



*Marine Mammal Observer Report
for*

**Geophysical and Geotechnical offshore
survey for a subsea fibre cable off West Cork**

Client: Amazon MCS Ireland Ltd

Contractor: Subcom

Consultants: IWDG Consulting

Marine Mammal Observers: Heleen Middel & Claudia di Petta

Vessel: RV Ocean Invincible

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Table of Contents

1. Executive Summary	5
2. Introduction.....	6
2.1. Project Description	6
2.2. Legislation Protecting Marine Mammals.....	6
2.3. Marine Mammals Species in the Celtic Sea.....	7
3. Survey Operations	10
3.1. Operational Area	10
3.2. Vessel	11
3.3. Scope of Work	11
3.4. Survey Instrument Specifications.....	12
4. Marine Mammal Mitigation Plan	13
5. Observation Methodology	15
5.1 MMO Observation Platform.....	15
5.2. Distance Measurement Tools.....	16
5.3. Methods of Recording.....	16
6. Results	16
6.1. Sound Producing Activity.....	16
6.2. Marine Mammal Observer Effort	19
6.3. Sightings.....	19
6.4. Mitigation	21
6.5. Environmental Conditions	22
7. Conclusion	24
8. References.....	25
Appendix I – MMO Qualification	i
Appendix II – JIP MMO Recording Operations Form.....	iv
Appendix III – JIP MMO Recording Effort Form.....	viii
Appendix IV – JIP MMO Recording Sightings Form.....	xii
Appendix V – Sighting Images	xiii

List of Figures

Figure 1. Proposed subsea telecoms cable system, linking United States to Ireland (McMahon Design and Management Ltd., 2024).....	6
Figure 2. Maritime Usage Licence Map, the Licenced Area is outlined in red (MARA, 2025)	10
Figure 3. Survey Vessel RV Ocean Invincible © John O Neill (ShipSpotters.com). The bridge deck from where most observational effort was conducted is highlighted in purple.	11
Figure 4. Total hours of sound-producing activities.	17
Figure 5. Overview of marine mammal sightings during the project. Close-up of sightings closer to shore provided in Figure 6.	20
Figure 6. Close-up of inshore marine mammal sightings during the project. Overview of all sightings provided in Figure 5.	21
Figure 7. Monitoring conditions based on weather parameters recorded in situ on JIP data sheets, including swell height, visibility, sea state, and wind speed. The charts display the percentage of total observation time each condition was recorded, with inset values indicating the corresponding number of observation periods.	23
Figure 8. Sighting #08 (Common dolphins), a. shows the yellow flank, b. shows the long pointy beak, and c. shows dorsal shape	xiii
Figure 9. Sighting #09 (Minke whale), a-c show surfacing sequence.....	xiii
Figure 11. Sighting #17 (Common dolphins).....	xiii
Figure 10. Sighting #13 (Common dolphins).....	xiii
Figure 12. Sighting #16 (Common dolphins), a. shows the yellow flank, b. shows the long pointy beak, and c. shows dorsal shape	xiii
Figure 13. Sighting #18 (Minke whale) Figure 14. Sighting #19 (Minke whale).....	xiii
Figure 15. Sighting #23 (Fin whale), a-c show dive sequence, a shows size compared to common dolphins.....	xiv
Figure 16. Sighting #24 (Common dolphins).....	xiv
Figure 17. Sighting #25 (Fin whale), a. shows tall blow b. shows tailstock before dive.....	xiv
Figure 18. Sighting #26 (Fin whales), a and b show blow, dorsal fin, and size comparison with common dolphins	xiv
Figure 19. Sighting #27 (unidentified large baleen whale), a. shows tall blow, b. shows tip of dorsal fin, c. shows back	xv
Figure 20. Sighting #28 (Bottlenose dolphins)	xv
Figure 21. Sighting #30 (Common dolphins), a. and b. show typical common dolphin colouration	xv

List of Tables

Table 1. Cetacean species recorded in Irish waters	9
Table 2. Pinniped species recorded in Irish waters	9
Table 3. Noise-producing survey equipment specifications.....	12
Table 4. Noise-producing site investigation equipment specifications	12
Table 5. Overlap between source frequencies and marine mammal hearing groups	13
Table 6. MMO equipment utilised during project.....	15
Table 7. Summary of sound-producing activities. Underlined start times include a 20-min Soft Start.	17
Table 8. Visual monitoring effort over the course of the project on board RV Ocean Invincible	19
Table 9. Sightings summary, recorded over the course of survey on board RV Ocean Invincible.	20

Table 10. Overview of sound-producing activity conducted during the survey under Licence MUL230031 from the RV Ocean Invincible.	iv
Table 11. Overview of visual monitoring effort conducted during the survey under Licence MUL230031 from the RV Ocean Invincible.	viii
Table 12. Overview of all visual marine mammal sightings recorded during the survey conducted under Licence MUL230031 from the RV Ocean Invincible.	xii

1. Executive Summary

Irish Whale and Dolphin Group (IWDG) Consulting was contracted to carry out marine mammal monitoring and mitigation during geophysical survey operations in the Celtic Sea, off the coast of County Cork, as part of a cable route investigation. All monitoring was conducted in accordance with the National Parks and Wildlife Service (NPWS) (2014) Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters, the Marine Mammal Mitigation Plan (MMMP), and the Maritime Usage Licence (MUL), MUL230031.

Survey operations were conducted from the Research Vessel (RV) Ocean Invincible between 09 and 02 July 2025 and included the use of sub-bottom profilers (SBP), side-scan sonar (SSS), multibeam and single-beam echosounders (MBES, SBES), ultra-short baseline (USBL) positioning systems and Vibro-core. A dedicated and qualified Marine Mammal Observer (MMO) was present on board throughout these operations, and a total of 207 hours and 37 minutes of visual monitoring effort were completed over 31 days. Weather conditions generally allowed for effective monitoring, and the MMO had uninterrupted access to appropriate vantage points.

Eleven pre-watches were undertaken during the project, with only one sighting of marine mammals observed during one of them. As such, one small delay (10 minutes) to the start of operations occurred due to sightings or environmental conditions. A total of 41 sightings were recorded across the duration of the survey, representing at least seven different species. Most sightings occurred during active effort watches, sighting #34 occurred incidentally when the MMO was not on watch. Mitigation procedures were followed at all times. One sighting of pilot whales occurred during a brief break in SSS use, but mitigation procedures were not required as the break was less than 30 minutes and other sound sources remained operational. This approach was confirmed to be compliant by The Maritime Area Regulatory Authority (MARA) and aligned with NPWS (2014) guidelines. Minor miscommunications led to a small number of unintentional periods of additional noise output, but these were not classified as non-compliances.

The MMOs found that the survey crew, Party Chief, and client representatives demonstrated strong cooperation and open communication throughout the project. The MMOs appreciated the crew's consistent interest in marine mammals and their commitment to applying mitigation measures not just for compliance but also out of genuine concern for minimising environmental impacts.

2. Introduction

2.1. Project Description

Amazon MCS Ireland Ltd. has proposed the development of a new subsea telecommunications cable system linking the north-east coast of the United States to a landfall site at Glandore Bay, County Cork, on the south-west coast of Ireland (Figure 1). To inform the design and final routing of the cable system, the company is undertaking a series of marine geophysical, hydrographic, and shallow geotechnical surveys across a designated Licence Application Area within the Irish Exclusive Economic Zone (EEZ) and Maritime Area.

The proposed survey activities are being carried out under the MUL licence, MUL230031, granted by MARA (MARA, 2025). The licence permits site investigations and data collection to support route selection and landfall feasibility for the transatlantic cable system. This licence commenced on 22 April 2025.

As per Clause 32 of the licence, Amazon MCS Ireland Ltd. is required to appoint a qualified MMO, to implement mitigation measures in strict accordance with the most up-to-date NPWS guidance (2014), and to provide detailed reporting of MMO activity and marine mammal mitigation efforts to NPWS and MARA within 30 days of completion. The licence also requires that the MMO report and associated data forms be published on the licence holder's website within 60 days of completion, unless otherwise agreed.



Figure 1. Proposed subsea telecoms cable system, linking United States to Ireland (McMahon Design and Management Ltd., 2024).

2.2. Legislation Protecting Marine Mammals

Cetaceans and pinnipeds in Irish waters are protected under national legislation and several international directives and agreements to which Ireland is a signatory. These protections apply within both Irish territorial waters (out to 12 nautical miles) and the Irish EEZ, which has been designated a Whale and Dolphin Sanctuary since 1991.

All cetaceans, as well as grey seals (*Halichoerus grypus*), harbour seals (*Phoca vitulina*), and otters (*Lutra lutra*), are protected under the Wildlife Act (1976) and its subsequent amendments in 2000,

2005, 2010, and 2012. Under this legislation, it is an offence to hunt, injure, or wilfully interfere with, disturb, or destroy the resting or breeding place of any protected species without an appropriate licence or derogation.

At a European level, marine mammals in Irish waters are protected under the EU Habitats Directive (Council Directive 92/43/EEC). All cetaceans are listed under Annex IV of the Directive as species “in need of strict protection.” In addition, several species, including harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), grey seal, harbour seal, and Eurasian otter, are listed under Annex II as species whose conservation requires the designation of Special Areas of Conservation (SACs). In these areas, Member States are obliged to avoid the deterioration of habitats and any significant disturbance to the species for which the site has been designated. Harbour porpoise and bottlenose dolphin have also been identified as Qualifying Interests for several Irish SACs.

