

# REPORT

## Schedule of Works

Wicklow Export Cable Corridor Foreshore Licence  
Application

Client: Wicklow Sea Wind Limited

Reference: UB1019-RHD-ZZ-XX-RP-Z-0011

Status: S0/001

Date: 30 June 2022



HASKONINGDHV UK LTD.

Marlborough House  
Marlborough Crescent  
Newcastle upon Tyne  
NE1 4EE  
Industry & Buildings  
VAT registration number: 792428892



Document title: Schedule of Works

Document short title:

Reference: UB1019-RHD-ZZ-XX-RP-Z-0011

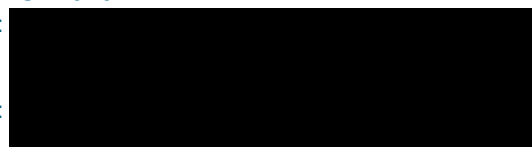
Status: 001/S0

Date: 30 June 2022

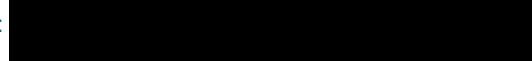
Project name:

Project number: UB1019

Author(s):



Drafted by:



Checked by:



Date: 06/07/2022

Approved by:



Date: 05/08/2022

Classification

Project related

*Unless otherwise agreed with the Client, no part of this document may be reproduced or made public or used for any purpose other than that for which the document was produced. HaskoningDHV UK Ltd. accepts no responsibility or liability whatsoever for this document other than towards the Client.*

*Please note: this document contains personal data of employees of HaskoningDHV UK Ltd.. Before publication or any other way of disclosing, this report needs to be anonymized.*

## Table of Contents

<b>1</b>	<b>Scope of Works</b>	<b>1</b>
1.1	Surveys Proposed and programme	1
1.2	Survey Vessels	2
1.3	Description of the Proposed Survey Works	4
<b>2</b>	<b>Good Practice Measures</b>	<b>11</b>
2.1	Geophysical Surveys	11
2.2	Water quality	12
2.3	Archaeology	13
<b>3</b>	<b>References</b>	<b>15</b>

## Table of Figures

Figure 1	Wicklow Sea Wind Farm Export Cable Corridor AoS - Navigation and Shipping	3
Figure 2	Indicative Locations of Geotechnical Surveys	5
Figure 3	Indicative Benthic Sampling Stations	6

## Appendices

### Appendix 1 Survey Vessels and Site Investigation Survey Equipment Examples

A1	Survey Vessels
A1.1	Site Investigation Equipment
A1.1.1	DGPS Positioning
A1.1.2	Acoustic positioning
A1.1.3	Motion Reference Unit
A1.1.4	Echosounder
A1.1.5	Sub Bottom Profiler
A1.1.6	Magnetometer
A1.1.7	Day Grab
A1.1.8	Drop Down Video
A1.1.9	Vibrocorer
A1.1.10	CPT

## 1 Scope of Works

Wicklow Sea Wind Limited wish to undertake surveys to assess the suitability of the area of search (AoS) for the installation of an export cable corridor connecting an offshore wind farm (the Wicklow Project) to the coastline. The Wicklow Project AoS for the export cable corridor (herein the 'cable AoS') lies off the east coast of Ireland in the Irish Sea, as shown in **Figure 1**.

### 1.1 Surveys Proposed and programme

Surveys proposed are set out below including proposed start and duration:

- **Geophysical Survey** – Q2 / Q3 2023 (approx. 3 months duration)
- **Archaeological Survey** – Q2 2023 (as part of Geophysical survey, approx. 3 months duration)
- **Marine Benthic Ecology Survey** – Q3 2023 (approx. 3 months duration)
- **Geotechnical Survey** – Q2/3 2024 (approx. 3 months duration)
- **Intertidal Survey** - Q3 2023 / Q3 2024 (maximum 1 week duration)

Note that the Seabird and Marine Mammal Aerial Survey planned for the wind farm site would cover part of the export cable corridor AoS. As any potential impacts from the export cable might arise from the effects of temporary construction there is no requirement to undertake a dedicated survey for seabirds and marine mammals covering the export cable corridor AoS. For intertidal survey the duration will be much shorter, likely a few days only.

These timeframes are indicative and are subject to change depending on receipt of the foreshore licence, final survey design, weather delay and outcome of any consultation and responses from statutory bodies.

#### 1.1.1 Duration of Activity

The exact timings and duration of surveys are yet to be determined but this foreshore licence application assumes that surveys could be undertaken during any season. The estimated duration of surveys is expected to be approximately 24 months in total with each survey campaign within it having an approximate 3 month duration.

Given the potential for delays due to poor weather conditions and potential timing restrictions, this foreshore licence application relates to the possibility of site investigations taking place over a five-year period.

#### 1.1.2 Site Investigation (SI) Objectives

The objectives of the works proposed under this foreshore licence application are as follows:

- To gather further information on seabed and sub-seabed conditions;
- To gather sufficient geotechnical data on the stability of soils, sediments, clays and gravels to allow the characterisation of the sub-seabed strata to inform design;
- To provide baseline information on the benthos along the export cable corridor; and
- To provide information on the archaeological conditions along the export cable corridor.

In order to meet the above objectives various SI works and monitoring device deployments are required, for which a foreshore licence is required.

## 1.2 Survey Vessels

A variety of survey vessels will be required to complete the full scope of surveys. The exact vessel types will be defined after the procurement process has been completed. **Appendix 1** provides further details on example survey vessels and equipment. **Figure 1** illustrates the navigation and shipping in the vicinity of the cable AoS which has been used to help determine vessel requirements.

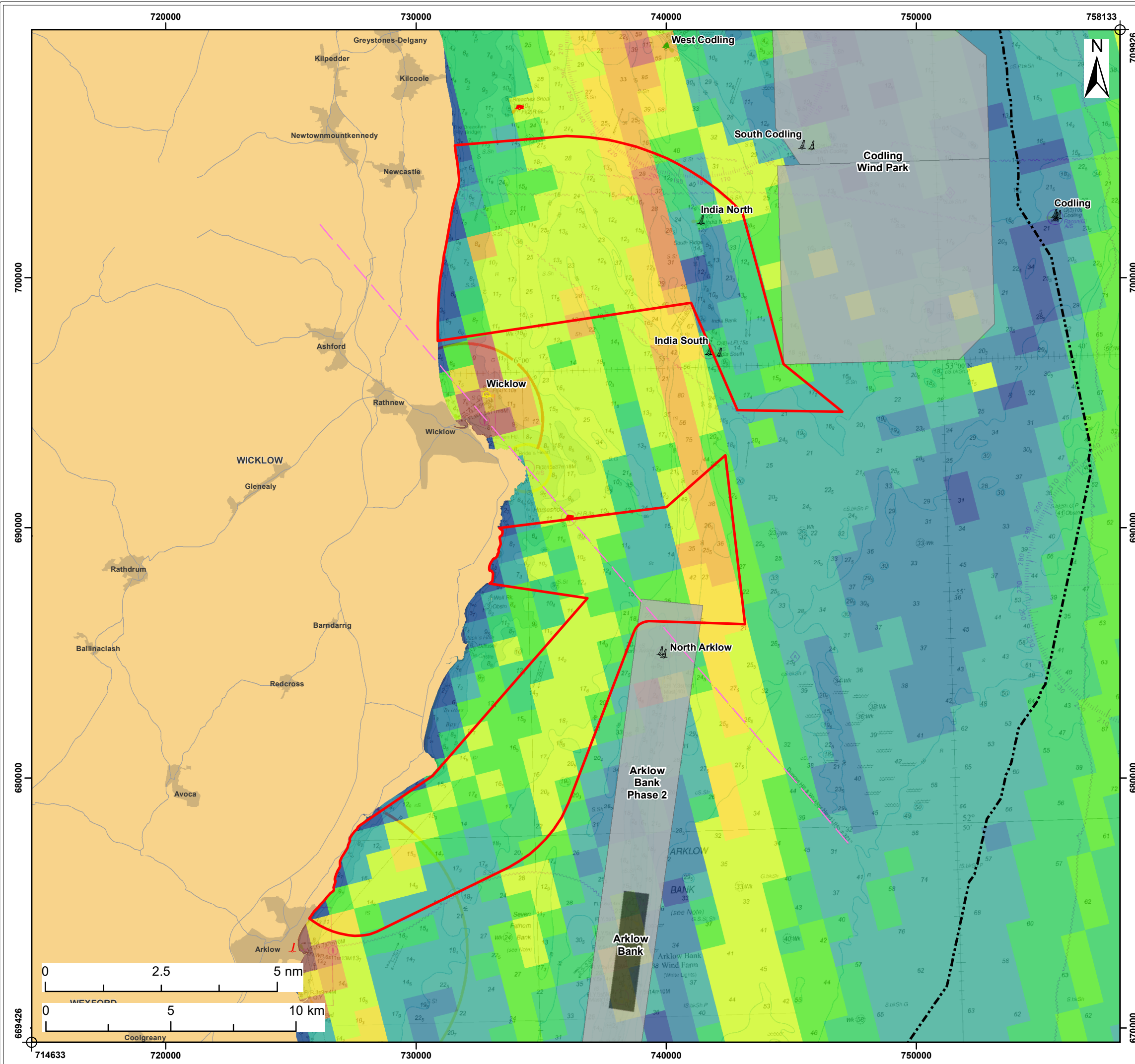
The vessels will conform to the following minimum requirements as appropriate:

- All health and safety requirements including safe systems of works prepared prior to starting the survey works;
- Endurance (e.g. fuel, water, stores, etc.) to undertake the required survey works;
- Appropriate accommodation and mess facilities on board;
- Station-keeping and sea keeping capabilities required by the specified work at the proposed time of year; the appointed contractor may provide supplemental tug assistance if such assistance benefits the operation;
- Sufficiently qualified staffing to allow all planned work to be carried out as a continuous operation (on a 24 hour per day basis for the offshore activities and on a 12 hour per day basis for the nearshore activities);
- Equipment and spares with necessary tools for all specified works; and
- Compliance with Safety of Life at Sea (SOLAS), International Maritime Organization (IMO) and national requirements for operating within Irish territorial waters.

