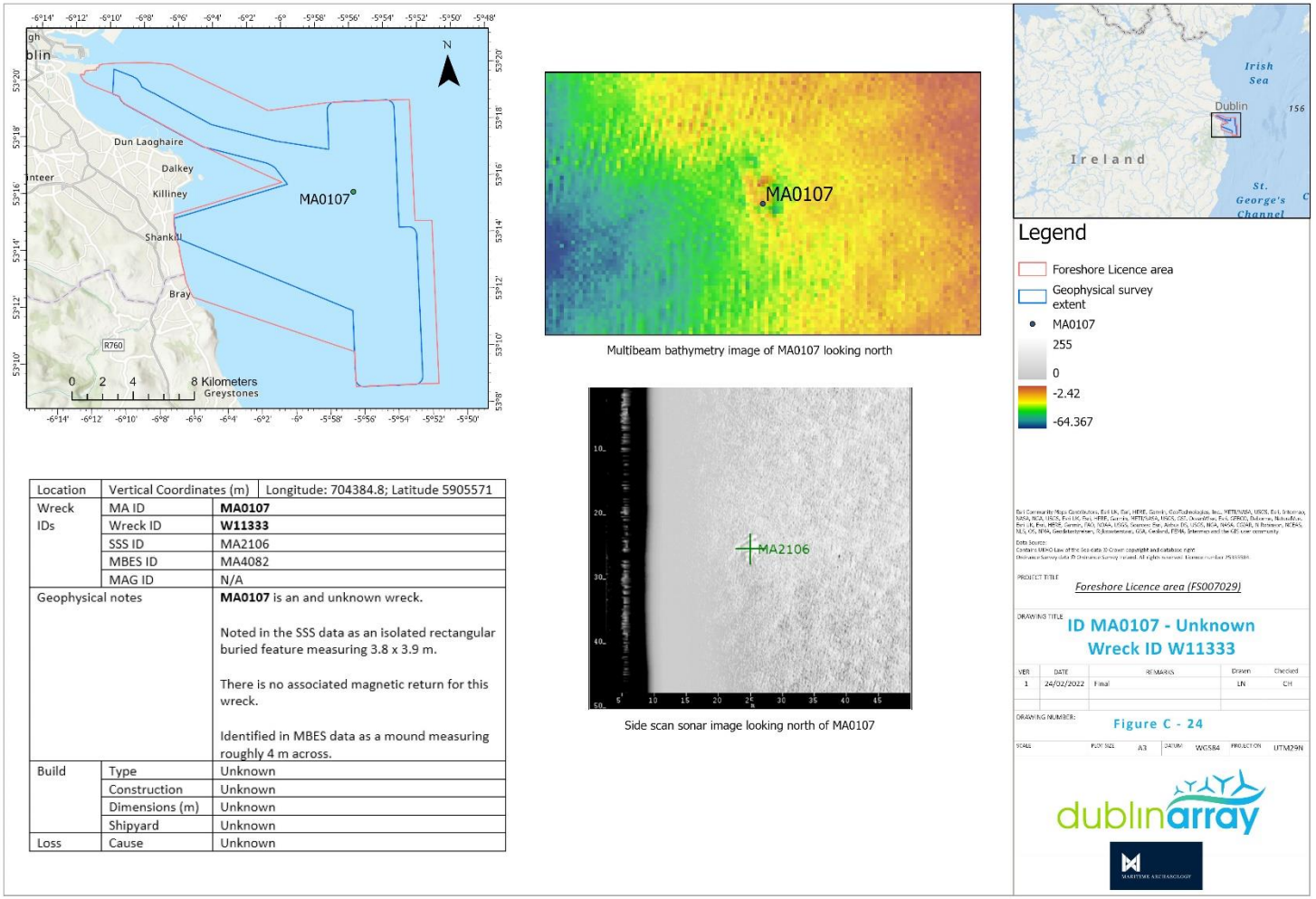
Location	Vertical Coordinates (m)	Longitude: 704261.8; Latitude: 5906153
Wreck IDs	MA ID	**MA0106**
	Wreck ID	**W11626**
	SSS ID	MA2105
	MBES ID	MA4081
	MAG ID	MA20526
Geophysical notes		**MA0106** is an unknown wreck described in the INFOMAR data as a wooden wreck known as the 'Iron Pipe Wreck' and measuring 19 x 5 m. Noted in the SSS data as a linear scattering of hard reflectors measuring 20 x 9.2 m. There is a large associated magnetic return of 736 nT indicating the presence of ferrous material. Identified in MBES data as a slight depression.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 22: MA0106, unknown wreck