Given the importance of sound to marine mammals for navigation, foraging, and communication, they are particularly vulnerable to anthropogenic underwater noise, including geophysical and geotechnical survey sources. As such, the Marine Strategy Framework Directive (MSFD) (2008/56/EC) obliges EU Member States to achieve or maintain Good Environmental Status (GES) for marine habitats. Under Descriptor 11 of the MSFD, underwater noise (both impulsive and continuous) is recognised as a pressure requiring monitoring and mitigation. In 2022, thresholds for underwater noise were agreed at EU level to help assess and manage cumulative noise impacts.

In 2007, the NPWS published the Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters (NPWS, 2007). This was reviewed and updated in 2014 to produce the current Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters (NPWS, 2014). These guidelines remain the most up-to-date national standard and are referenced in all relevant marine usage licences. The guidelines recommend that all marine operations involving man-made sound sources undergo risk assessment, take into account spatial and temporal sensitivities, and apply appropriate mitigation measures including visual and acoustic monitoring, soft-start procedures, and shutdown protocols.

2.3. Marine Mammals Species in the Celtic Sea

A total of 32 marine mammal species have been recorded in Irish waters, comprising 26 species of cetaceans (whales, dolphins, and porpoises) and six species of pinnipeds (seals) (see Table 1 and Table 2). Among the cetaceans, 10 species are considered resident, seven migratory, and nine vagrant or of unknown status. Of the pinnipeds, the grey seal and harbour seal are resident, while the remaining four occur only as vagrants.

The Celtic Sea and southern coastline of Ireland, including the waters off West Cork and Glandore Bay, provide important habitat for several of these species. Common dolphins (*Delphinus delphis*) are the most frequently observed dolphin species along the southern coast, regularly encountered in both inshore and offshore waters. Harbour porpoise and bottlenose dolphin are also resident and commonly seen in coastal waters and semi-enclosed bays throughout the region. Risso’s dolphin (*Grampus griseus*), another resident species, is typically associated with deeper inshore waters and is regularly recorded along the continental shelf edge.

Fin whales (*Balaenoptera physalus*) are the most frequently observed large baleen whale species in Irish waters. Though they prefer the deeper waters along the continental shelf edge, they may move closer to shore when inshore feeding conditions are favourable. Sightings typically peak in late summer and autumn, and individuals have been recorded along the entire Celtic Sea coastline, from West Kerry to Co. Wexford (IWDG, 2025). Humpback whales (*Megaptera novaeangliae*) are also present

seasonally, and over 92 individual whales have been photo-identified in Irish waters since 1999. Many of these return to the southwest coast annually, with some individuals recorded over multiple decades (IWDG, 2025). Minke whales (*Balaenoptera acutorostrata*) are another regularly observed baleen species in Irish waters. They are widely distributed and can be seen both nearshore and offshore throughout much of the year, though sightings peak in the summer months.

Deep-diving species, such as sperm whales (*Physeter macrocephalus*) and various beaked whale species (*Ziphiidae* spp.), are typically found only in the deep waters beyond the continental shelf and are not expected to occur in the shallower coastal waters where the current survey operations are focused.

Ireland's two resident seal species, the grey seal and the harbour seal, are regularly observed along the Irish coast and are known to haul out at specific sites for resting, moulting, and breeding. While both species rely on land for key stages of their life history, they spend the majority of their time at sea. Recent tracking studies have shown that grey seals may forage over distances of up to 448 km, while harbour seals have an estimated foraging range of 273 km (Carter *et al.*, 2022). This suggests that while harbour seals typically remain relatively close to the coast, grey seals are capable of ranging well into offshore waters, and may be encountered in deeper areas, including parts of the current survey zone.

Table 1. Cetacean species recorded in Irish waters

Species	Taxonomic name	Status
Atlantic White-sided Dolphin	<i>Lagenorhynchus acutus</i>	Resident
Bottlenose Dolphin	<i>Tursiops truncatus</i>	Resident
Common Dolphin	<i>Delphinus delphis</i>	Resident
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>	Resident
Harbour Porpoise	<i>Phocoena phocoena</i>	Resident
Long-finned Pilot Whale	<i>Globicephala melas</i>	Resident
Northern Bottlenose Whale	<i>Hyperoodon ampullatus</i>	Resident
Risso's Dolphin	<i>Grampus griseus</i>	Resident
Striped Dolphin	<i>Stenella coeruleoalba</i>	Resident
White-beaked Dolphin	<i>Lagenorhynchus albirostris</i>	Resident
Killer Whale	<i>Orcinus orca</i>	Migratory
Blue Whale	<i>Balaenoptera musculus</i>	Migratory
Fin Whale	<i>Balaenoptera physalus</i>	Migratory
Humpback Whale	<i>Megaptera novaeangliae</i>	Migratory
Minke Whale	<i>Balaenoptera acutorostrata</i>	Migratory
Sei Whale	<i>Balaenoptera borealis</i>	Migratory
Sperm Whale	<i>Physeter macrocephalus</i>	Migratory
Beluga	<i>Delphinapterus leucas</i>	Vagrant
Bowhead	<i>Balaena mysticetus</i>	Vagrant
False Killer Whale	<i>Pseudorca crassidens</i>	Vagrant
Sowerby's Beaked Whale	<i>Mesoplodon bidens</i>	Vagrant
North Atlantic Right Whale	<i>Eubalaena glacialis</i>	Vagrant
Dwarf Sperm Whale	<i>Kogia sima</i>	?
Gervais' Beaked Whale	<i>Mesoplodon europaeus</i>	?
Pygmy Sperm Whale	<i>Kogia breviceps</i>	?
True's Beaked Whale	<i>Mesoplodon mirus</i>	?

Table 2. Pinniped species recorded in Irish waters

Species	Taxonomic name	Status
Harbour Seal	<i>Phoca vitulina</i>	Resident
Grey Seal	<i>Halichoerus grypus</i>	Resident
Bearded Seal	<i>Erignathus barbatus</i>	Vagrant
Hooded Seal	<i>Cystophora cristata</i>	Vagrant
Ringed Seal	<i>Pusa hispida</i>	Vagrant
Walrus	<i>Odobenus rosmarus</i>	Vagrant

3. Survey Operations

3.1. Operational Area

The survey operations were conducted within the Licenced Area located off the coast of County Cork, in the Celtic Sea (Figure 2). The total area of the survey corridor covered approximately 16,880 km², with a combined route length of 898.5 km (McMahon Design and Management Ltd., 2024). The Licenced Area includes both western and eastern route options; however, only the western route was surveyed during this campaign. A single cable route corridor, approximately 500 m in width, was surveyed within this area as part of the current geophysical campaign.

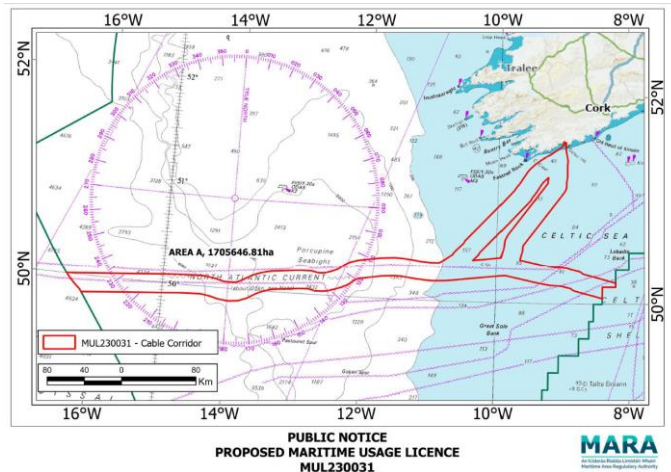


Figure 2. Maritime Usage Licence Map, the Licenced Area is outlined in red (MARA, 2025)

The survey operations under Licence MUL230031 were divided into four overlapping zones based on water depth, as outlined in the licence and supporting technical documentation:

- Landfall Beach Survey – Terrestrial beach and intertidal zone
- Inshore Survey – From 3 m Chart Datum to 15 m Chart Datum
- Offshore Survey – From >15 m to 1500 m Chart Datum
- Deepwater Survey – Water depths exceeding 1500 m Chart Datum

Only the Offshore Survey component was conducted during the current phase. This survey covered all areas between the outer limits of the inshore zone and the 1500 m depth contour, with operations designed to ensure adequate line spacing and overlap for full corridor coverage. Other survey components (Landfall, Inshore, and Deepwater) are scheduled separately under the same licence but were not included in this phase of work.

Survey operations commenced in the inshore section, progressing from Glandore Bay in a south-westerly direction and remaining west of Galley Head. The vessel surveyed as close inshore as practicable while maintaining adequate water depth; the shallowest nearshore segments will be completed separately by the inshore survey team. From the coastal shelf, the survey corridor extended

westward across the continental shelf into the Porcupine Seabight, south of the Gollum Channel System and the Mound Provinces.