The cable AoS ranges in depth of approximately 0m to 61m, however the depths of the final export cable corridor route may vary slightly. Example vessels for geophysical surveys are generally between 10-90m in length (depending on area of work) and are also suitable for environmental surveys. For deeper water and geotechnical surveys, larger 55-90 m vessels may be required. The acoustic broadband source levels for different vessel sizes are typically with smaller vessels (<50m) having source levels 160-175 dB (re 1 $\mu$ Pa), medium sized vessels (50-100m) 165-180 dB (re 1 $\mu$ Pa) and large vessels (>100m) having source levels of 180-190 dB (re 1 $\mu$ Pa) (Richardson, *et al.* 1995). These vessels used for geotechnical surveys typically consist of a self-elevating work platform and legs (normally 4 to 8m) that are deployed to the seabed.

Wicklow Sea Wind Limited is committed to the use of good practice techniques and due diligence regarding the potential for pollution throughout all survey activities. A Project Environmental Management Plan (PEMP) will be developed prior to any survey being undertaken. Good practice measures are outlined in **Section 2**.





**Legend:**

- Wicklow Cable Area of Search
- Ireland 12nm Limit
- ┆ Beacon - Lateral, Port
- ⚓ Buoy - Cardinal
- ┆ Buoy - Lateral, Port
- ▲ Buoy - Lateral, Starboard
- ⦿ Buoy - Special Purpose/General
- Navigation Line

**Offshore Wind Farm Sites**

- Operational
- Maritime Area Consent Application

**Time Spent by All Vessels in 1km<sup>2</sup> - Monthly Average 2019 (hours/km<sup>2</sup>/month)**

- 0 - 0.25
- 0.26 - 0.5
- 0.51 - 1
- 1.01 - 1.5
- 1.51 - 2
- 2.01 - 4
- 4.01 - 6
- 6.01 - 8
- 8.01 - 10
- 10.01 - 30
- 30.01 - 550

**Data Sources:** © EMODnet, 2022. © UKHO, 2022. © HaskoningDHV UK Ltd. 2022.  
**Basemap:** © British Crown and OceanWise, 2022. All rights reserved. License No. EMS-EK001-638207. Not to be used for Navigation. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors.

Client: <b>Wicklow Sea Wind Limited</b>	Project: <b>Wicklow Offshore Wind Farm</b>
--	---

Title:  
**Offshore Wind Farms, Navigation and Shipping**

Figure: 1      Drawing No: PC3392-RHD-ZZ-XX-DR-Z-0067

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	10/06/2022	[REDACTED]	[REDACTED]	A3	1:150,000

Co-ordinate system: IRENET95 Irish Transverse Mercator

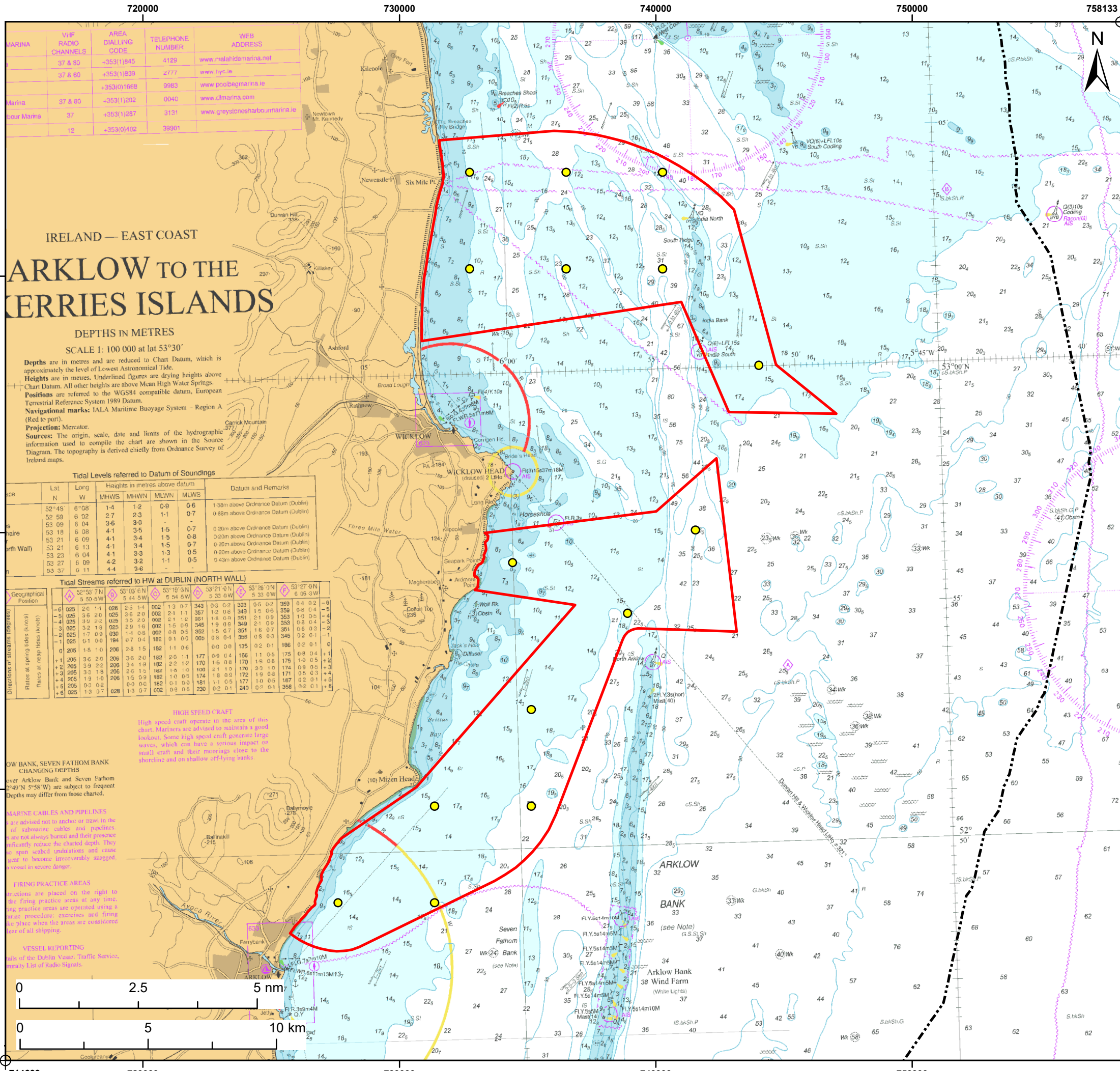
**Royal HaskoningDHV**  
Enhancing Society Together

**ROYAL HASKONINGDHV  
INDUSTRY & RENEWABLES**  
2 ABBEY GARDENS  
GREAT COLLEGE STREET  
LONDON  
SW1P 3NL  
+44 (0)20 7222 2115  
www.royalhaskoningdhv.com

### 1.3 Description of the Proposed Survey Works

The detail of each type of survey proposed is provided in the subsections below and further details of examples of likely vessels and equipment specifications are provided in **Appendix 1**. The final export cable corridor route is not yet defined and so the final location of geotechnical surveys and benthic sampling sites are indicative at this stage. The indicative locations of the proposed geotechnical surveys are illustrated in **Figure 2**. The indicative locations of benthic sampling sites are illustrated in **Figure 3**.