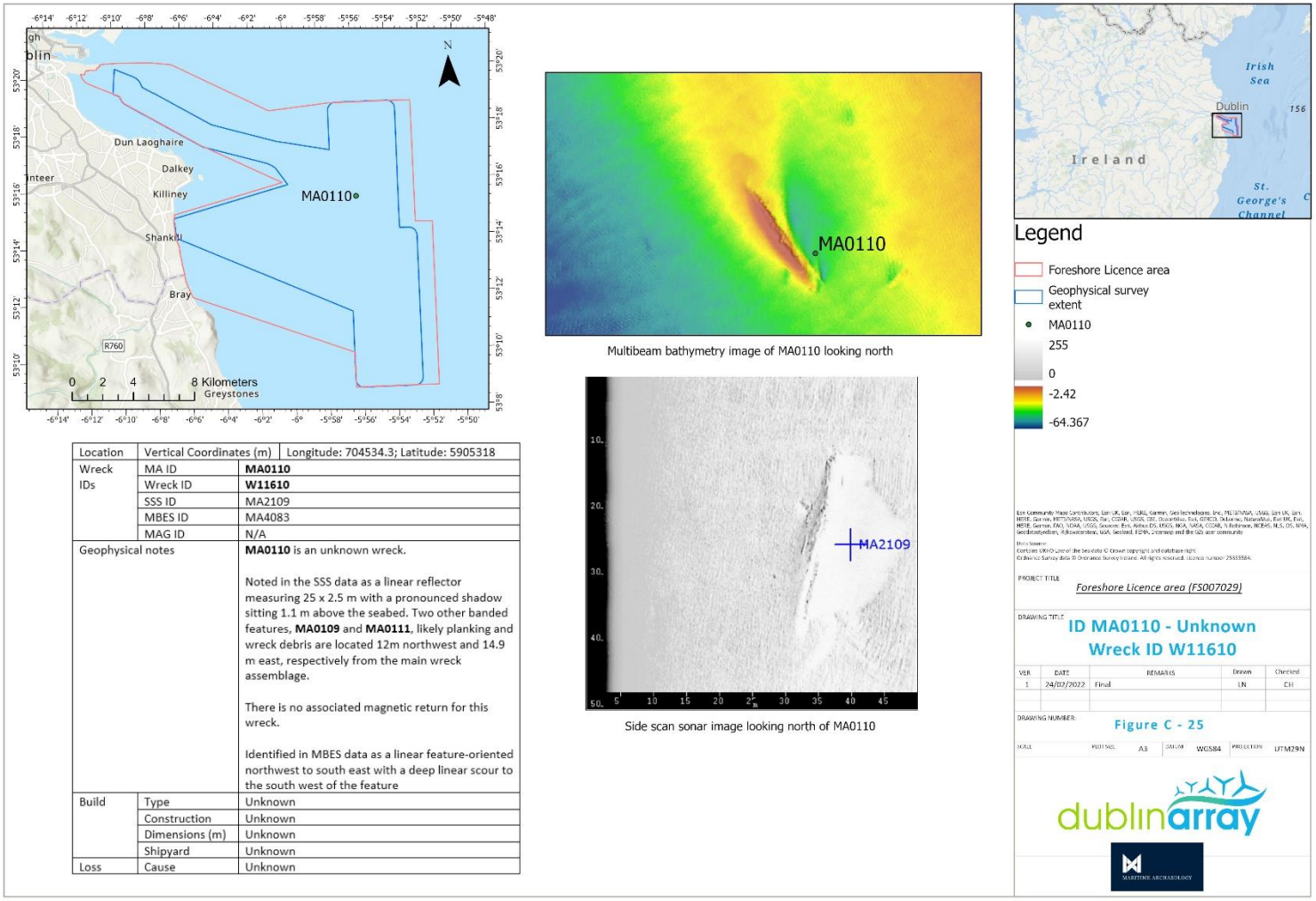
Location	Vertical Coordinates (m)	Longitude: 705080.6; Latitude: 5905840
Wreck IDs	MA ID	**MA0127**
	Wreck ID	**W01629** or **W01588**
	SSS ID	MA2126
	MBES ID	MA4095
	MAG ID	MA21117
Geophysical notes		**MA0127** is an unknown wreck identified in the SSS data located in close proximity to two recorded unknown charted wrecks. **W01629** lies 7.4 m west of the features seen in the SSS and is listed as the remains of a 300–400-ton wooden wreck, partially exposed with a number of anchors, pottery, clay pipes, iron pots, a capstan and winch recorded on the wreck site. **W01588** is the recorded site for the *Sir Charles Napier*, a 638-ton merchant sailing Bessel carrying a cargo of iron pots and iron hoops. Noted in the SSS data as a scattered array of angular reflectors over an area of 29 x 8 m with a height of 1 m above the seabed. There is an associated magnetic return of 106 nT indicating the presence of ferrous material. Identified in MBES data as a mound with scour to the north west and south east.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 23: MA0127, *Sir Charles Napier* (potentially)