3.2. Vessel

All survey operations were conducted from the *RV Ocean Invincible* (Figure 3), a 66.4 m research vessel operated by EGS Marine. The vessel is registered in the Bahamas and has its port of origin in the Philippines, and is equipped for hydrographic, geophysical, and shallow geotechnical surveys, including full-ocean MBES capabilities.

All MMO watches were carried out from the bridge deck (outside) at height of approximately 12,8 m above sea level. During periods of unfavourable weather, observations were conducted from within the enclosed bridge, at a height of approximately 13,8 m.



Figure 3. Survey Vessel *RV Ocean Invincible* © John O'Neill (ShipSpotters.com). The bridge deck from where most observational effort was conducted is highlighted in purple.

3.3. Scope of Work

The principal objective of the survey was to acquire detailed information to support cable route design, armouring, burial, and long-term maintenance. Specific goals included the acquisition of high-resolution bathymetry, the identification of seabed and shallow sub-seabed features (e.g., boulders, shallow gas, wrecks, or debris), the characterisation of sediment stratigraphy and variability, and the identification of any sensitive or hazardous marine features that may affect route planning or installation.

The scope of work for this phase of the project focused on conducting an offshore marine geophysical and geotechnical survey along a proposed subsea telecommunications cable route within a 500 m wide corridor, in accordance with Licence MUL230031. Survey operations were undertaken exclusively in the Offshore Survey Zone, covering water depths between approximately 15 m and 1500 m, from the outer edge of the inshore zone to the Irish EEZ boundary. This part of the project was estimated to last between 21-23 days, depending on weather and sea state.

Noise-producing geophysical activities included acquisition using the following survey equipment:

- Multibeam Echosounder (MBES)
- Single-beam Echosounder (SBES)
- Side-scan Sonar (SSS)
- Sub-bottom Profiler (SBP)
- Ultra-short Baseline (USBL) acoustic positioning system

The geophysical component of the work was supported by geotechnical sampling, including Cone Penetration Testing (CPT) (62 locations), gravity coring (7 locations), vibro-coring (23 locations), and grab samples (3 locations), aimed at validating subsurface conditions along the proposed route. These operations would last anywhere from 20 minutes to 3 hours per locations, depending on water depth, environmental conditions, and seabed type.

3.4. Survey Instrument Specifications

Table 3. Noise-producing survey equipment specifications

Equipment	Type	Frequency	Max. Source Level (dB re 1 μ Pa 1 m)
Multibeam Echosounder (MBES)	Kongsberg EM2040P MKII	200 – 400 kHz	N/A
Deepwater Multibeam Echosounder (MBES)	Kongsberg EM124	10.5 – 13.5 kHz	246
Single-beam Echosounder (SBES)	Kongsberg EA440	38 – 200 kHz	227
Side Scan Sonar	Edgetech 4205MP	100 – 400 kHz	227
Sub-bottom Profiler	Edgetech 3300 (pinger)	2 – 16 kHz	225
Ultra-short Base Line (USBL)	N/A	21 – 31 kHz	203

Published data on sound pressure levels produced by CPT equipment are scarce, with limited information available from either field measurements or manufacturer specifications. However, data from a comparable device suggest that source levels generally fall within the range of 118 to 145 dB (McMahon Design and Management Ltd., 2024).

Table 4. Noise-producing site investigation equipment specifications

Activity	Equipment	Frequency	Max. Source Level (dB re 1 μ Pa 1 m)
Cone Penetration Test (CPT)	Neptune 3000	28 Hz	145 (McMahon Design and Management Ltd., 2024)
Gravity-coring	N/A	N/A	N/A
Vibro-coring	Geomarine VC	28 Hz	187.4 (McMahon Design and Management Ltd., 2024)
Grab samples	Shipeck centre-pivot	N/A	N/A

4. Marine Mammal Mitigation Plan

A MMMP was prepared by the MMO together with IWDG Consulting in advance of the survey, agreed with the client and printed and circulated to all crew on board. This plan was based on the NPWS (2014), Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters and covered all noise-producing geophysical activities undertaken during the offshore survey phase. A copy of the agreed mitigation protocol is included in Box 1.

The MMMP applied to the use of SBP, SSS, MBES and SBES, as well as USBL acoustic positioning systems. While guidance from MARA advises that *“a soft start would not be required in the event of one or two of the three sound sources stopping”*, the acoustic output of each system was assessed individually rather than treated as functionally equivalent.

Various types of equipment operate across a wide spectrum of frequencies, many of which lie outside the hearing range of certain marine mammal groups. Following consultation with IWDG Consulting, it was concluded that a biologically informed approach was more appropriate for determining mitigation requirements.

- SSS operates at 100–400 kHz, which is audible only to toothed whales.
- SBES (EA440) and USBL operate at 38–200 kHz and 21–31 kHz, respectively, within the hearing ranges of toothed whales and pinnipeds.
- MBES EM124 and SBP operate at lower frequencies (10.5–13.5 kHz and 2–16 kHz), which are audible to all marine mammal groups, including baleen whales.
- MBES EM2040 operates at 200–400 kHz, a frequency range outside the hearing range of all marine mammals, and therefore requires no mitigation when used in isolation.

A visual overview of the overlap between source frequencies and marine mammal hearing groups is provided in Table 5. Overlap between source frequencies and marine mammal hearing groups

Table 5. Overlap between source frequencies and marine mammal hearing groups

	Species group	Baleen whales	Toothed whales	Pinnipeds (in water)
	Hearing range	7 Hz – 22 kHz	150 Hz – 180 kHz	75 Hz – 75 kHz
	Operation frequency			
SBP	2 – 16 kHz	✓	✓	✓
MBES EM124	10.5 – 13.5 kHz	✓	✓	✓
USBL	21 – 31 kHz		✓	✓
SBES	38 – 200 kHz		✓	✓
SSS	10 – 400 kHz		✓	
MBES EM2040	200 – 400 kHz			

Marine Mammal Mitigation Procedures

Before starting sound producing activities (multibeam, single beam, side-scan sonar & sub-bottom profile surveys), Pre-Start Monitoring and a subsequent Ramp-up Procedure must be undertaken.

No acoustic surveying can be performed if marine mammals are detected within a **500m** distance of the sound source (the “Monitored Zone”).

In all cases, to reduce unnecessary artificial sound and associated energy in the marine environment, operators should **minimise the duration and output power of sound-producing activity**.

Pre-Start Monitoring (“pre-watch”)

- Conducted **by dedicated MMO (Heleen Middel & Claudia di Petta)**
- Only **daylight hours**
- Minimum visibility: **1,500m**
- Maximum sea state: WMO sea state 4 (**Beaufort 4**)
- In waters **<200m deep**, at least **30 minutes** must have passed with no marine mammals within 500m before starting Ramp-Up Procedure
- In waters **>200m deep**, at least **60 minutes** must have passed with no marine mammals within 500m before starting Ramp-Up Procedure

Ramp-Up Procedure (“soft-start”)

Gradual increase in acoustic energy from levels unlikely to cause disturbance to full operational output.

- Required if **peak sound pressure level** exceeds **170dB re: 1µPa @1m**.
- Start from a lower energy start-up (below 170dB re: 1µPa @1m), and gradually and consistently increase to necessary maximum output, over a period of **20 minutes**.

Breaks in sound output

If **all** sound sources are off for more than **30 minutes**, a full **Pre-Start Monitoring and Ramp-up Procedure must be repeated**.

- **MBES EM124 ↔ SBP** can be considered interchangeable for mitigation purposes; if one has been operating, the other can start without pre-watch or ramp-up
- **SBES ↔ USBL** can be considered interchangeable for mitigation purposes; if one has been operating, the other can start without pre-watch or ramp-up
- **SBES / USBL** may also start without mitigation procedures if **MBES EM124 / SBP** has been running
- **SSS** always requires full Pre-Start Monitoring and Ramp-up Procedure, due to potential towing distance.

The MMMP did not include mitigation for Cone Penetration Testing (CPT). Although CPT may produce moderate underwater noise, source levels are unlikely to pose a risk of auditory injury to marine mammals, and the greatest potential impact would be limited to behavioural disturbance. Mitigation for CPT was not implemented in consultation with IWDG Consulting, due to the operational requirement for continuous 24-hour sampling and the risk of increased total noise exposure and disturbance from extending vessel presence. It was agreed that the potential disturbance from extended vessel operations likely outweighed any benefit from individually mitigating for each CPT deployment.

Vibro-coring operations using Geomarine VC equipment were conducted between 25 June to 02 July 2025, with sound producing of 28Hz and 187.4 dB re 1 μ Pa 1 m. The same mitigation measures were applied as described in the Drilling guidance NWPS (2014), using 500m radical distance for Mitigation Zone, 30 minutes pre-watch in waters up to 200m depth and 60 minutes for depths greater than 200m, followed by a soft start of the USBL for 20 minutes. As the USBL was online during all VC operations, pre-watches were conducted only before the USBL was activated, when no other sound producing equipment were active.

5. Observation Methodology

5.1 MMO Observation Platform

All marine mammal observations were conducted from the *RV Ocean Invincible*. The primary observation platform was the bridge deck (external), which offered a wide and unobstructed field of view suitable for effective monitoring of the mitigation zone during periods of good visibility and sea state. The estimated eye height from this platform during the current survey was approximately 14,4 m above sea level, based on the MMO's standing height and a fixed deck height of 12,8m (height from water surface to the bridge deck). In unfavourable weather conditions, watches were conducted from within the enclosed bridge, which provided an eye height of 15,4 m but a more limited field of view due to structural and reflective constraints.