MARINA	VHF RADIO CHANNELS	AREA DIALLING CODE	TELEPHONE NUMBER	WEB ADDRESS
	37 & 80	+353(1)845	4129	www.malahide marina.net
	37 & 80	+353(1)839	2777	www.fyc.ie
		+353(0)1668	9983	www.podbegmarina.ie
Marina	37 & 80	+353(1)802	0040	www.dmarina.com
Four Marina	37	+353(1)287	3131	www.greytonsharbourmarina.ie
	12	+353(0)402	39001	

# IRELAND — EAST COAST

## ARKLOW TO THE CARRIG ISLANDS

**DEPTHS IN METRES**  
 SCALE 1: 100 000 at lat 53°30'

Depths are in metres and are reduced to Chart Datum, which is approximately the level of Lowest Astronomical Tide.  
 Heights are in metres. Underlined figures are drying heights above Chart Datum. All other heights are above Mean High Water Springs.  
 Positions are referred to the WGS84 compatible datum, European Terrestrial Reference System 1989 Datum.  
 Navigational marks: IALA Maritime Buoyage System - Region A (Red to port).  
 Projection: Mercator.  
 Sources: The origin, scale, date and limits of the hydrographic information used to compile the chart are shown in the Source Diagram. The topography is derived chiefly from Ordnance Survey of Ireland maps.

Name	Lat N	Long W	Tidal Levels referred to Datum of Soundings				Datum and Remarks
			MHWS	MHWN	MLWN	MLWS	
Arklow	52°45'	6°08'	1.4	1.2	0.9	0.6	1.58m above Ordnance Datum (Dublin)
Arklow	52°59'	6°02'	2.7	2.3	1.1	0.7	0.85m above Ordnance Datum (Dublin)
Arklow	53°09'	6°04'	3.6	3.0	-	-	
Arklow	53°19'	6°08'	4.1	3.5	1.5	0.7	0.20m above Ordnance Datum (Dublin)
Arklow	53°21'	6°09'	4.1	3.4	1.5	0.8	0.20m above Ordnance Datum (Dublin)
Arklow	53°21'	6°13'	4.1	3.4	1.5	0.7	0.20m above Ordnance Datum (Dublin)
Arklow	53°23'	6°04'	4.1	3.3	1.3	0.5	0.20m above Ordnance Datum (Dublin)
Arklow	53°27'	6°09'	4.2	3.2	1.1	0.5	0.43m above Ordnance Datum (Dublin)
Arklow	53°37'	0°11'	4.4	3.6	-	-	

Geographical Position	Tidal Streams referred to HW at DUBLIN (NORTH WALL)			
	52°53'7"N 5°50'4"W	53°10'6"N 5°54'5"W	53°18'0"N 5°33'0"W	53°27'0"N 5°05'3"W
Directions of streams (degrees)	-6 025	2 0 11	026 2 5 14	002 1 3 07
Rate of spring tides (knots)	-5 025	3 6 20	025 3 6 20	002 2 1 11
Rate of neap tides (knots)	-4 025	3 5 22	025 3 5 22	002 2 1 11
Flows at spring tides (knots)	-3 025	3 2 18	025 2 9 16	002 1 5 09
Flows at neap tides (knots)	-2 025	1 7 09	030 1 4 08	002 0 8 05
Directions of streams (degrees)	-1 025	0 1 00	184 0 7 04	182 0 1 00
Rate of spring tides (knots)	0 206	1 8 10	206 2 8 15	182 1 1 06
Rate of neap tides (knots)	+1 205	3 6 20	206 3 6 20	182 2 0 11
Flows at spring tides (knots)	+2 205	3 9 22	206 3 4 19	182 2 2 12
Flows at neap tides (knots)	+3 205	3 3 18	206 2 0 15	182 1 8 09
Directions of streams (degrees)	+4 205	1 9 00	206 1 5 09	182 1 0 05
Rate of spring tides (knots)	+4 205	0 3 02	0 0 00	182 0 1 00
Rate of neap tides (knots)	+6 025	1 3 07	028 1 3 07	002 0 9 05

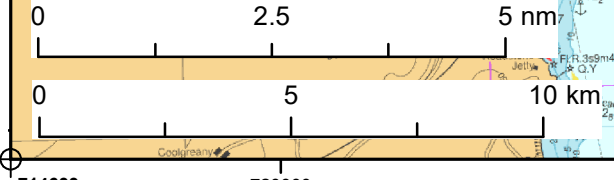
**HIGH SPEED CRAFT**  
 High speed craft operate in the area of this chart. Mariners are advised to maintain a good lookout. Some high speed craft generate large waves, which can have a serious impact on small craft and their moorings close to the shoreline and on shallow off-lying banks.

**LOW BANK, SEVEN FATHOM BANK CHANGING DEPTHS**  
 Over Arklow Bank and Seven Fathom Bank (53°49'N 5°58'W) are subject to frequent depth changes. Depths may differ from those charted.

**MARINE CABLES AND PIPELINES**  
 Mariners are advised not to anchor or trawl in the area of submarine cables and pipelines. These are not always buried and their presence is not always indicated on the charted depths. They are subject to seabed erosion and cause great damage to become irreversibly damaged, or severed in severe danger.

**FIRING PRACTICE AREAS**  
 Firing practice areas are placed on the right to the firing practice areas at any time. Firing practice areas are operated using a range of live ammunition and firing practice areas are considered a danger to all shipping.

**VESSEL REPORTING**  
 Vessels of the Dublin Vessel Traffic Service, nearby List of Radio Signals.



**Legend:**

- Wicklow Cable Area of Search
- Ireland 12nm Limit
- Vibrocore/Cone Penetration Test

**Data Sources:** © UKHO, 2022. © HaskoningDHV UK Ltd. 2022.  
**Basemap:** © British Crown and OceanWise, 2022. All rights reserved. License No. EMS-EK001-638207. Not to be used for Navigation. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors.

<b>Client:</b>	<b>Project:</b>
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

**Title:**  
 Indicative Locations of Geotechnical and Metocean Surveys

**Figure:** 2      **Drawing No:** PC3392-RHD-ZZ-XX-DR-Z-0068

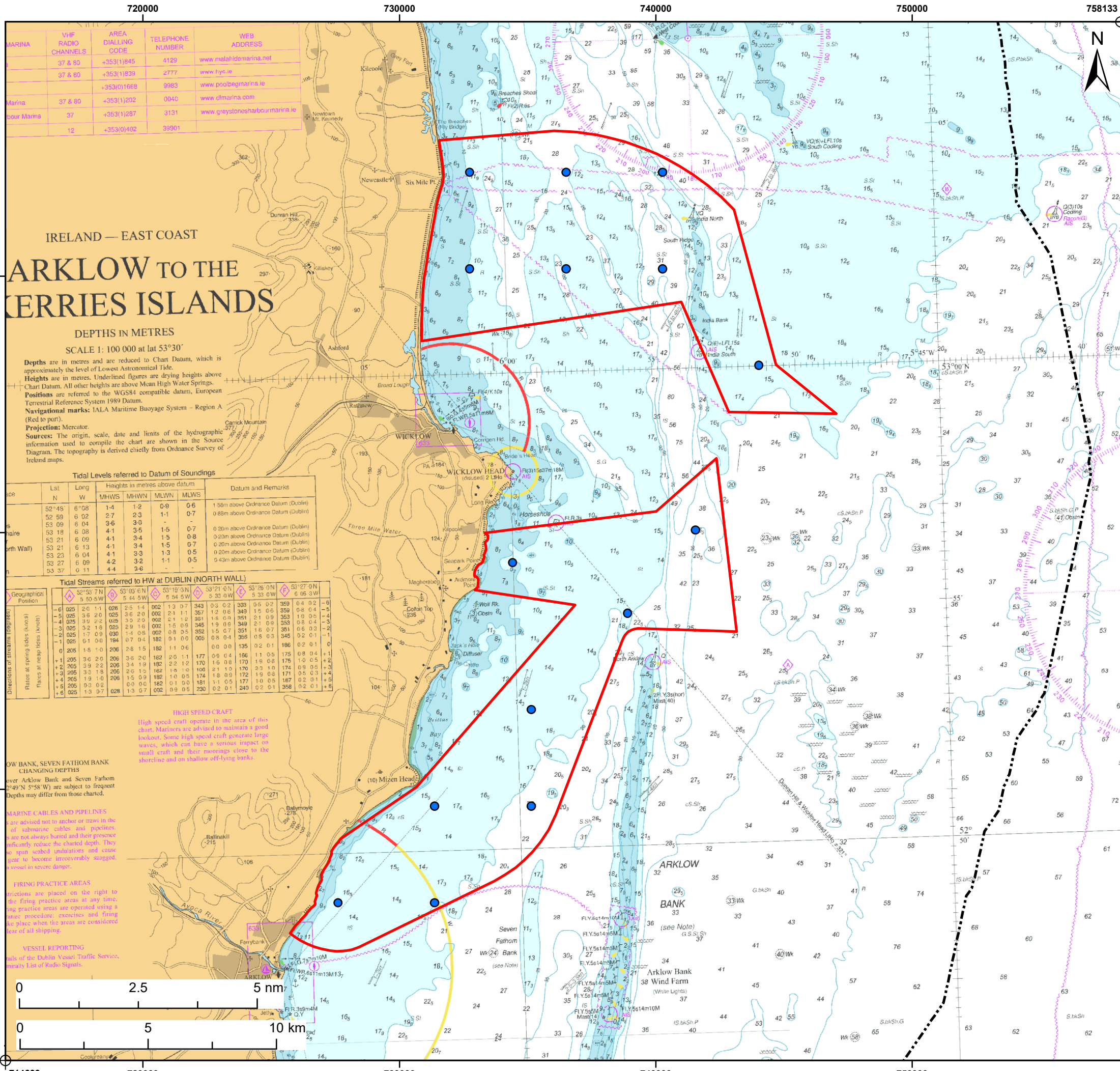
Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	10/06/2022			A3	1:150,000