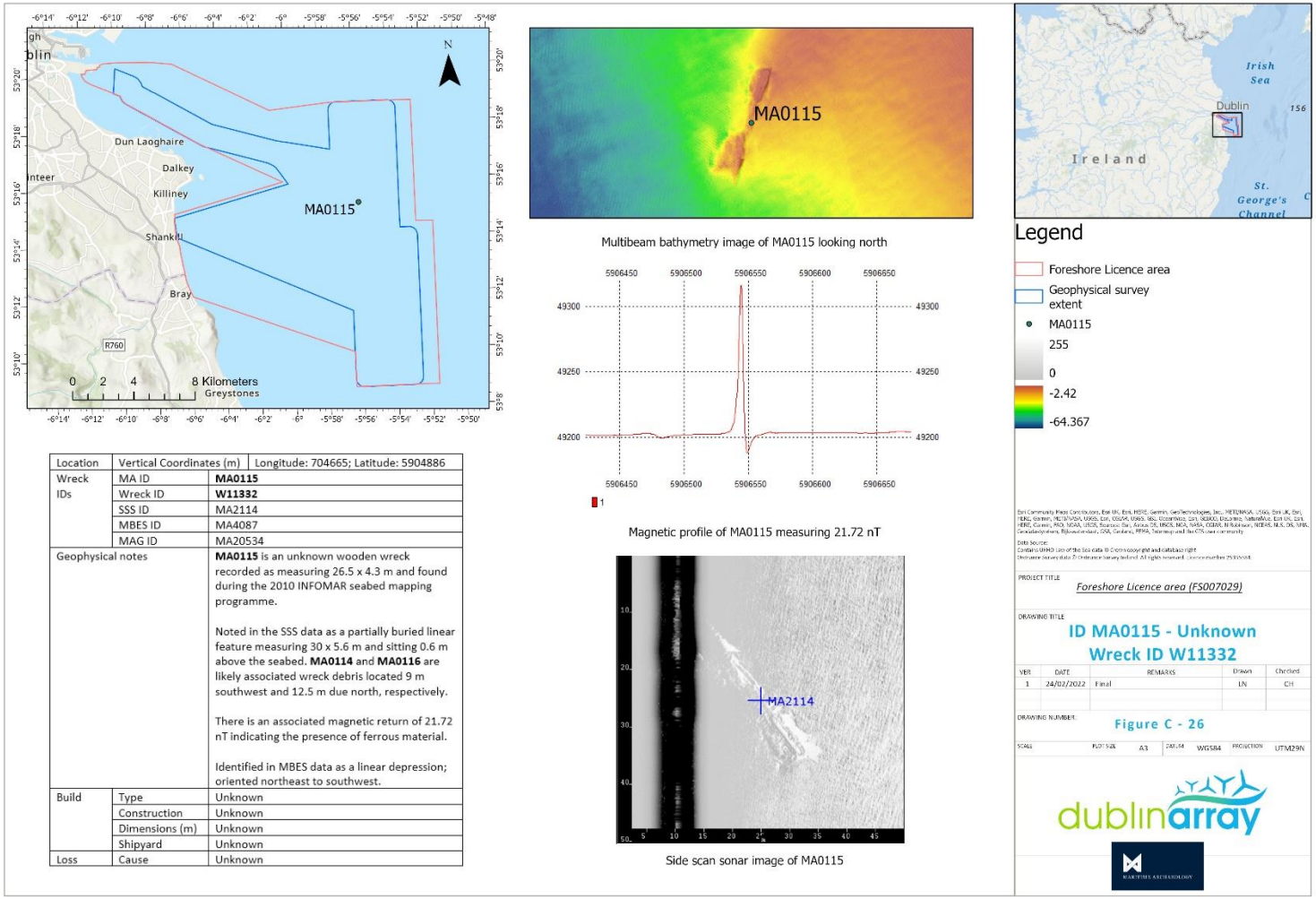
Location	Vertical Coordinates (m)	Longitude: 704384.8; Latitude 5905571
Wreck IDs	MA ID	**MA0107**
	Wreck ID	**W11333**
	SSS ID	MA2106
	MBES ID	MA4082
	MAG ID	N/A
Geophysical notes		**MA0107** is an and unknown wreck. Noted in the SSS data as an isolated rectangular buried feature measuring 3.8 x 3.9 m. There is no associated magnetic return for this wreck. Identified in MBES data as a mound measuring roughly 4 m across.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 24: MA0107, unknown wreck