The MMOs were equipped with 7x50 binoculars, a digital camera with telelens, smartphone, and laptop for data collection (Table 6). All observations were logged digitally in accordance with NPWS (2014) requirements, including time-stamped GPS data and real-time notes on environmental conditions and sighting details.

Table 6. MMO equipment utilised during project.

MMO 1 Equipment	Model
Camera	Sony A7 mark IV
Lens	Sony FE 100-400 F/4.5-5.6 GM
Binoculars	7x50 marine binoculars with reticules
Range	Range stick

MMO 2 Equipment	Model
Camera	Cannon EOS D90
Lens	Cannon 150-500 1:5-6.6 APO HSM Cannon EF 75-300 1:4-5.6 III
Binoculars	7x50 marine binoculars with reticules
Range	Reticules

5.2. Distance Measurement Tools

Distance to marine mammal sightings was estimated using a combination of visual assessment, binocular reticule measurements, and a range stick. For sightings within approximately 1000 m, distances were primarily estimated by eye and by a excel sheet with calculating formulas using the total height of the observer (vessel + eye height) and curvature of the Earth, calculating the number of reticules for each distance, and supported by known vessel dimensions, horizon references, and the observer's experience.

For longer-range sightings, including whale blows observed at distances exceeding 1000 m, distance was verified also with the excel sheet and retrospectively using the time elapsed between the initial sighting and the vessel passing the location, cross-referenced with the vessel's speed over ground (SOG).

5.3. Methods of Recording

The MMO recorded all required data in situ using printed Joint Industry Programme (JIP) standard deck forms, as specified under the NPWS 2014 *Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters*. These forms were completed manually during each watch, capturing observation effort, environmental conditions, operational activity, and any marine mammal sightings.

At the end of each day, the completed deck forms were digitised using the official MMO Recording Excel Spreadsheet provided by the Marine Life JIP. This spreadsheet includes dedicated sheets for Monitoring Effort, Operational Activity, and Sightings.

Weather data were collected visually, through weather applications, and by discussing conditions with the bridge crew. GPS coordinates were recorded using a maritime navigational app. Depth data were not consistently recorded, as it required either accessing the bridge or contacting the bridge crew during watches conducted outside. During periods of frequent sightings, or to avoid repeatedly interrupting bridge operations, this information was sometimes omitted.

6. Results

6.1. Sound Producing Activity

Sound-producing activities began on 09 May and concluded on 02 July 2025. On 24 May, the RV *Ocean Invincible* sought shelter inshore due to adverse weather conditions, returning to the Port of Cork on 27 May 2025. The survey operations were resumed on 09 June after weather standby at the Port of Cork. The geophysical and CPT operations were concluded on 17 June, and the vessel returned to Port of Cork to change the equipment for vibro-core operations. Vibro-core operations started on the 24 June and concluded on the 02 July 2025.

Sound-producing operations were carried out using MBES (both EM2040 and EM124), USBL, SBP, and SSS over 31 days during the operations. Days without acoustic operations were usually due to port calls, technical maintenance, or weather downtime. SBES was used twice during this period during CPT and Vibro-core operations. Sound-producing activities with Vibro-core equipment occurred over five days, from 25 June to 02 July 2025. A summary of the sound-producing activities is outlined in Table 7 and visualised in Figure 4. The complete operations recording sheet is included in Appendix II – JIP MMO Recording Operations Form.

Of all acoustic equipment used during the survey, the USBL had the longest cumulative operational time, totalling 599 hours and 24 minutes, as it has been used for all operations including CPT and Vibro-core. During geophysical operations, the SBP was not active continuously, breaks in SBP operation occurred a few times. The other equipment continued active during breaks in SBP activity of less than 30 minutes and were all turned off in longer breaks. The total duration of the MBES activity (EM2040 & EM 124) was 546 hours, as they were used together during the first period of the operations. SSS activity corresponded to 384 hours and 25 minutes, SBP activity corresponded to 396 hours and 48 minutes. The SBES was used twice, one time during CPT operations for the soft-start procedure, then inter-changed to the USBL, and one time during vibro-core operations, totalizing 9 hours and 14 minutes of activity. In total eleven pre-watches and eleven 20-min Soft Starts were performed.

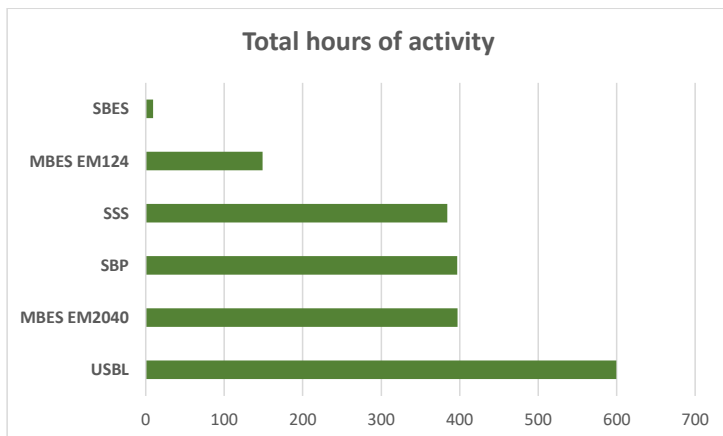


Figure 4. Total hours of sound-producing activities.

Table 7. Summary of sound-producing activities. Underlined start times include a 20-min Soft Start.

Equipment	Turned on	Turned off	Total time
MBES EM2040 (<i>outside marine mammal hearing range</i>)			397 hours 8 min
	09/05/2025 12:16	22/05/2025 00:20	298 hours 6 min
	22/05/2025 23:18	24/05/2025 06:14	47 hours 57 min
	09/06/2025 13:28	11/06/2025 06:15	40 hours 47 min
	11/06/2025 17:54	12/06/2025 02:09	8 hours 15 min
	16/06/2025 13:36	16/06/2025 15:39	2 hours 3 min
MBES EM124			148 hours 52 min
	16/05/2025 16:38	22/05/2025 21:30	148 hours 52 min
USBL			599 hours 24 min
	09/05/2025 16:30	23/05/2025 01:28	309 hrs 58 min
	23/05/2025 07:50	23/05/2025 11:06	3 hrs 16 min
	23/05/2025 14:30	23/05/2025 17:45	3 hrs 15 min
	23/05/2025 19:40	24/05/2025 06:08	10 hrs 28 min

	09/06/2025 13:28	11/06/2025 06:15	40 hours 47 min
	11/06/2025 18:14	13/06/2025 13:40	43 hours 26 min
	13/06/2025 19:07	16/06/2025 12:30	53 hours 23 min
	16/06/2025 13:36	16/06/2025 15:39	2 hours 3 min
	17/06/2025 05:35	17/06/2025 11:00	5 hours 25 min
	24/06/2025 14:07	25/06/2025 17:30	27 hours 23 min
	28/06/2025 14:29	02/07/2025 07:30	89 hours 10 min
SBP			396 hours 48 min
	<u>09/05/2025 12:16</u>	23/05/2025 01:29	313 hrs 13 min
	<u>23/05/2025 07:50</u>	23/05/2025 17:46	9 hrs 56 min
	<u>23/05/2025 19:40</u>	24/05/2025 06:14	10 hrs 34 min
	09/06/2025 13:28	11/06/2025 06:15	40 hours 47 min
	11/06/2025 17:54	12/06/2025 02:09	8 hours 15 min
	16/06/2025 13:36	16/06/2025 15:39	2 hours 3 min
SSS			384 hours 25 min
	<u>09/05/2025 16:30</u>	10/05/2025 01:39	9 hours 9 min
	10/05/2025 01:50	10/05/2025 23:15	21 hours 25 min
	10/05/2025 23:28	11/05/2025 13:35	14 hours 7 min
	11/05/2025 14:00	12/05/2025 17:55	27 hours 55 min
	12/05/2025 18:10	13/05/2025 18:03	23 hours 53 min
	13/05/2025 18:27	14/05/2025 13:45	19 hours 18 min
	14/05/2025 14:06	15/05/2025 12:51	22 hours 45 min
	15/05/2025 13:12	16/05/2025 19:20	30 hours 8 min
	16/05/2025 19:46	17/05/2025 19:44	23 hours 58 min
	17/05/2025 20:04	18/05/2025 20:22	24 hours 18 min
	18/05/2025 20:49	19/05/2025 17:52	21 hours 3 min
	19/05/2025 18:13	20/05/2025 17:00	22 hours 47 min
	20/05/2025 17:15	22/05/2025 22:24	53 hours 9 min
	22/05/2025 22:43	23/05/2025 01:22	2 hours 39 min
	<u>23/05/2025 07:50</u>	23/05/2025 11:00	3 hours 10 min
	<u>23/05/2025 14:29</u>	23/05/2025 17:43	3 hours 14 min
	<u>23/05/2025 19:40</u>	24/05/2025 06:02	10 hours 22 min
	09/06/2025 13:28	11/06/2025 06:15	40 hours 47 min
	11/06/2025 17:54	12/06/2025 02:09	8 hours 15 min
	16/06/2025 13:36	16/06/2025 15:39	2 hours 3 min
SBES			9 hours 14 minutes
	17/06/2025 05:15	17/06/2025 05:35	20 min
	28/06/2025 05:35	28/06/2025 14:29	8 hours 54 min

6.2. Marine Mammal Observer Effort

Between 09 May and 02 July 2025, a total of 207 hours and 37 minutes (207,6 hours) of dedicated visual monitoring effort was conducted over 31 days, averaging 06 hours and 41 minutes per day. Monitoring effort was significantly reduced on days with unfavourable weather conditions. No effort was undertaken on two days due to MMO illness; during these periods, no pre-watches were required and no effort watches were conducted. From 24 to 26 May, the vessel remained in a sheltered area near the coast due to adverse weather conditions. The vessel arrived at the Port of Cork on the afternoon of 27 May and remained there until 08 June 2025. A MMO crew change occurred on 02 June 2025, when Heleen Middel disembarked and Claudia di Petta took over MMO responsibilities from that point onward. A second port call occurred from 18 to 23 June, to mobilize vibro-core equipment.