**Co-ordinate system:** IREN95 Irish Transverse Mercator

**ROYAL HASKONINGDHV**  
 INDUSTRY & RENEWABLES  
 2 ABBEY GARDENS  
 GREAT COLLEGE STREET  
 LONDON  
 SW1P 3NL  
 +44 (0)20 7222 2115  
 www.royalhaskoningdhv.com

**Royal HaskoningDHV**  
 Enhancing Society Together





MARINA	VHF RADIO CHANNELS	AREA DIALLING CODE	TELEPHONE NUMBER	WEB ADDRESS
	37 & 80	+353(1)845	4129	www.malahide marina.net
	37 & 80	+353(1)839	2777	www.fytc.ie
		+353(0)1668	9983	www.podbegmarina.ie
Marina	37 & 80	+353(1)802	0040	www.dlmarina.com
Four Mains	37	+353(1)287	3131	www.greytonsharbourmarina.ie
	12	+353(0)402	3901	

# IRELAND — EAST COAST

## ARKLOW TO THE CARRIG ISLANDS

**DEPTHS IN METRES**  
 SCALE 1: 100 000 at lat 53°30'

Depths are in metres and are reduced to Chart Datum, which is approximately the level of Lowest Astronomical Tide.  
 Heights are in metres. Underlined figures are drying heights above Chart Datum. All other heights are above Mean High Water Springs.  
 Positions are referred to the WGS84 compatible datum, European Terrestrial Reference System 1989 Datum.  
 Navigational marks: IALA Maritime Buoyage System - Region A (Red to port).  
 Projection: Mercator.  
 Sources: The origin, scale, date and limits of the hydrographic information used to compile the chart are shown in the Source Diagram. The topography is derived chiefly from Ordnance Survey of Ireland maps.

Place	Lat N	Long W	Tidal Levels referred to Datum of Soundings				Datum and Remarks
			MHWS	MHWN	MLWN	MLWS	
Dublin	52°45'	6°08'	1.4	1.2	0.9	0.6	1.58m above Ordnance Datum (Dublin)
Wicklow	52°59'	6°02'	2.7	2.3	1.1	0.7	0.85m above Ordnance Datum (Dublin)
Arklow	53°09'	6°04'	3.6	3.0	-	-	0.20m above Ordnance Datum (Dublin)
Wicklow Head	53°19'	6°08'	4.1	3.5	1.5	0.7	0.20m above Ordnance Datum (Dublin)
Wicklow Head (Point)	53°21'	6°09'	4.1	3.4	1.5	0.8	0.20m above Ordnance Datum (Dublin)
Wicklow Head (Point)	53°21'	6°13'	4.1	3.4	1.5	0.7	0.20m above Ordnance Datum (Dublin)
Wicklow Head (Point)	53°23'	6°04'	4.1	3.3	1.3	0.5	0.20m above Ordnance Datum (Dublin)
Wicklow Head (Point)	53°27'	6°09'	4.2	3.2	1.1	0.5	0.43m above Ordnance Datum (Dublin)
Wicklow Head (Point)	53°37'	0°11'	4.4	3.6	-	-	

Geographical Position	Tidal Streams referred to HW at DUBLIN (NORTH WALL)			
	52°53' 7N 5 50.4W	53°10' 6N 5 54.5W	53°18' 0N 5 33.0W	53°27' 0N 5 05.3W
Directions of streams (degrees)	-6 025	2 0 11	026 2 5 14	002 1 3 07
Rate of spring tides (knots)	-5 025	3 6 20	025 3 6 20	002 2 1 11
Rate of neap tides (knots)	-4 025	3 9 22	025 3 9 22	002 2 1 11
Directions of streams (degrees)	-3 025	3 2 18	025 2 9 16	002 1 5 09
Rate of spring tides (knots)	-2 025	1 7 09	030 1 4 08	002 0 8 05
Rate of neap tides (knots)	-1 025	0 1 00	034 0 7 04	002 0 8 04
Directions of streams (degrees)	0 206	1 8 10	206 2 8 15	182 1 1 06
Rate of spring tides (knots)	+1 205	3 6 20	206 3 6 20	182 2 0 11
Rate of neap tides (knots)	+2 205	3 9 22	206 3 4 19	182 2 2 12
Directions of streams (degrees)	+3 205	3 3 18	206 2 0 15	182 1 8 09
Rate of spring tides (knots)	+4 205	1 9 00	206 1 5 09	182 1 0 05
Rate of neap tides (knots)	+4 205	0 3 02	0 0 00	182 0 1 00
Directions of streams (degrees)	+6 025	1 3 07	028 1 3 07	002 0 9 05
Rate of spring tides (knots)				
Rate of neap tides (knots)				

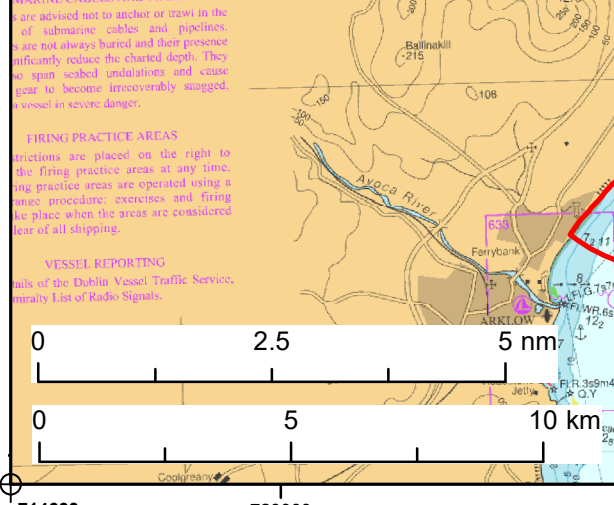
**HIGH SPEED CRAFT**  
 High speed craft operate in the area of this chart. Mariners are advised to maintain a good lookout. Some high speed craft generate large waves, which can have a serious impact on small craft and their moorings close to the shoreline and on shallow off-lying banks.

**LOW BANK, SEVEN FATHOM BANK CHANGING DEPTHS**  
 Over Arklow Bank and Seven Fathom Bank (53°49'N 5°58'W) are subject to frequent depth changes. Depths may differ from those charted.

**MARINE CABLES AND PIPELINES**  
 Mariners are advised not to anchor or trawl in the area of submarine cables and pipelines. These are not always buried and their presence is not always indicated on the charted depths. They are subject to seabed erosion and cause great damage to become irreversibly damaged, or severed in severe danger.

**FIRING PRACTICE AREAS**  
 Firing practice areas are placed on the right to the firing practice areas at any time. Firing practice areas are operated using a range of live ammunition and firing practice areas are considered a danger to all shipping.

**VESSEL REPORTING**  
 Vessels of the Dublin Vessel Traffic Service, nearby List of Radio Signals.



**Legend:**

- Wicklow Cable Area of Search
- Ireland 12nm Limit
- Grab/Drop Down Video Sampling Site

**Data Sources:** © UKHO, 2022. © HaskoningDHV UK Ltd. 2022.  
**Basemap:** © British Crown and OceanWise, 2022. All rights reserved. License No. EMS-EK001-638207. Not to be used for Navigation. Sources: Esri, GEBCO, NOAA, National Geographic, Garmin, HERE, Geonames.org, and other contributors.

<b>Client:</b>	<b>Project:</b>
Wicklow Sea Wind Limited	Wicklow Offshore Wind Farm

**Title:**  
 Indicative Benthic Sampling Stations

**Figure:** 3      **Drawing No:** PC3392-RHD-ZZ-XX-DR-Z-0069

Revision:	Date:	Drawn:	Checked:	Size:	Scale:
01	10/06/2022			A3	1:150,000

**Co-ordinate system:** IREN95 Irish Transverse Mercator

**ROYAL HASKONINGDHV**  
 INDUSTRY & RENEWABLES  
 2 ABBEY GARDENS  
 GREAT COLLEGE STREET  
 LONDON  
 SW1P 3NL  
 +44 (0)20 7222 2115  
 www.royalhaskoningdhv.com

**Royal HaskoningDHV**  
 Enhancing Society Together

### 1.3.1 Geophysical Surveys

For the assessment of potential effects of geophysical surveys, the Review of Consents (RoC) Habitats Regulations Assessment (HRA) for the Southern North Sea (SNS) Special Area of Conservation (SAC) (BEIS, 2020) was used as the basis for the desk-based assessment. BEIS (2020) undertook underwater noise modelling to determine the potential impact ranges of geophysical surveys for harbour porpoise, with their worst case based upon Sub-Bottom Profiling with sound source levels of between 196 and 225 dB re 1  $\mu$ Pa -1 m (rms SPL) and at frequencies ranging from between 0.5 and 300 kHz. All the equipment listed below would fit within this worst case.