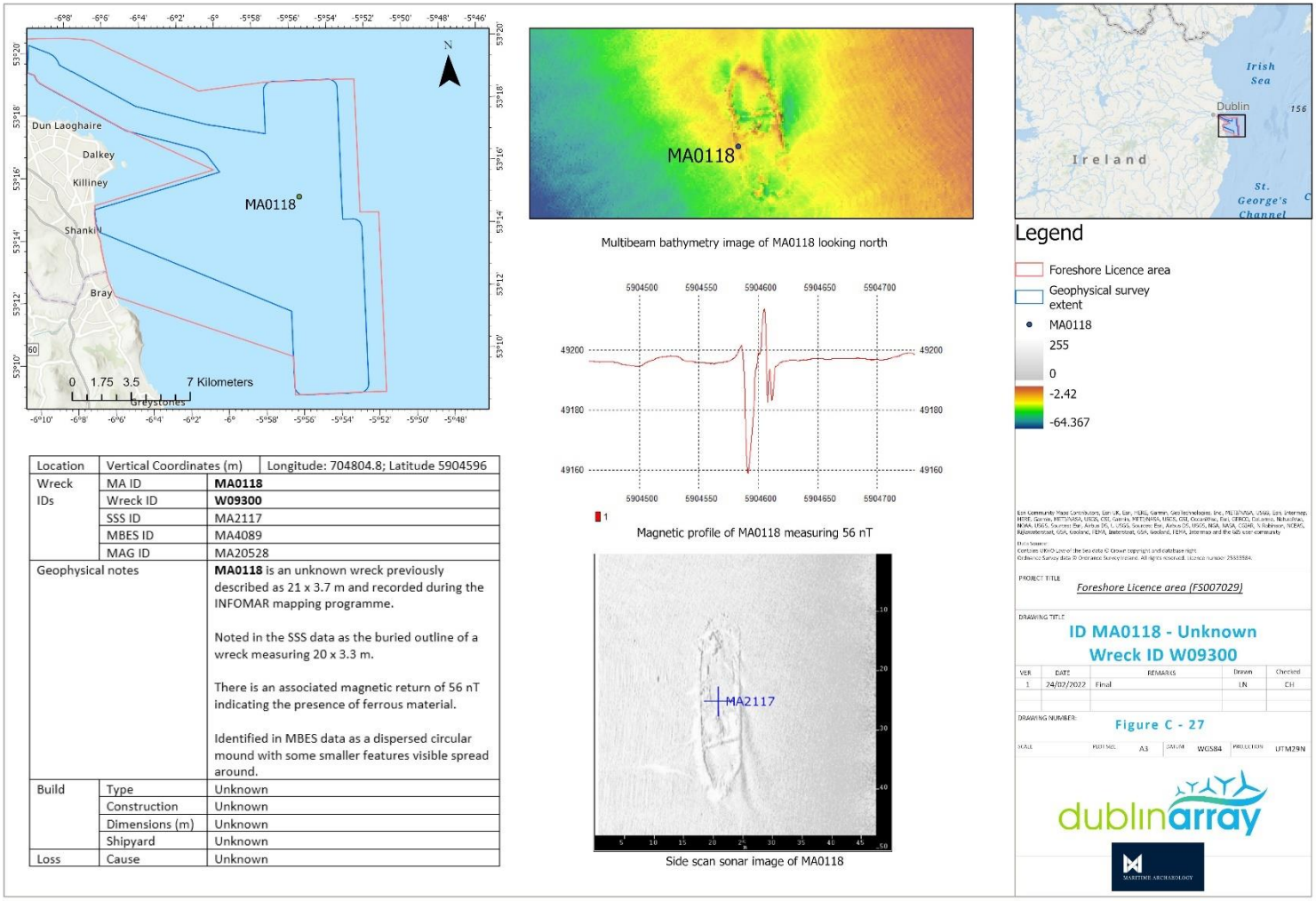
Location	Vertical Coordinates (m)	Longitude: 704534.3; Latitude: 5905318
Wreck IDs	MA ID	**MA0110**
	Wreck ID	**W11610**
	SSS ID	MA2109
	MBES ID	MA4083
	MAG ID	N/A
Geophysical notes		**MA0110** is an unknown wreck. Noted in the SSS data as a linear reflector measuring 25 x 2.5 m with a pronounced shadow sitting 1.1 m above the seabed. Two other banded features, **MA0109** and **MA0111**, likely planking and wreck debris are located 12m northwest and 14.9 m east, respectively from the main wreck assemblage. There is no associated magnetic return for this wreck. Identified in MBES data as a linear feature-oriented northwest to south east with a deep linear scour to the south west of the feature
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 25: MA0110, unknown wreck