Of the total observation effort, 35 hours and 47 minutes (17,2%) were conducted during periods with no noise-producing activity, meaning that 82,22% (171 hours and 50 minutes) of monitoring effort took place during active acoustic operations. Additionally, eleven pre-watches were conducted, totalling 09 hours and 33 minutes. Only one sighting was recorded during pre-watches, with one small delay to survey operations was caused due to marine mammal presence.

An overview of monitoring effort is presented in Table 8, with the complete effort recording sheet included in Appendix III – JIP MMO Recording Effort Form.

Table 8. Visual monitoring effort over the course of the project on board RV Ocean Invincible

Observation summary	Totals
Number of days where monitoring occurred	31
Total hours of observation (hh:mm)	207:37
Number of Pre-Watches	11
Total hours of Pre-Watch	09:33
Number of mitigation actions	1
Total delay due to mitigation (hh:mm)	00:10

6.3. Sightings

MMOs maintained visual watches in accordance with mitigation guidelines. Observational effort was recorded throughout daylight hours when visibility and weather permitted. Observers logged active survey windows and environmental conditions that could affect detection rates.

A total of 41 marine mammal sightings were recorded during the survey, representing at least nine different species (Table 9). These included confirmed sightings of identifiable cetacean species, as well as five sightings of unidentified dolphin species and three sightings of unidentified baleen whale species. Most sightings occurred during standard effort watches, only sighting #34 occurred incidentally while the MMO was not on watch. One sighting was recorded during Pre-Watches and no sightings were recorded during soft start. All sightings are shown on the maps in Figure 5 and Figure 6. Sighting 31, 32, and 33 were made while sheltering from the weather, and sightings 34 to 37 and 39 were made during transit when the vessel was leaving Cork port and are therefore not near any of the survey lines.

Table 9. Sightings summary, recorded over the course of survey on board RV Ocean Invincible.

Species	# Sightings	% of Total Sightings	Total Individuals
Common dolphin	15	35,7	220
Bottlenose dolphin	1	2,4	15
Atlantic white-sided dolphin	2	4,9	6
Unidentified dolphin	8	19,5	36
Pilot whale	1	2,4	4
Minke whale	8	19,5	8
Fin whale	3	7,4	5
Unidentified baleen whale	2	4,9	2
Harbour seal	1	2,4	1
TOTAL	41	100	297

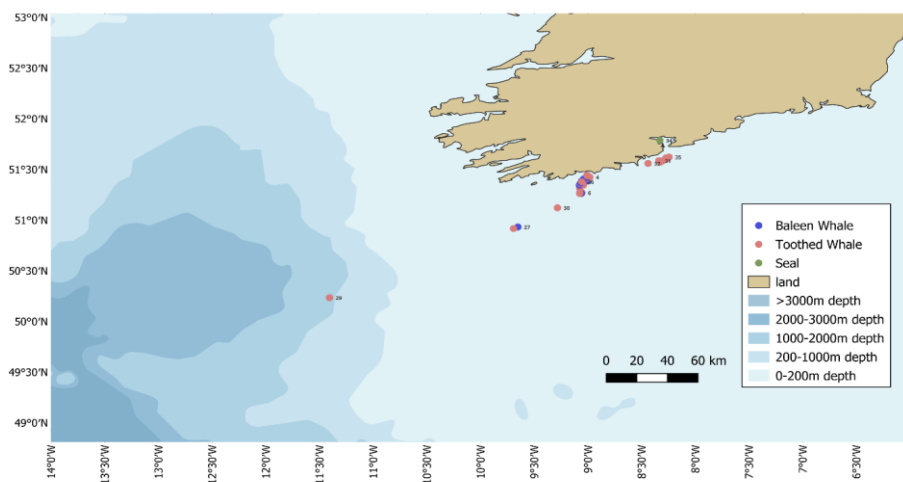


Figure 5. Overview of marine mammal sightings during the project. Close-up of sightings closer to shore provided in Figure 6.

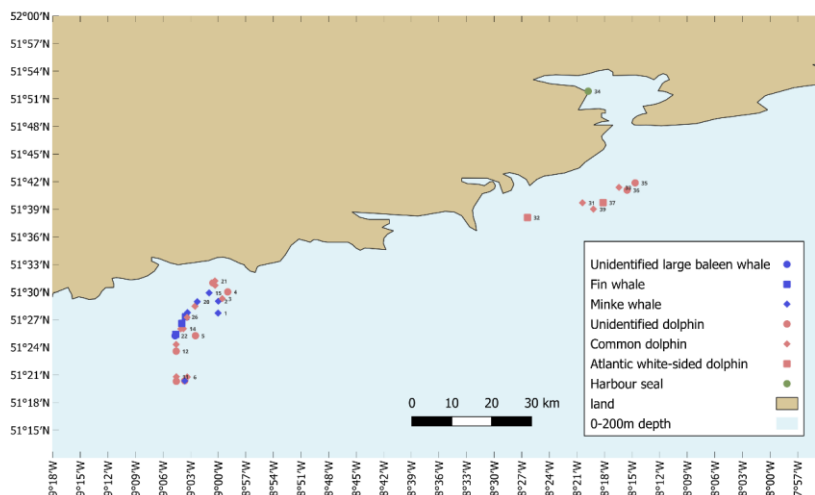


Figure 6. Close-up of inshore marine mammal sightings during the project. Overview of all sightings provided in Figure 5.

6.4. Mitigation

Only one sighting of marine mammals occurred during one of the pre-watches, and consequently, one delays to the start of operations was required.

Sighting during short break (<30min) in one of the sound sources

A single relevant event occurred during the project: Sighting #29 of pilot whales took place during a short 15-minute pause in the operation of the SSS, which was stopped at 17:00 for deployment of the SVP. At the time of shutdown, pilot whales were sighted at approximately 150 m from the vessel on the port bow, swimming in the opposite direction of the ship's movement. They were observed again at 17:04, roughly 400 m astern, and were not seen thereafter. The SSS was redeployed at 17:15, resulting in a total break in sound output of less than 30 minutes.

Given the direction of travel of the animals and the vessel's speed (2.8 knots), it is reasonable to conclude that the animals were outside the 500 m mitigation zone at the time of recommencement. Furthermore, under NPWS (2014) guidelines, no mitigation is required for breaks in sound output of less than 30 minutes. Additionally, MARA had confirmed that where other sound sources remain active (in this case, SBP, MBES EM124, and USBL), neither a pre-watch nor soft start is required for recommencement of the paused source. No mitigation actions were taken, and based on the available evidence, it is highly unlikely that the pilot whales experienced any injury or significant disturbance as a result of the SSS redeployment.

Unnecessary sound output

Survey staff were instructed to minimise the duration of noise-producing activities by switching off equipment during transits. Due to incoming bad weather, the vessel had to relocate from offshore to

a sheltered area near the coast. Four short Route Development surveys were planned along the way, with the first scheduled during the night of 22 to 23 May, when a pre-watch could not be performed.

To avoid losing a night of work and extending the project duration, it was agreed, after consultation with IWDG Consulting, the Party Chief, and the Client, to leave either the SBP or MBES EM124 running during transit. This ensured continuous coverage across all marine mammal hearing groups, allowing the remaining equipment to be started at the first site without a pre-watch, in accordance with the MMMP. Since the SSS would be towed only a few hundred metres behind the vessel in shallow water, a separate pre-watch was deemed unnecessary.

However, due to miscommunication, all equipment except the SSS remained on during the first transit (18:17–23:18, 5 hr 01 min). Equipment was correctly shut down for the next leg and restarted the following morning after a pre-watch and soft start. A similar misunderstanding led to the SBP remaining active during another transit (11:10–14:29, 3 hr 19 min).

These events were not non-compliances but resulted in unnecessary noise output. They appear to have been honest miscommunications without ill intent.

6.5. Environmental Conditions

Between 09 June and 02 July, a total of 207,6 hours of visual observational effort were conducted, during which environmental conditions were also recorded. No environmental data were collected during periods deemed unsuitable for monitoring; specifically, when sea state exceeded International Maritime Organization (IMO) sea state 4 or visibility dropped below 1,500 m, as MMO effort and pre-watches were not conducted under such conditions. Figure 7a-d summarise the environmental conditions recorded throughout the project.