Note that no seismic survey is required or proposed.

**Multibeam echosounder (MBES)** is a recommended technique used to assess the bathymetry of the seabed prior to deploying the Cone Penetration Test (CPT) tool and other tests (see **Section 1.3.4**). The MBES will obtain high resolution bathymetry data to map the seafloor and the seafloor features along the entire proposed export cable corridor route. The system will emit a sound source of 200 and 400 kHz, with a source SPL of 210dB re 1  $\mu$ Pa peak.

A **Magnetometer** will be used to detect geomorphological anomalies and ferrous obstructions. The magnetometer will be a caesium marine magnetometer such as the Geometrics G-882 and capable of recording variations in magnetic field strength during survey to an accuracy of  $\pm 0.5$ nT.

**Sub-Bottom Profiling** is a method for obtaining high-resolution characterisation of sediments and rock under bodies of water. A high frequency single channel sub bottom profiler will be deployed to collect data on all geophysical survey lines. The primary objectives of this survey are:

- To identify the geological structures in the upper 50-100m of the seabed substratum;
- To identify geo-hazards, especially buried boulders, peat layers close to the seabed and shallow gas etc.
- The SBPs may include:
  1. Pinger/parametric system with a sound source of between 0.2 and 22 kHz and Sound Pressure Level (SPL) of 247dB @ 1 $\mu$ Pa ref. 1m
  2. Sparker system with a sound source of between 300Hz and 1.2kHz and SPL of 225 dB @ 1 $\mu$ Pa ref. 1m
  3. Boomer system with a sound source of up to 5 kHz with an amplitude of 222dB @ 1 $\mu$ Pa ref. 1m

The sparker system resolution can be improved by deploying multi-channel streamers to receive the reflected acoustic signals from the seabed. Whether a multi-channel or a single channel streamer is deployed the sound source details remain the same. A key characteristic of this system is that it is high frequency which minimises the impact of the noise source on the surrounding environment. This is distinct from low frequency systems such as air guns (0-10kHz) commonly used in oil and gas seismic surveys.

**Ultra Short Baseline (USBL)** system is a method for monitoring and recording the subsea positioning of all towed equipment. This is a common system for location monitoring and is not a geophysical sensor itself. A typical USBL system sound source would be c. 20-30kHz, 200dB @ 1 $\mu$ Pa ref. 1m.

**Side Scan Sonar (SSS)** is a method used to detect potential seabed obstructions and identify additional seabed features prior to deploy the CPT. A simultaneous dual frequency SSS will be used.

- The SSS system can operate at greater than 600 kHz using the Edgetech 4125 900 kHz or



equivalent, with a source level of 215 – 226dB re 1  $\mu$ Pa @ 1m.

### 1.3.2 Archaeological Surveys

The survey scopes detailed in **Section 1.3.1** will provide data suitable for the interpretation and assessment of features of potential archaeological significance. No additional dedicated archaeological surveys are likely to be required at the foreshore licence application stage. In accordance with the relevant National Monuments Acts 1930-2014 and the National Cultural Institutions Act 1997 a detection device consent application will be made in advance of the magnetometer survey being undertaken. Geophysical surveys and subsequent archaeological analysis by a licensed marine archaeologist will be undertaken before any intrusive survey works, and sample locations will be positioned to avoid archaeological sensitive areas. Requirements are outlined in full in **Section 2**.

### 1.3.3 Benthic Ecology Surveys

to the sediment composition and macrofaunal component of the area will be samples to inform a potential environmental impact assessment (EIA) and Appropriate Assessment (AA), and as per standard protocols for the characterisation and monitoring of marine habitats. The quantity and location of the grabs will be determined by review of the geophysical surveys which will provide an understanding of the seabed conditions and features. However, an indicative maximum of approximately 15 locations will be sampled within the cable AoS.

The programme will use 0.1m<sup>2</sup> Day Grab and/or a Hamon grab for areas of coarser sediment. Grab samples will be analysed for particle size, Total Organic Carbon and macrofauna.

In addition to collecting infaunal grab samples, data on the epifaunal environment may be required. This will be dependent on the results of the geophysical surveys. If required a targeted Drop-down video (DDV) campaign will be undertaken. This may also include the capture of still photographs.

### 1.3.4 Geotechnical Surveys

The purpose of the geotechnical site investigations is to explore the stability of the soil to provide good quality geotechnical data to facilitate the detailed design and certification of the:

- Export cable routing and burial techniques (if possible); and
- Development and calibration of existing ground models.

**Cone penetration testing (CPT)** is a method used to determine the geotechnical engineering properties of soils/sediments and delineating soil/sediment stratigraphy. CPT does not involve the removal of any material and the hole created by the penetration of the cone (approx. 5cm diameter), will infill almost instantly upon extraction of the rods. The CPT unit has a footprint of approx. 8m<sup>2</sup> which will sit on the sea floor for the duration of the test, commonly 2-3 hours. There are no significant underwater acoustic signal results from the operation of CPT, available information suggests a frequency range of up to 600Hz and maximum SPL of between 90 and 145 dB @ 1 $\mu$ Pa ref. 1m. Data indicates that SPL levels are not at a level that is thought to cause a disturbance or injury to marine mammals (e.g. Erbe & McPherson, 2017).

**Vibrocores** may also be undertaken to investigate the nature of the upper layers of the seabed. This process would be an extremely localised activity and would not result in any significant disturbance to the seabed or to mobile species from underwater noise. Vibrocores may penetrate up to 6m into the seabed and have a diameter of approx. 80 - 150mm. A maximum of approximately 15 samples will be taken from within the cable AoS, however this number is only indicative. Available information suggests a frequency

of 50Hz and maximum SPL of 188 dB @ 1 $\mu$ Pa ref. 1m. Data indicates that SPL levels are not at a level that is thought to cause a disturbance or injury to marine mammals (e.g. Erbe & McPherson, 2017).

The OSIL High Power Vibrocorer and the Fugro HPC (high performance corer) are examples of a vibrocore that may be used for the proposed survey works.

All relevant survey work is considered in the Supporting Information for Screening for Appropriate Assessment (SISAA) (Royal HaskoningDHV, 2022a - document reference: UB1019-RHD-ZZ-XX-RP-Z-0009), Non-Statutory Environmental Report (Royal HaskoningDHV, 2022b – document reference: UB1019-RHD-ZZ-XX-RP-Z-0012) and Annex IV Risk Assessment (Royal HaskoningDHV, 2022c – document reference: UB1019-RHD-ZZ-XX-RP-Z-0013).

### 1.3.5 Intertidal Surveys

#### 1.3.5.1 Ecology Survey

A Phase I intertidal ecology survey (Wyn et al., 2006) will be undertaken at the landfall location(s). For much of the coast, the intertidal is narrow and therefore transects perpendicular to the shoreline are unlikely to show much differentiation in sample points, therefore intertidal survey will be appropriately simple in scope:

- For rocky shores this will consist of a walkover with species recording and photography. There is no requirement to take any samples
  - Boundaries will be identified where there are changes in habitat types and/or associated ecology from the lower littoral zone to the high intertidal (splash) zone.
  - Areas of different habitats will be identified based on visual features. All positional data will be recorded with Global Positional System (GPS).
- For sediment shores:
  - Boundaries will be identified where there are changes in habitat types and/or associated ecology from the lower littoral zone to the high intertidal (splash) zone
  - Within each observed habitat, a sampling station will be identified at the approximate centre of each zone. The following information will be recorded at each sampling station:
    - Sediment type (identified visually based on the Tyler-Walters and Tillin (2014) scale
    - Surface features (e.g. of conspicuous casts, mounds or burrows, indicative of a species presence);
    - Reduction–oxidation (redox) layer depth; and
    - Presence/absence or estimate of abundance of fauna identified on site.
  - At each sampling station three dig-overs will be undertaken of a 0.25m x 0.25m sediment area to a depth of around 20cm. Any infauna will be identified to the highest taxonomic resolution practicable. Species will not be retained for further analysis and no physical samples will be removed from site.
  - Photographs will also be taken at each of the sampling stations and of each dig-over to record the habitat, context and location.
  - Areas of different habitats will be identified based on visual features. All positional data will be recorded with Global Positional System (GPS).

Overall, the intertidal walkover survey will take approximately 1 day at any one landfall.

#### 1.3.5.2 Archaeology survey

An archaeological walkover survey will be conducted, which will be used to record any visible archaeological remains within the intertidal area at the landfall location. The walkover survey will be undertaken by a qualified archaeologist with transects across the intertidal at set distances. Any archaeological finds will be logged, including their locations and photographs taken.





A metal detector survey will be conducted on sediment shores to detect metallic archaeological objects that are buried beneath the surface of the intertidal area.

Each archaeological survey would take approximately 1 day.

## 2 Good Practice Measures

The following section outlines the measures required to be implemented by law and the relevant guidance as well as further measures adopted by way of good or standard practice for the carrying out of site investigations and marine surveys.