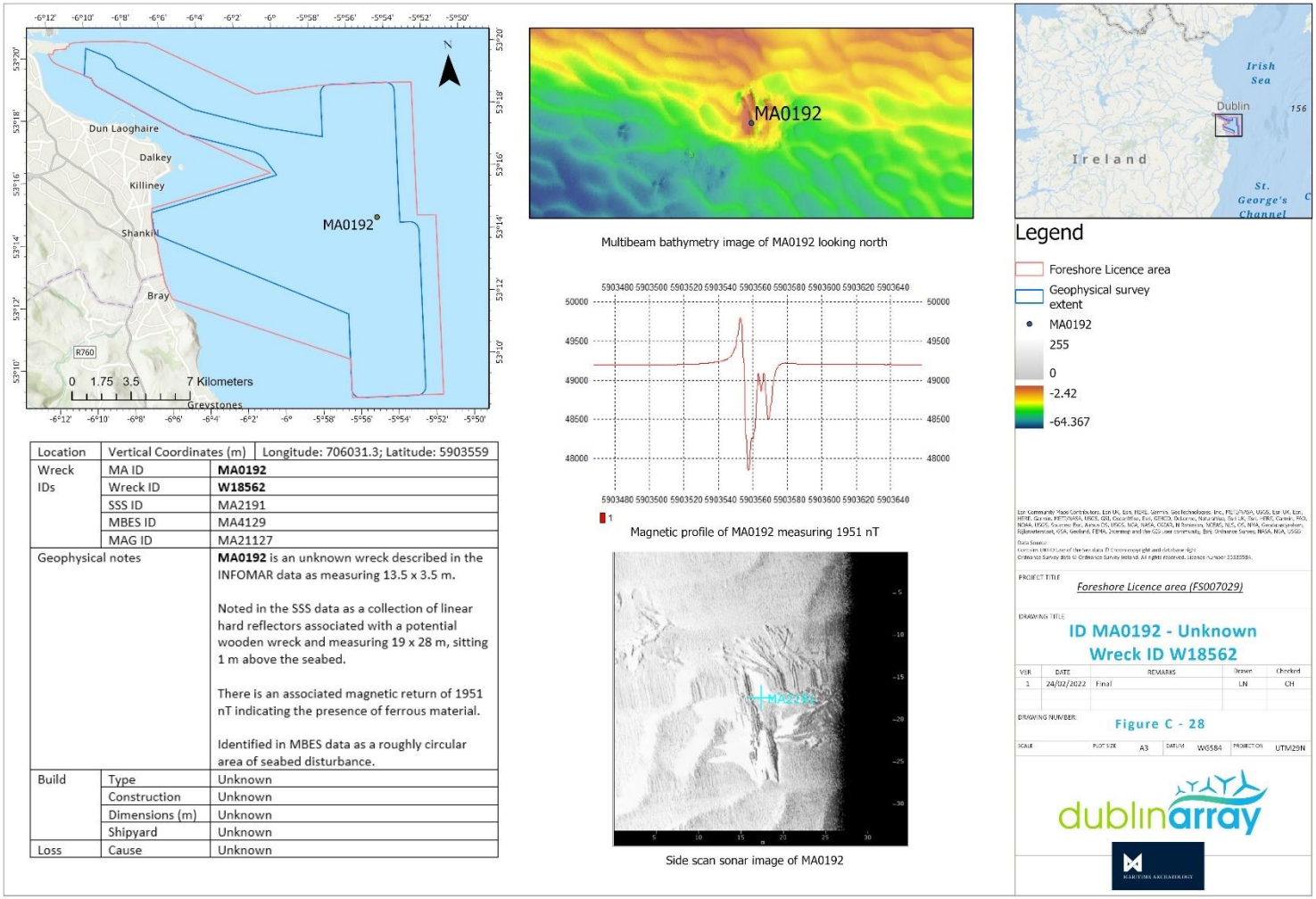
Location	Vertical Coordinates (m)	Longitude: 704665; Latitude: 5904886
Wreck IDs	MA ID	**MA0115**
	Wreck ID	**W11332**
	SSS ID	MA2114
	MBES ID	MA4087
	MAG ID	MA20534
Geophysical notes		**MA0115** is an unknown wooden wreck recorded as measuring 26.5 x 4.3 m and found during the 2010 INFOMAR seabed mapping programme. Noted in the SSS data as a partially buried linear feature measuring 30 x 5.6 m and sitting 0.6 m above the seabed. **MA0114** and **MA0116** are likely associated wreck debris located 9 m southwest and 12.5 m due north, respectively. There is an associated magnetic return of 21.72 nT indicating the presence of ferrous material. Identified in MBES data as a linear depression; oriented northeast to southwest.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 26: MA0115, unknown wreck