Wind conditions were generally moderate, with Beaufort force 2, 3, and 4 recorded during 22%, 39%, and 23% of observation time, respectively. The most frequently recorded sea state was choppy (many white caps), observed during 62% of effort time, followed by slight (few or no whitecaps) during 34%. Glassy seas, characterised by mirror, corresponded to 1% of effort time, and rough seas, characterized by large waves, foam, and occasional spray, and corresponding to IMO sea state >4, were observed during only 3% of effort time.

Swell height was consistently low (<2 m) for 95% of the monitoring period. Visibility was rated as good (>5 km) for 97% of the time. Bad (poor) visibility conditions posed limitation to effective visual monitoring during one morning due to heavy fog and zero visibility.

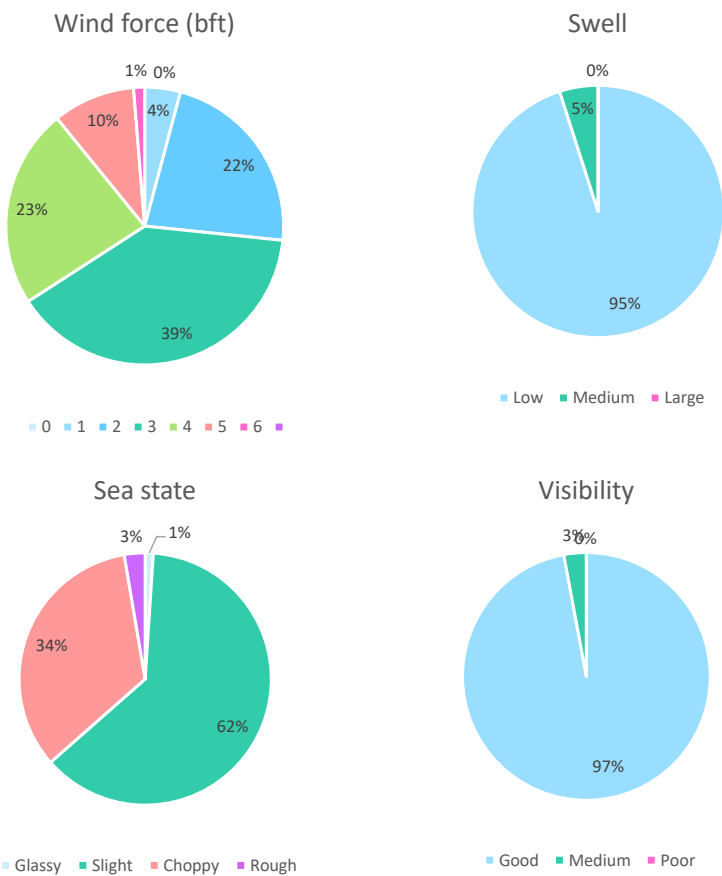


Figure 7. Monitoring conditions based on weather parameters recorded in situ on JIP data sheets, including swell height, visibility, sea state, and wind speed. The charts display the percentage of total observation time each condition was recorded, with inset values indicating the corresponding number of observation periods.

7. Conclusion

A total of 207,6 of visual marine mammal monitoring effort was conducted between 09 May and 02 July 2025 during geophysical survey operations undertaken from the RV Ocean Invincible. All marine mammal mitigation was carried out in accordance with the NPWS (2014) guidelines and the agreed MMMP.

No marine mammals were observed during any of the eleven pre-watches, and one delay to operations was caused by sightings or by unfavourable weather conditions. One sighting of pilot whales occurred during a brief break in SSS use, but mitigation procedures were not required as the break was less than 30 minutes and other sound sources remained operational. This approach was confirmed to be compliant by MARA and aligned with NPWS (2014) guidelines. A small number of instances occurred where sound-producing equipment remained active during transits due to miscommunication between survey crew, but these were not considered non-compliance events.

A total of 41 sightings were made across the duration of the project, representing at least nine different marine mammal species. Most sightings were made during effort watches, with only one sighting during pre-watches and one sighting when the MMO was not on effort. Monitoring was not obstructed at any time, and the MMO had access to high vantage points with excellent visibility across the mitigation zone.

Given the long daylight hours during the summer season, it is recommended that at least two MMOs be present on board to enable an effective shift pattern and ensure adequate rest periods. The presence of a PAM (Passive Acoustic Monitoring) operator during nighttime operations would also improve the monitoring effort and ensure 24-hour coverage. Additionally, it is recommended that NPWS update their guidelines to provide clearer instructions regarding geotechnical operations (i.e. distinguishing between CPT, gravity-coring, and vibro-coring) and to clarify mitigation procedures when multiple geophysical sound sources are operating simultaneously.

The MMOs would like to thank the survey crew, Party Chief, and client representatives for their professionalism, collaboration, and open communication throughout the project. Their consistent interest in marine mammals and commitment to both legal compliance and genuine impact mitigation contributed significantly to the success of the monitoring programme.

8. References

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Appendix I – MMO Qualification

HELEEN
MIDDEL



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Tromsø, Norway

PROFILE

"Dedicated marine scientist with a passion for marine mammal conservation, combining field expertise in species monitoring with strong data collection and environmental compliance skills."

SUMMARY

- Multi-disciplinary marine (mammal) scientist
- Effective science communication and passionate naturalist
- Certified Marine Mammal Observer (MMO) and Passive Acoustic Monitoring Operator (PAMO)
- International field research experience
- 4+ years of work experience in the Polar Regions
- Experienced sailor and freiver

EXPERIENCE

Marine Mammal Observer Marine Research Institute, Norway
(July 2020), July - August 2024
• Monitored and recorded cetacean sightings during a four-week research cruise in the Barents Sea and Svalbard, as part of the HASS-2024 survey.
• Conducted systematic observations and tracked minke whale surfacings for population assessments.
• Ensured data accuracy and contributed to scientific research on cetacean distribution and abundance.

Expedition Guide & Marine Biologist Albatros Expeditions, (sub-) Antarctica
December 2023 - January 2024
January 2025 - February 2025
• Conducted marine mammal observations, systematically recording cetacean and pinniped sightings for IATO's Voluntary Cetacean and Pinniped Sightings (V-CaPS) Programme.
• Giving lectures and impromptu reports to 180 guests about the marine environment.
• Onshore interpretation and guiding shore hikes, and fur seal guarding in South Georgia.
• Zodiac cruising with passengers in shallow waters, around icebergs, and near wildlife.

Science Coordinator & Marine Scientist Hurtigruten Expeditions, Polar Regions
September 2022 - September 2024 (contractor, part time)
• Responsible for planning and executing the onboard science and education program, managing and maintaining the Science Centre, collecting citizen science data, and supporting the science team (ind. post scientists).
• Giving lectures and workshops to 400+ passengers about the local marine environment of Svalbard, Jan Mayen, Iceland, Greenland, Arctic Canada, Norway, British Isles, Falkland Islands, and Antarctica.
• Rifle handler and polar bear guard in the Northwest Passage.
• Assisting in all general duties of the Expedition Team, ind. zodiac cruises and landings.

Field Coordinator & Research Assistant Icelandic Orca Project, Iceland
June 2024, June - July 2023, August 2022
• Assisted on a project investigating the role of acoustic communication in the coordination of feeding behaviour of killer whales.
• Collected photo-ID, acoustic data, drone imagery, and behaviour observations.
• Coordinated and trained groups of up to 6 volunteer citizen scientists from the Earthwatch Institute.

Several positions North Atlantic Marine Mammal Commission, Norway
May 2021 - Present
• Creating and designing educational material for the international educational project GuardNA (Guardians of the North Atlantic).
• Assisting in communication for the international collaborative tagging project MINTAG (ind. writing agreements and contracts, communicating with the scientific steering group, and designing the project's website).
• As Scientific Secretary, prepared and reported to the NAMMCO/JNCB Joint Scientific Working Group on Narwhal and Beluga 2021 in Canada as well as the 28th Scientific Committee meeting.
• As Series Editor, processed scientific papers for Volume 12 of the NAMMCO Scientific Publication series (NSP) from submission to publication.
• Chaired and moderated the hybrid Marine Mammal Student Symposium 2022 "Connecting scientists, policymakers and users: How can we cooperate to safeguard marine mammals and their environment?".
• Prepared scientific communication material for the IUCN World Conservation Congress 2021 in Marseille, and represented NAMMCO at the exhibition stand.

Guide & Polar Bear Guard Seil Norge, East Greenland
September 2020
• Main guide on SV Valiente, carrying 12 passengers, on a 2-week sailing voyage from Svalbard - East Greenland - Iceland.
• Giving lectures underway, managing and leading hikes in Greenland, while being the Lead Polar Bear Guard and Rifle Handler.
• Part of the general crew (keeping watch, sail handling, navigating, cooking & cleaning).

Field Assistant Alaska Whale Foundation, USA
July 2019 - September 2019
• Assisted in collecting and analysing data for projects examining humpback whale health, foraging ecology, and social behaviour.
• Participated in systematic whale counts, photo-ID, biopsy sampling, managing large datasets, driving a zodiac.