As outlined below, the surveys and investigations will be conducted in accordance with the Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (Departments of Arts, Heritage and the Gaeltacht (DAHG), 2014).

While the DAHG (2014) guidance refers to the Southall *et al.*, (2007) thresholds for noise impacts, the assessment in this report (using the NMFS (2018) and Southall *et al.*, (2019) thresholds) indicates that the proposed measures, in line with the guidance, is appropriate. However, the most recent guidance at the time of the surveys will be used. Comparable UK guidance (JNCC, 2010) states that if impacts occur at distances which are greater than the distance outlined in the guidance (500m), then the distance of the survey should be increased. However, the results of the assessments do not show an exceedance of the standard 500m as referred to in the DAHG (2014) guidance. Therefore, there is no indication that anything other than the measures given would be required.

### 2.1 Geophysical Surveys

The measures outlined below are applicable to all multibeam, single beam, SSS and sub-bottom profiler (e.g. pinger or chirp system) surveys within bays, inlets or estuaries and within 1,500m of the entrance of enclosed bays / inlets / estuaries, or as requested by the Minister or NPWS Regulator (DAHG, 2014) and will be applied as good practice.

#### 2.1.1 Multibeam, single beam, side-scan sonar & sub-bottom profiler surveys

Wicklow Sea Wind Limited will consider opportunities to coordinate with other developers undertaking geophysical surveys during similar timeframes to minimise any potential for in combination effects.

A qualified marine mammal observer (MMO) shall be appointed to monitor for marine mammals and to log all relevant events using standardised data forms.

Unless information specific to the location and/or plan/project is otherwise available to inform the mitigation process (e.g. specific sound propagation and/or attenuation data) and a distance modification has been agreed with the NPWS and the Minister, acoustic surveying using the above equipment shall not commence if marine mammals are detected within a 500m radial distance of the sound source intended for use, i.e., within the Monitored Zone.

#### 2.1.2 Pre-Start Monitoring

Sound-producing activities shall only commence in daylight hours where effective visual monitoring, as performed and determined by the MMO, has been achieved. Where the MMO determines that effective visual monitoring is not possible the sound-producing activities shall be postponed until effective visual monitoring is possible.

A clear on-site communication signal must be agreed upon and used between the MMO and the Works Superintendent to indicate whether the relevant activity may or may not proceed, or resume following a break (see below). It shall only proceed on positive confirmation with the MMO.

The MMO will conduct pre-start-up constant effort monitoring at least 30 minutes before the sound-producing activity is due to commence. Sound-producing activity shall not commence until at least 30 minutes have elapsed with no marine mammals detected within the Monitored Zone by the MMO.

This prescribed Pre-Start Monitoring shall subsequently be followed by a Ramp-Up Procedure which should include continued monitoring by the MMO.

#### **2.1.2.1 Ramp-Up Procedure**

When commencing an acoustic survey operation using the above equipment, the following Ramp-up Procedure (i.e. “soft-start”) must be used, including during any testing of acoustic sources, where the output peak sound pressure level from any source exceeds 170 dB re: 1µPa @1m:

- a) Where possible according to the operational parameters of the equipment concerned, the device’s acoustic energy output shall commence from a lower energy start-up (i.e. a peak sound pressure level not exceeding 170 dB re: 1µPa @1m) and thereafter be allowed to gradually build up to the necessary maximum output over a period of 20 minutes.
- b) This controlled build-up of acoustic energy output shall occur in consistent stages to provide a steady and gradual increase over the ramp-up period.

Where the acoustic output measures outlined in steps (a) and (b) are not possible according to the operational parameters of any such equipment, the device shall be switched “on” and “off” in a consistent sequential manner over a period of 20 minutes prior to commencement of the full necessary output.

In all cases where a Ramp-Up Procedure is employed the delay between the end of ramp-up and the necessary full output must be minimised to prevent unnecessary high-level sound introduction into the environment.

Once the Ramp-Up Procedure commences, there is no requirement to halt or discontinue the procedure at night-time, nor if weather or visibility conditions deteriorate nor if marine mammals occur within a 500m radial distance of the sound source, i.e., within the Monitored Zone.

#### **2.1.2.2 Break in sound output**

If there is a break in sound output for a period greater than 30 minutes (e.g., due to equipment failure, shut-down, survey line or station change) then all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) must be undertaken.

For higher output survey operations which have the potential to produce injurious levels of underwater sound as informed by the associated risk assessment, there is likely to be a regulatory requirement to adopt a shorter 5-10 minute break limit after which period all Pre-Start Monitoring and a subsequent Ramp-up Procedure (where appropriate following Pre-Start Monitoring) shall recommence as for start-up.

#### **2.1.2.3 Reporting**

Full reporting on MMO operations and mitigation undertaken must be provided to the Minister, as Licensor, and to the NPWS where required.

## **2.2 Water quality**

Wicklow Sea Wind Limited is committed to the use of good practice techniques and due diligence throughout all survey activities to mitigate the risk of potential changes in water quality (including from accidental spills and leaks) and invasive alien species. A Project Environmental Management Plan (PEMP)

will be developed prior to any survey being undertaken to fully manage the risk of accidental spills / leaks and risks of invasive species. The PEMP will provide for the following non-exhaustive items (including vessel requirements set out in **Section 1.2**):

- Oils and lubricants used in the survey equipment will be biodegradable where possible, and all chemicals would be certified to the relevant standard;
- Good practice procedures will be put in place when transferring oil or fuel between service vessels;
- Vessels will be free of invasive alien species on their hulls and in their ballast water;
- Vessels will comply with the International Maritime Organization (IMO) ballast water management guidelines;
- Appropriate vessel maintenance following guidance from the International Convention for the Prevention of Pollution from Ships (MARPOL);
- Appropriate spill plan procedures will also be implemented in order to appropriately manage any unexpected discharge into the marine environment;
- Inclusion of control measures such as the requirement to carry spill kits, and bunding to contain any spill, and the requirement for vessel personnel to undergo training to ensure requirements of the PEMP are understood and communicated;
- All work practices and vessels will adhere to the requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL) 73/78; specifically Annex 1 Regulations for the prevention of pollution by oil concerning machine waters, bilge waters and deck drainage and Annex IV Regulations for the prevention of pollution by sewage from ships concerning black and grey waters; and
- All vessels will be certified by the Marine Survey Office.

## 2.3 Archaeology

The proposed surveys will be licenced under the National Monuments Acts 1930 – 2014 and National Cultural Institutions Act 1991. With regards to the magnetometer survey in-particular a detection device consent application will be made to the Department of Housing, Local Government and Heritage in advance of the magnetometer survey being undertaken.

A Retained Archaeologist, and Archaeological Contractor(s) will be engaged as required to provide consistency throughout the project. As the main objective is to characterise the area for the purposes of assessment and all data will be provided to a specialist, licensed contractor for archaeological assessment, it is not proposed to have an archaeologist on board the vessel, although the option for having someone on board during future, targeted surveys would be retained as required. This would be progressed in consultation with the National Monuments Service (NMS).

A written scheme of investigation (WSI) and protocol for archaeological discoveries (PAD) will be prepared and implemented during the proposed surveys. Additionally, a Retained Archaeologist, and Archaeological Contractor(s) will be engaged as required, to provide consistency to the WSI and PAD and throughout the project.

The proposed geophysical surveys will be carried out prior to the geotechnical surveys. The data from the geophysical surveys will be analysed by a licensed marine archaeologist to determine the scope of the intrusive works (geotechnical and benthic ecology surveys), to ensure the sample locations avoid any potential wrecks, aircraft crash sites and identified seabed features of potential archaeological interest. The





scope of the geotechnical and benthic surveys will be agreed in advance with the Department of Housing, Local Government and Heritage and will be planned to take account of geoarchaeological objectives as advised by a licenced marine geoarchaeology specialist. The WSI and PAD will be prepared and implemented during the site investigation works.

### 3 References

BEIS (2020). Record of The Habitats Regulations Assessment Undertaken Under Regulation 65 of the Conservation of Habitats and Species (2017), and Regulation 33 of The Conservation of Offshore Marine Habitats and Species Regulations (2017). Review of Consented Offshore Wind Farms in the Southern North Sea Harbour Porpoise SAC.

Department of Arts, Heritage and the Gaeltacht (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound sources in Irish Waters.

Erbe, C. and McPherson, C. (2017). Underwater noise from geotechnical drilling and standard penetration testing. *The Journal of the Acoustical Society of America*, 142(3), pp.EL281-EL285.

JNCC (2010). Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise. August 2010. Available from: <https://data.jncc.gov.uk/data/31662b6a-19ed-4918-9fab-8fbcff752046/JNCC-CNCB-Piling-protocol-August2010-Web.pdf>

Richardson, J, C.R Greene, C.I Malme, and D.H. Thomson. (1995). *Marine Mammals and Noise*. San Diego California: Academic Press.