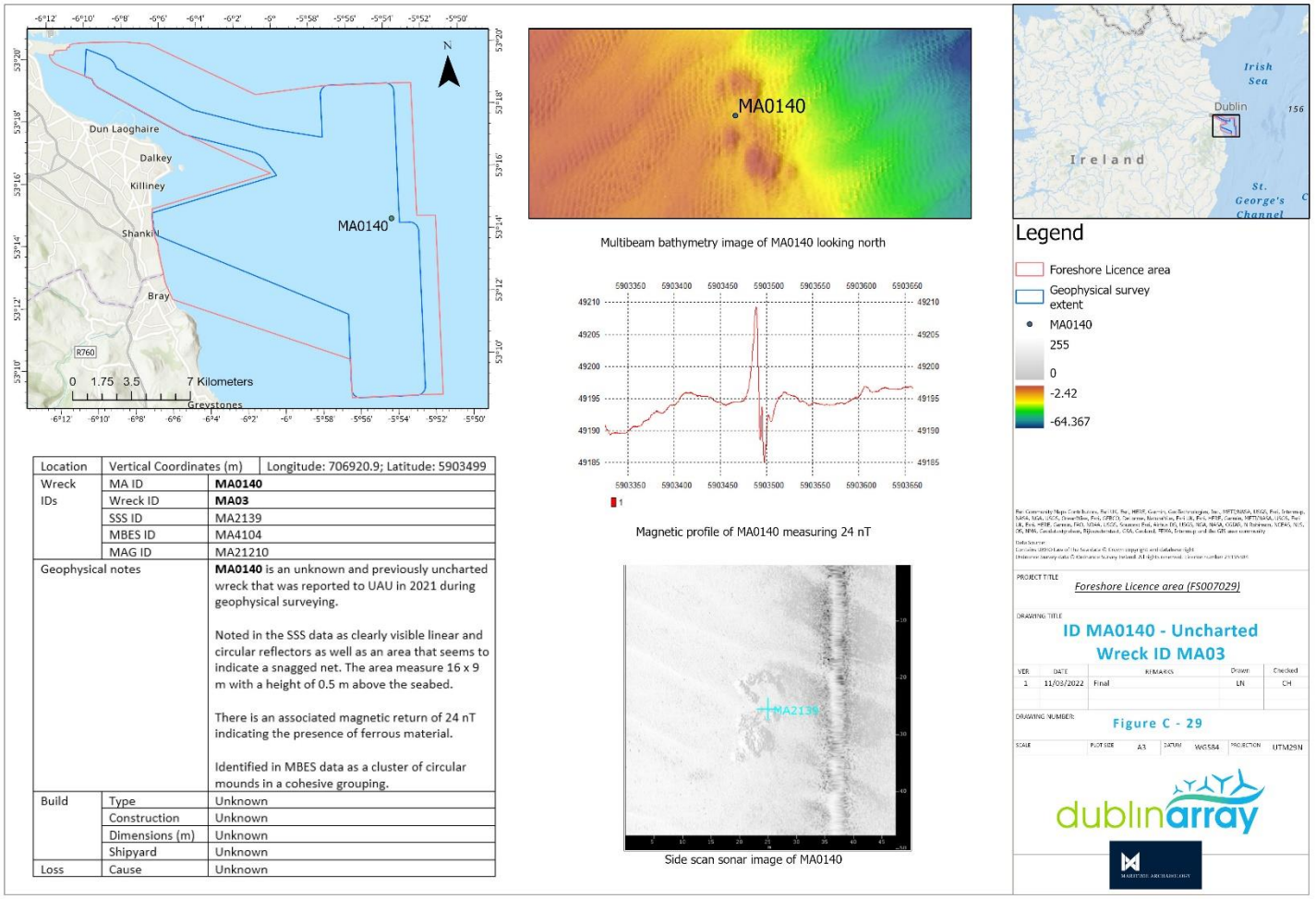
Location	Vertical Coordinates (m)	Longitude: 704804.8; Latitude 5904596
Wreck IDs	MA ID	**MA0118**
	Wreck ID	**W09300**
	SSS ID	MA2117
	MBES ID	MA4089
	MAG ID	MA20528
Geophysical notes		**MA0118** is an unknown wreck previously described as 21 x 3.7 m and recorded during the INFOMAR mapping programme. Noted in the SSS data as the buried outline of a wreck measuring 20 x 3.3 m. There is an associated magnetic return of 56 nT indicating the presence of ferrous material. Identified in MBES data as a dispersed circular mound with some smaller features visible spread around.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 27: MA0118, unknown wreck