HELEEN
MIDDEL

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IT SKILLS

MS Office
PAMGuard
ARGIS
Python
Lightroom
WordPress

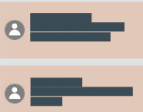
LANGUAGES

Dutch
English
Norwegian
German
Spanish

INTERESTS



REFERENCES



OTHER EXPERIENCE (cont.)

Research Assistant IndEcol Research Group NTNU, Norway
November 2018 - November 2019
• Contributed to the development of a digital tool that maps marine invasive species.
• Quantified habitat loss, disturbance, and collision impacts from wind turbines on birds for the SURF project (a collaboration with the Norwegian Institute for Nature Research).
July 2016 - August 2016
• Made a successful first attempt at integrating marine noise pollution within the framework of Life Cycle Impact Assessment, resulting in a published article.

Naturalist / Deckhand Whale Watch Kalkoura, New Zealand
November 2017 - May 2018
• Guided daily whale-watching tours on the South Pacific Ocean.
• Used a hydrophone to localize (sperm) whales, spotting cetaceans and distance estimation, identifying species and behaviour.
• Assisted the skipper with boat-related tasks on the 18m catamarans, this included small maintenance.

EDUCATION

MSC Industrial Ecology Norwegian University of Science and Technology
July 2014 - June 2016
• Thesis Title: "Making marine noise pollution impacts heard: the case of cetaceans in the North Sea within Life Cycle Impact Assessment".
• Extra-curricular: Marine Ecology, Arctic Petroleum Sciences (UNIS Svalbard).

BSc Aerospace Engineering Delft University of Technology
September 2009 - January 2014
• Thesis Title: "Unmanned Aerial Vehicle Cargo Delivery System for emergency response".
• Minor: Project Management.
• Extra-curricular: Sustainable Development & Global Cycles, Applied Sustainable Science, Arctic Engineering, Arctic Science (Umeå University).

CERTIFICATIONS

Maritime
RYA Day Skipper (Salt)
STCW Crisis Management and Human Behaviour
STCW Passenger Ship Crowd Management
BOSET (incl. HUET) - CA-EBIS
STCW Basic Safety Training (+ Security Awareness)
RYA Powerboat Level 2
RYA SRC Marine Radio License
COUK Offshore Medical Certificate
Norwegian Seafarer's Medical Certificate

Marine Mammals
JNCC Marine Mammal Observer
BOEM/BSEE Protected Species Observer
Passive Acoustic Monitoring Level 1
Marine Mammal Medic
Other
AECO Field Staff Certificate 2024
IATO Expedition Guide Certificate 2024/2025
Polar Bear Safety & Firearm Handling
Bear Safety Training
The Polar Collective Citizen Science Certificates
EASA UAS Remote Pilot A1+A3
Food Safety Level 2
AIDA2 Pool Freediving
Advanced Open Water Diver

Baumgartner, C., Seibmann, A., Middel, H., Schulze, J., Belon, G., Samarra, F.J.P. (in press). Interactions between killer whales (Orcinus orca) and minke whale long-finned pilot whales (Globicephala melaena) off Foulf Bay, Iceland, as observed from whale-watching vessels. Manuscript under review.
Belon, G., Middel, H., Chico, C., Rempel, J.N. (2024). An overview of changes in cetacean occurrence in Foulf Bay, Iceland, as observed from whale-watching vessels. Manuscript under review.
May, R., Jackson, C. R., Middel, H., Spilke, B. G., & Veronesi, F. (2021). Life-cycle impacts of wind energy development on bird diversity in history. Environmental Impact Assessment Review, 90, 106685.
May, R., Middel, H., Spilke, B. G., Jackson, C. & Veronesi, F. (2020). Global life-cycle impacts of onshore wind-power plants on bird richness. Environmental and Sustainability Indicators, 8, 100080.
Middel, H., & Veronesi, F. (2017). Making marine noise pollution impacts heard: the case of cetaceans in the North Sea within life cycle impact assessment Sustainability, 9(7), 1138.

Training Course:
JNCC Marine Mammal Observer Course

This is to certify that
Helen Middel

Attended the
Marine Mammal Observer Course
At Seiche Training UK
On 10th to 12th September 2019



JNCC Approved Course
Delivered by:
Seiche Training Ltd
www.seichetraining.com

Claudia Di Petta, BSc DVM PIEMA

Environmental Consultant & Marine Mammal Specialist

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Professional Profile

A highly motivated professional Environmental Consultant and Marine Mammal Specialist with proficient training and awareness of marine fauna and their interactions with offshore and coastal water industry operations. Extensive knowledge in the management of wildlife species and a history of working with private companies. Good communication liaising with the client and onboard crew of protected species guidelines, E.I.A.'s, O.E.M.P.s and implementing delays and shutdowns of operations where relevant. Responsible for the completion of risk assessments and reporting documentation. Meticulous in data collection, recording and report writing. Eighteen years of experience in offshore work in the oil industry and four years of offshore work experience with Marine Mammals research. International expertise in environmental training, drilling rigs/seismic vessels/supply vessels' compliance, waste management, biota monitoring, Brazilian ecological legislation, beach monitoring for stranded marine mammals, environmental reports, and Passive Acoustic Monitoring. A hardworking, energetic, and responsible individual who works very well in a team environment.

Core Competencies

- Marine Mammal Mitigation (MMO & PAM)
- Environmental Compliance & Auditing
- Environmental Impact Assessments (EIA/OEMP)
- Offshore Project Planning & Support
- Risk Assessment & Data Analysis
- Environmental Training & Education
- Technical & Scientific Reporting
- Stakeholder & Crew Liaison
- Team Coordination & Mentoring

Professional Experience (Recent – full experience provided upon request)

- **Atlas Professionals (Spain) – Environmental Personnel Coordinator**

May 2024 – May 2025

Managed recruitment and coordination of MMO/PAM and environmental professionals for offshore operations. Conducted environmental data quality control, reviewed reports and databases, and ensured certification compliance. Acted as liaison between professionals, clients, and internal teams.

- **Freelancer – Multiple Clients – Environmental Consultant / Advisor / MMO / PAM Operator**

2007 – Present

Led marine biodiversity surveys, implemented PAM systems, developed mitigation plans, and advised on environmental best practices for offshore drilling, seismic, and geophysical campaigns in compliance with international guidelines.

- **MMO Association (MMOA) – Executive Committee Secretary (Volunteer)**

2022 – Present

Managed communication with stakeholders, coordinated meetings, documented minutes, and supported project logistics. Gained advanced skills in administrative coordination, multitasking, digital tools, and stakeholder engagement.

- **Witt O'Brien's (Brazil) – Environmental Technician (Equinor Project)**

Apr 2018 – Apr 2019

Implemented environmental protocols onboard the West Saturn rig. Oversaw zero-discharge procedures, fluid testing, and ensured compliance with Brazilian environmental legislation.

Education

Doctor of Veterinary Medicine (DVM), BSc

São Paulo State University (UNESP), Brazil | 1996–2002

Key Certifications

- IEMA Certificate in Environmental Management, UK (2024)
- Project Management Essentials – Howard University (2025)
- PAMGUARD & Passive Acoustic Monitoring – Intelligent Ocean (2022)
- Protected Species Observer Training – RPS (2022)
- Marine Mammal Medic – BDMLR, UK (2022)
- Integrated Management Systems Auditing (ISO 9001/14001/45001) – QHSE (2021)
- JNCC MMO & PAM Courses – Seiche Training (2014)

Languages

- Portuguese: Native
- English: Fluent
- Spanish: Basic
- Catalan: Basic

Professional Affiliations

- Marine Mammals Observers Association (MMOA) – Full Member
- Institute of Environmental Management & Assessment (IEMA) – Practitioner Member
- Institute of Marine Engineering, Science & Technology (IMarEST) – Associate Member

HSE & Medical Certificates

- FOET – Stream Marine Training (UK, 2024)
- OEUK Medical Certificate (2025)
- NMFS/NOAA Approvals – Offshore/REV/Nearshore Projects (2022–2025)
- Fully COVID-19 Vaccinated (AstraZeneca, Pfizer, Janssen – 5 doses)

References

- Neil Niru Dorrian – ADNOC Senior Environmental | ✉ Advisor.dorrian.environmental@gmail.com
- Dr. Renata Kowalik – ADNOC Senior Environmental Advisor | ✉ renata.a.kowalik@gmail.com

Project Highlights (Selection)

Country	Client	Project Type	Contractor	Duration	Guideline	Year
Ireland	Amazon MCS	Geophysical & Vibrocore	IWDG Consulting	32 days	NPWS	2025
Scotland	SSE Scotwind	Geophysical	Ocean Ecology	60 days	JNCC	2024
Ireland	Statkraft	Geotechnical	Ocean Ecology	16 days	NPWS	2023
UK	Royal HaskoningDHV	Geophysical	Ocean Ecology	30 days	JNCC	2023
Ireland	Codling Wind Farm	Drilling	IWDG Consulting	45 days	NPWS	2023
Ireland	Dublin Port Company	Drilling	IWDG Consulting	5 months	NPWS	2022/23
Ireland	Fuinneamh Sceirde Teoranta	Geophysical	Benthic Solutions Ltd.	45 days	NPWS	2022
UK	SSE Scotwind	Benthics	Ocean Infinity	14 days	JNCC	2022
UAE	A.D.N.O.C.	4D seismic	BGP Offshore	2 years	JNCC	2021/22

* Full experience provided upon request



Appendix II – JIP MMO Recording Operations Form

Table 10. Overview of sound-producing activity conducted during the survey under Licence MUL230031 from the RV Ocean Invincible.