Royal HaskoningDHV (2022a). Supporting Information for Screening for Appropriate Assessment (SISAA) - document reference: UB1019-RHD-ZZ-XX-RP-Z-0009

Royal HaskoningDHV (2022b). Non-Statutory Environmental Report – document reference: UB1019-RHD-ZZ-XX-RP-Z-0012

Royal HaskoningDHV (2022c). Annex IV Risk Assessment – document reference: UB1019-RHD-ZZ-XX-RP-Z-0013

Žydelis, Ramūnas & Dorsch, Monika & Heinänen, Stefan & Nehls, Georg & Weiß, Felix. (2019). Comparison of digital video surveys with visual aerial surveys for bird monitoring at sea. *Journal of Ornithology*.



## **Appendix 1 Survey Vessels and Site Investigation Survey Equipment Examples**

## A1 Survey Vessels

As the contracts for the site investigation surveys have not yet been awarded, the survey vessels have not yet been determined. Examples of potential survey vessels and their associated survey equipment are provided below.

Survey vessels vary in size, from 10m to 90m in length. The size of the vessel is dependent on availability and bathymetry of the survey area.

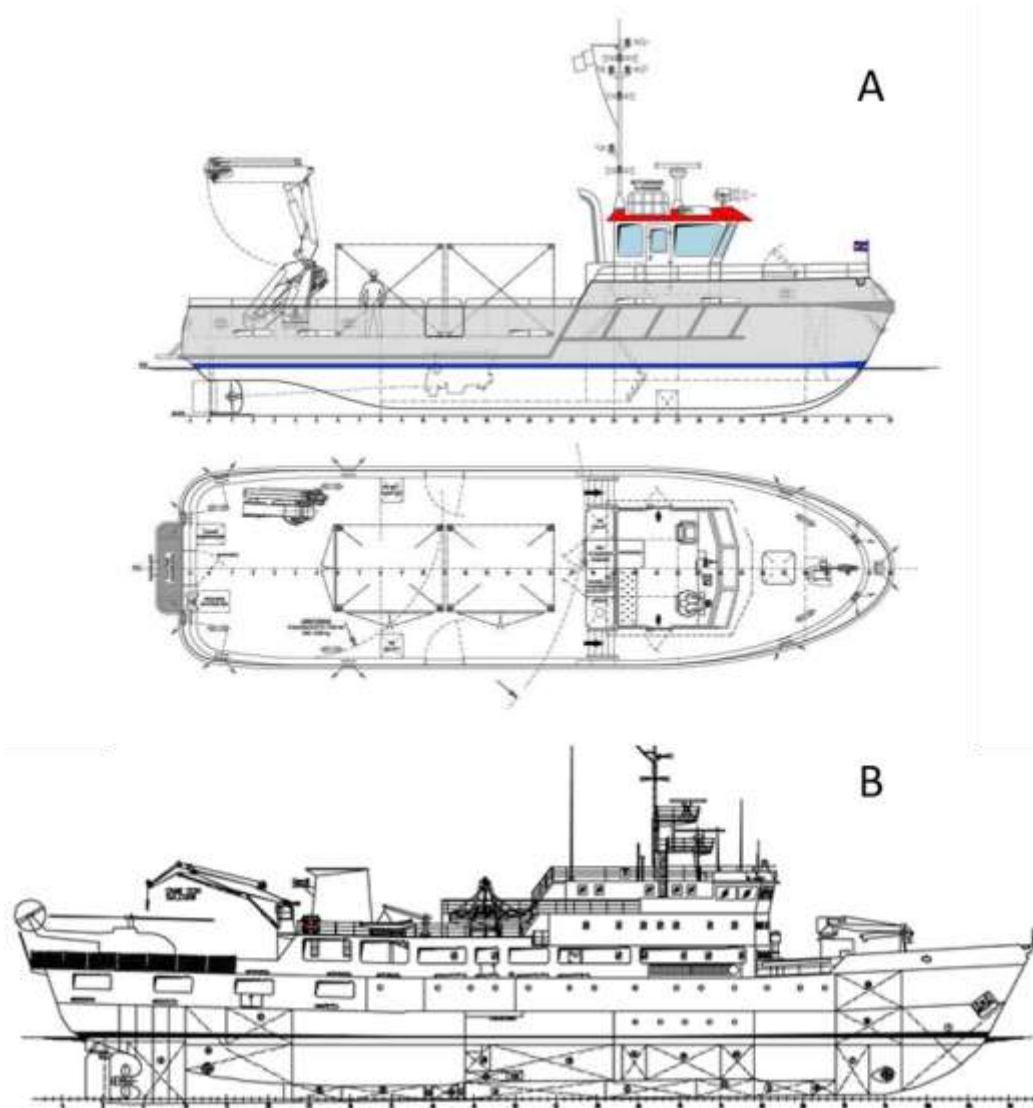


Figure A 1 Examples of small (A) and larger (B) survey vessels used in geotechnical investigations (Dignity Source – Survey Vessel, unknown)



## A1.1 Site Investigation Equipment

Typical survey equipment is outlined below.

### A1.1.1 DGPS Positioning

Differential Global Positioning System (DGPS) is an enhancement to the Global Positioning System (GPS) which provides improved location accuracy, in the range of operations of each system, from the 15-metre (49 ft) nominal GPS accuracy to about 1–3 centimetres (0.39–1.18 in) in case of the best implementations.

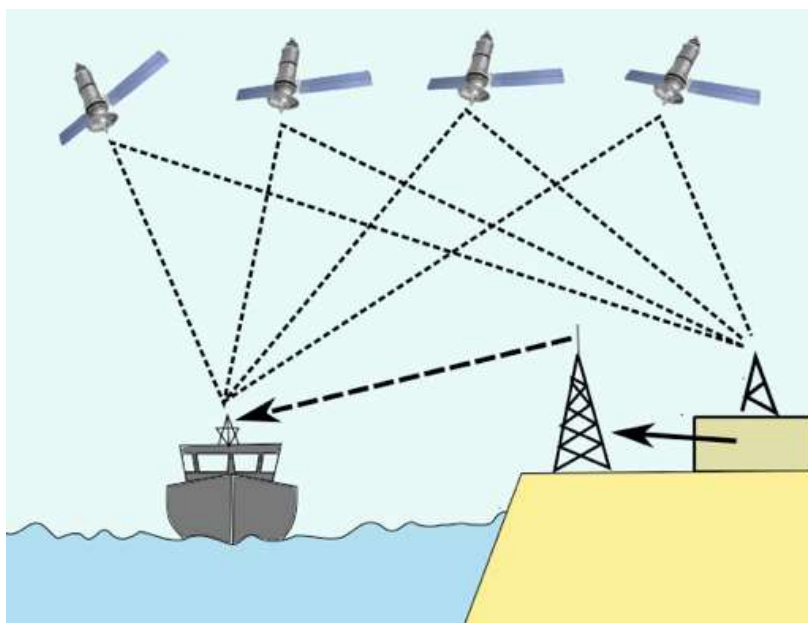


Figure A 2 DGPS schematic (Freedom sailing Scotland, unknown)

### A1.1.2 Acoustic positioning

An acoustic positioning system calculates range from a submersible-mounted transducer to other transducers at known locations with known spacing. This permits an accurate range calculation, with adjustment for water temperature/salinity/density, by computing the one-way or round-trip timing.

### A1.1.3 Motion Reference Unit

The Motion Reference Unit (MRU) is a solid-state motion reference device capable of measuring Pitch and Roll to a high degree of accuracy. The MRU can be mounted in either a horizontal or vertical position.

### A1.1.4 Echosounder

The echo sounder transmits the sound pulses downward into the water by a transducer. The echo reflected from the bed is also received by the echo sounder. The time interval between the emission of the sound pulse and its return as an echo is used to estimate the depth of the water. There are three types of echosounder that may be employed:

- A. Single Beam Echosounder - releases a single sound pulse in a single, narrow beam

- B. Sidescan sonar - emits conical or fan-shaped pulses down toward the seafloor across a wide angle perpendicular to the path of the sensor through the water, which may be towed from a surface vessel or submarine, or mounted on the ship's hull
- C. Multi Beam Echosounder: releases a fan of narrow acoustic beams, thus providing 100% coverage of the bottom.