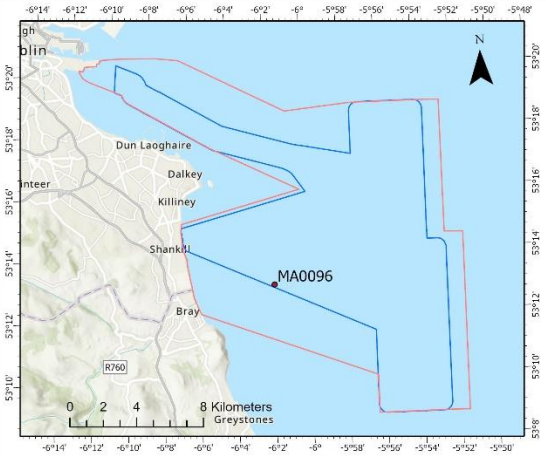
Location	Vertical Coordinates (m)	Longitude: 706031.3; Latitude: 5903559
Wreck IDs	MA ID	**MA0192**
	Wreck ID	**W18562**
	SSS ID	MA2191
	MBES ID	MA4129
	MAG ID	MA21127
Geophysical notes		**MA0192** is an unknown wreck described in the INFOMAR data as measuring 13.5 x 3.5 m. Noted in the SSS data as a collection of linear hard reflectors associated with a potential wooden wreck and measuring 19 x 28 m, sitting 1 m above the seabed. There is an associated magnetic return of 1951 nT indicating the presence of ferrous material. Identified in MBES data as a roughly circular area of seabed disturbance.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