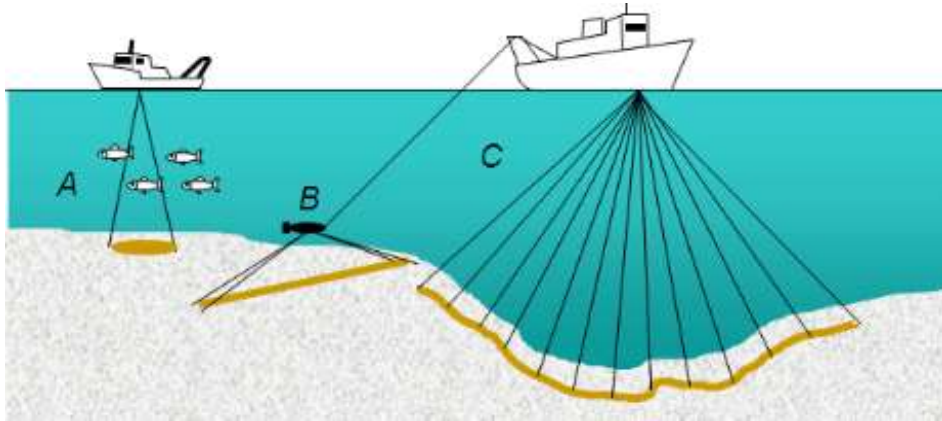


Figure A 3 Types of echosounder (Lurton et al., 2015)

### A1.1.5 Sub Bottom Profiler

Sub-bottom profilers are usually comprised of single channel source that sends sound pulses into the shallow sub-sea floor sediments. The sound pulses bounce off the sea floor and subsequent buried sediment layers according to differences in their acoustic impedance (hardness). Acoustic impedance is related to the density of the material and the rate at which sound travels through this material. The different times taken for this signal to be returned and recorded by the sub-bottom profiler indicate how deep the layers are below the sea floor. The surface of the different rock strata beneath the sea floor are mapped over the study area.

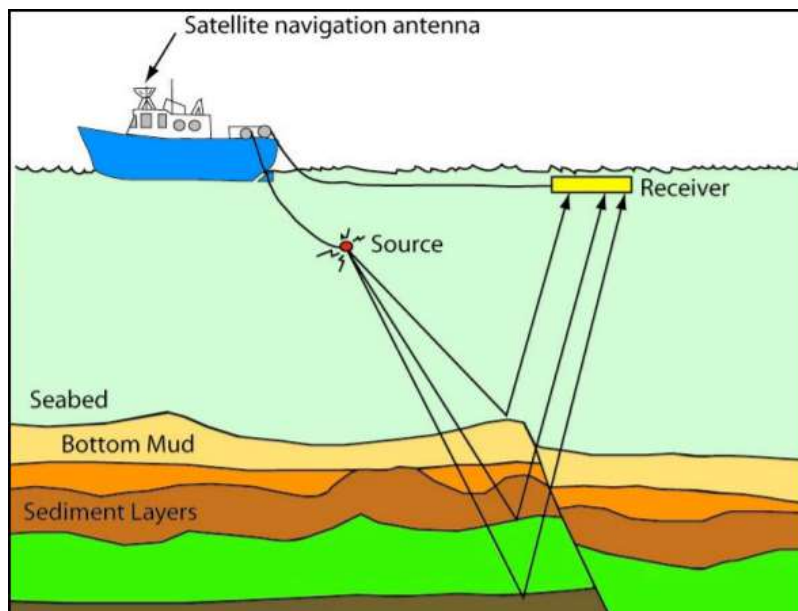


Figure A 4 Sub bottom profiler schematic (Nitsche, unknown)

### A1.1.6 Magnetometer

A magnetometer is towed behind a survey vessel and detects the magnetic field anomalies that result when induced magnetic fields are superimposed on the earth's magnetic field, such as the magnetic anomalies created by ferrous material in the earth's magnetic field.

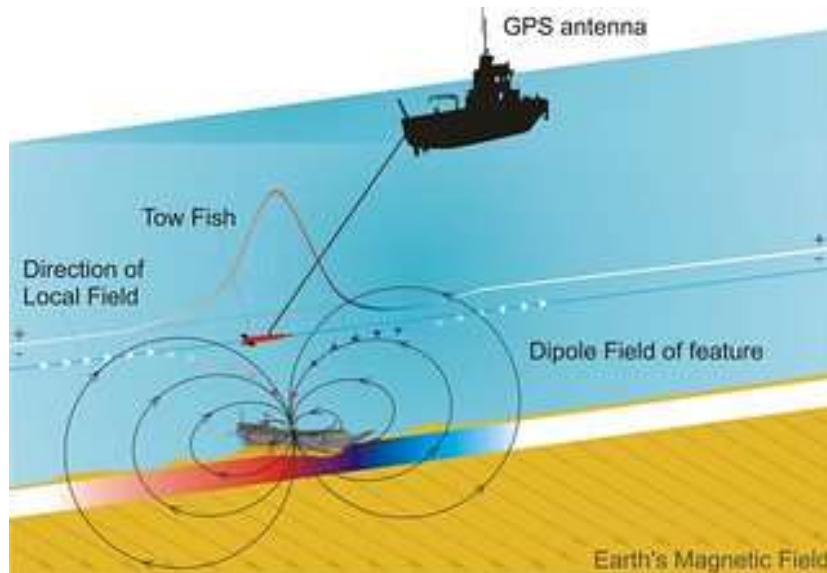


Figure A 5 Magnetometer survey vessel (Wessex Archaeology,2011)

### A1.1.7 Day Grab

Day grabs comprise of two stainless bucket sections which are mounted within a stainless-steel frame. On contact with the seabed, a trigger bar is pushed upwards via pressure plates allowing the buckets to close under the gravity of the unit through a pulley system. This controlled contact and closure once on the seabed helps ensure sample disturbance is minimised. The top of the grab is covered by two catch-closed inspection doors also made of stainless steel.



Figure A 6 Day grab (KC Denmark Research Equipment, unknown)

### A1.1.8 Drop Down Video

Video and stills cameras are extremely valuable and wide-ranging tools for providing evidence for benthic monitoring and mapping. There are a range of drop-down/towed camera systems suitable for deployment in a range of environmental conditions.

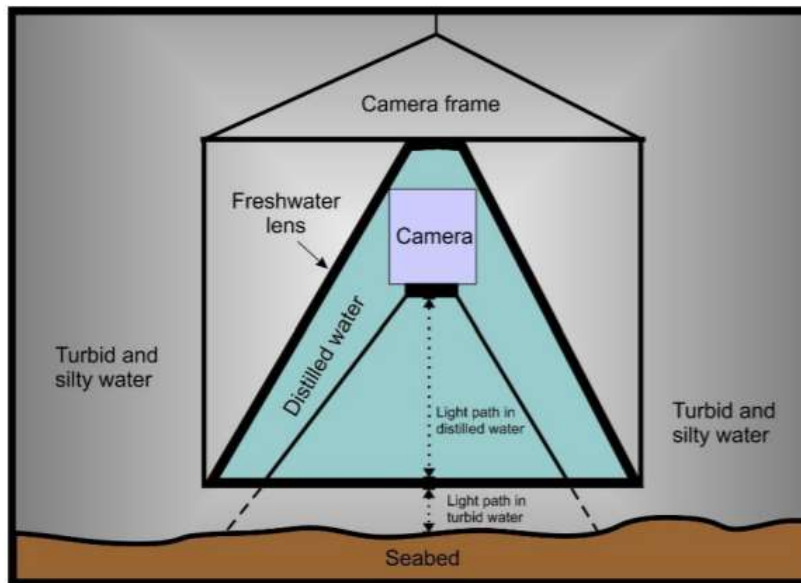


Figure A 7 Drop down video schematic (Hitchin et al., 2015)

### A1.1.9 Vibrocorer

The vibrocorer can obtain sediment cores. It works by vibrating the entire core tube at such a high frequency that the sediment becomes thixotropic causing the core tube to sink into the sediment.

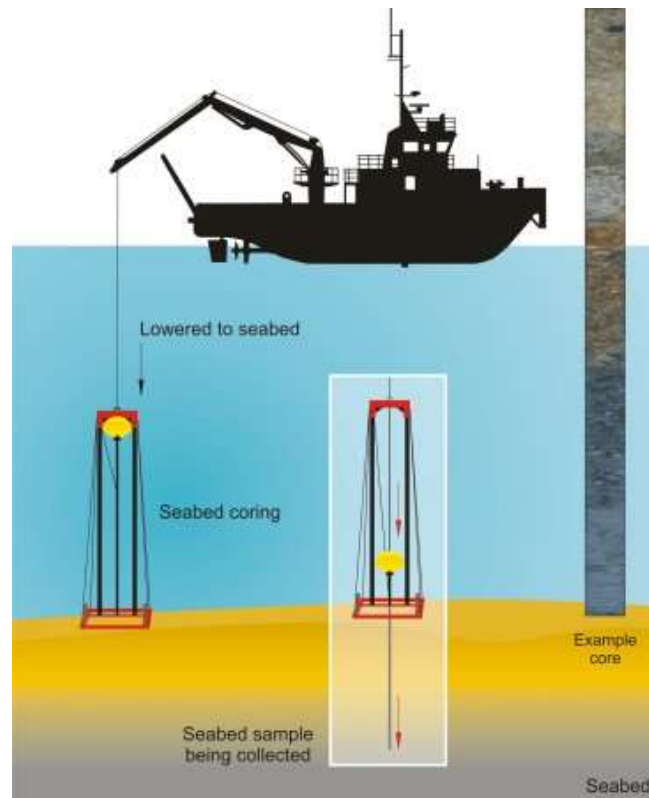


Figure A 8 Vibrocorer schematic (Wessex Archaeology, unknown)

### A1.1.10 CPT

The cone penetration or cone penetrometer test (CPT) is a method used to determine the geotechnical engineering properties of soils and delineating soil stratigraphy.