Figure C- 28: MA0192, unknown wreck

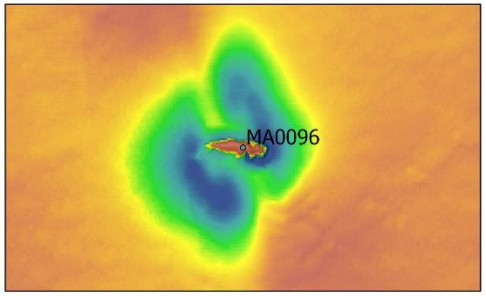


Location	Vertical Coordinates (m)	Longitude: 706920.9; Latitude: 5903499
Wreck IDs	MA ID	**MA0140**
	Wreck ID	**MA03**
	SSS ID	MA2139
	MBES ID	MA4104
	MAG ID	MA21210
Geophysical notes		**MA0140** is an unknown and previously uncharted wreck that was reported to UAU in 2021 during geophysical surveying. Noted in the SSS data as clearly visible linear and circular reflectors as well as an area that seems to indicate a snagged net. The area measure 16 x 9 m with a height of 0.5 m above the seabed. There is an associated magnetic return of 24 nT indicating the presence of ferrous material. Identified in MBES data as a cluster of circular mounds in a cohesive grouping.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown

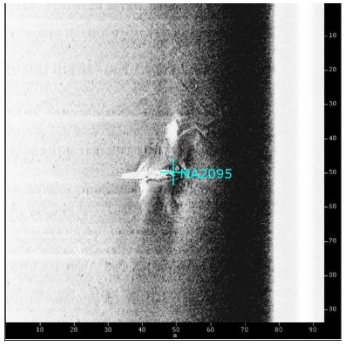
Figure C- 29: MA0140, uncharted wreck



Location	Vertical Coordinates (m)	Longitude: 698255.4; Latitude: 5900476
Wreck IDs	MA ID	**MA0096**
	Wreck ID	**MA05**
	SSS ID	MA2095
	MBES ID	MA4076
	MAG ID	N/A
Geophysical notes		**MA0096** is an unknown and previously uncharted wreck that was reported to UAU in 2021 during geophysical surveying. Noted in the SSS data as a visible feature measuring 15 m long and 5 – 6 m wide. There is no associated magnetic return for this wreck. Identified in MBES data as a distinct wreck within surrounding scour oriented from east to west.
Build	Type	Unknown
	Construction	Unknown
	Dimensions (m)	Unknown
	Shipyard	Unknown
Loss	Cause	Unknown



Multibeam bathymetry image of MA0096 looking north



Side scan sonar image looking north of MA0096

Legend

- Foreshore Licence area
- Geophysical survey extent
- MA0096
- 255
- 0
- -2.42
- -64.367

Foreshore Licence area (FS007029)

ID MA0096 - Uncharted Wreck ID MA05

VER	DATE	REMARKS	Drawn	Checked
1	11/03/2022	Final	LN	CH

Figure C - 30

SCALE | PLOT SIZE: A3 | DATUM: WGS84 | PROJECTION: UTM29N

dublinarray

Figure C- 30: MA0096, uncharted wreck