All effort was carried out visually; no acoustic monitoring was undertaken. Purple rows indicate pre-watches (PW) and soft start periods (SS). Depth range: s = shallow (<200 m), d = deep (>200 m), b = overlapping shallow and deep.

Date	Time soft start/ramp-up began (UTC)	Time of full power (UTC)	Time of start of line (UTC)	Time of end of line (UTC)	Time of reduced output (UTC) (if relevant)	Time airguns/ source stopped (UTC)	Time pre-shooting search began (UTC)	Time search ended (UTC)	Depth range	Was it day or night in the period prior to firing?	Was any mitigating action required?	Comments
09/05/2025	12:16	12:37	13:20	15:50			11:46	12:37	s	d	n	MBES EM2040 & SBP. Started ~40min before SOL because of SVP deployment meanwhile
09/05/2025			15:56	16:10					s			MBES EM2040 & SBP
09/05/2025	16:30	16:50	17:41	17:47			16:00	16:50	s	d	n	Deployment SSS & USBL
09/05/2025			17:47	18:00					s			MBES EM2040, SBP, SSS, USBL
09/05/2025			18:04	18:18					s			MBES EM2040, SBP, SSS, USBL
09/05/2025			18:19	18:35					s			MBES EM2040, SBP, SSS, USBL
09/05/2025			18:45	19:31					s			MBES EM2040, SBP, SSS, USBL
09/05/2025			19:31	22:25					s			MBES EM2040, SBP, SSS, USBL
09/05/2025			22:38	1:30		1:39			s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
10/05/2025		1:50	2:30	5:14					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			5:28	8:16					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			10:48	11:50					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			12:03	13:06					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			13:26	14:17					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			14:19	15:03					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			15:09	15:52					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			16:01	16:07					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			16:16	16:23					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			16:32	16:40					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			16:48	17:03					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			17:10	17:27					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			17:30	17:42					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			17:49	18:01					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			18:03	18:14					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			18:19	18:30					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			18:32	18:42					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			18:45	19:00					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			19:01	19:12					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			19:26	19:52					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			20:22	20:27					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			20:37	20:43					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			20:49	21:35					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			21:42	22:23					s			MBES EM2040, SBP, SSS, USBL
10/05/2025			22:48	23:07	23:15				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
10/05/2025		23:28	23:43	23:56					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			0:06	3:50					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			4:02	6:36					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			6:52	9:20					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			9:38	13:27	13:35				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
11/05/2025		14:00	14:20	17:42					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			17:51	21:06					s			MBES EM2040, SBP, SSS, USBL
11/05/2025			21:19	0:36					s			MBES EM2040, SBP, SSS, USBL
12/05/2025			0:48	4:11					s			MBES EM2040, SBP, SSS, USBL
12/05/2025			4:24	7:55					s			MBES EM2040, SBP, SSS, USBL
12/05/2025			8:06	11:24					s			MBES EM2040, SBP, SSS, USBL
12/05/2025			12:09	17:43	17:55				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
12/05/2025		18:10	18:37	0:15					s			MBES EM2040, SBP, SSS, USBL
13/05/2025			0:28	6:03					s			MBES EM2040, SBP, SSS, USBL
13/05/2025			6:21	12:08					s			MBES EM2040, SBP, SSS, USBL
13/05/2025			12:23	17:54	18:03				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
13/05/2025		18:27	19:01	0:47					s			MBES EM2040, SBP, SSS, USBL
14/05/2025			1:01	6:46					s			MBES EM2040, SBP, SSS, USBL
14/05/2025			7:14	13:37	13:45				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
14/05/2025		14:06	14:33	21:51					s			MBES EM2040, SBP, SSS, USBL
14/05/2025			22:02	5:08					s			MBES EM2040, SBP, SSS, USBL
15/05/2025			5:29	12:45	12:51				s			SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
15/05/2025		13:12	13:37	20:48					s			MBES EM2040, SBP, SSS, USBL
15/05/2025			21:03	3:58					s			MBES EM2040, SBP, SSS, USBL

16/05/2025			4:16	11:01					s				MBES EM2040, SBP, SSS, USBL
16/05/2025			11:38	19:13	19:20				s				MBES EM2040, SBP, SSS, USBL, MBES EM124 turned on 16:38
16/05/2025		19:46	20:22	3:55					s				SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
17/05/2025			4:11	11:53					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
17/05/2025			12:14	19:39	19:44				s				SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
17/05/2025		20:04	20:33	4:19					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
18/05/2025			4:39	12:17					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
18/05/2025			12:33	20:15	20:22				s				SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
18/05/2025		20:49	21:47	22:11					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
18/05/2025			22:34	22:59					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
18/05/2025			23:18	23:41					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			0:07	0:33					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			0:50	1:15					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			1:35	1:52					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			2:12	2:28					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			2:47	3:04					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			3:27	3:42					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			4:04	4:21					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			4:40	4:58					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			5:44	9:38					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			10:08	13:42					s				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			14:01	17:38	17:52				b				SSS briefly on deck for conducting SVP, MBES, SBP, USBL ongoing
19/05/2025		18:13	18:46	22:35					b				MBES EM2040, MBES EM124, SBP, SSS, USBL
19/05/2025			22:54	2:29					b				MBES EM2040, MBES EM124, SBP, SSS, USBL
20/05/2025			3:02	6:26					b				MBES EM2040, MBES EM124, SBP, SSS, USBL
20/05/2025			6:49	10:23					b				MBES EM2040, MBES EM124, SBP, SSS, USBL
20/05/2025			11:20	16:14	17:00				d				SSS briefly on deck
20/05/2025		17:15	18:29	23:04					d				MBES EM2040, MBES EM124, SBP, SSS, USBL
20/05/2025			23:34	4:43					d				MBES EM2040, MBES EM124, SBP, SSS, USBL
21/05/2025			6:24	11:18					d				MBES EM2040, MBES EM124, SBP, SSS, USBL
21/05/2025			11:48	16:47					d				MBES EM2040, MBES EM124, SBP, SSS, USBL
21/05/2025			18:35	23:08					d				MBES EM124, SBP, SSS, USBL, (MBES EM2040 off 00:20)
21/05/2025			23:35	4:31					d				MBES EM124, SBP, SSS, USBL
22/05/2025			7:05	10:41					d				SSS briefly on deck for conducting SVP, MBES EM124 off 21:30
22/05/2025		22:43	13:54	17:19	22:24				d				MBES EM2040 on 23:18
22/05/2025			23:18	23:59					s				SSS off 01:22, USBL off 01:28, all off 01:29 (except EM2040)
23/05/2025			0:25	1:07	1:22	1:29			s				MBES EM2040, SBP, SSS, USBL
23/05/2025	7:50	8:10	8:17	9:22			6:56	8:12	s	d	n		SSS off 11:00, USBL off 11:06, SBP ongoing
23/05/2025			9:41	10:55	11:00				s				MBES EM2040, SBP, SSS, USBL
23/05/2025	14:29	14:49	14:52	15:25			13:21	14:28	s	d	n		MBES EM2040, SBP, SSS, USBL
23/05/2025			15:43	16:13					s				MBES EM2040, SBP, SSS, USBL
23/05/2025			16:33	17:02					s				MBES EM2040, SBP, SSS, USBL
23/05/2025									s				SSS off 17:43, USBL off 17:45, all off 17:46 (except MBES EM2040)
23/05/2025	19:40	20:00	20:07	21:15			19:00	19:39	s	d	n		MBES EM2040, SBP, SSS, USBL
23/05/2025			21:29	22:30					s				MBES EM2040, SBP, SSS, USBL
23/05/2025			22:45	23:39					s				MBES EM2040, SBP, SSS, USBL
23/05/2025			23:54	0:47					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			1:04	1:53					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			2:10	2:56					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			3:16	3:56					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			4:25	4:48					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			5:04	5:23					s				MBES EM2040, SBP, SSS, USBL
24/05/2025			5:35	5:50	6:02	6:14			s				SSS out 06:02, USBL out 06:08, everything off 06:14

09/06/2025	13:28	13:48	14:35	18:19			12:15	13:28	d	d	n	MBES EM2040, SBP, SSS, USBL
09/06/2025			20:56	0:22					d			MBES EM2040, SBP, SSS, USBL
10/06/2025			2:29	6:09					d			MBES EM2040, SBP, SSS, USBL
10/06/2025			6:37	11:58					d			MBES EM2040, SBP, SSS, USBL
10/06/2025			13:57	17:41					d			MBES EM2040, SBP, SSS, USBL
10/06/2025			20:21	21:54					d			MBES EM2040, SBP, SSS, USBL
10/06/2025			23:02	0:41					d			MBES EM2040, SBP, SSS, USBL
11/06/2025			2:11	3:46					d			MBES EM2040, SBP, SSS, USBL
11/06/2025			4:33	6:14		6:15			d			MBES EM2040, SBP, SSS, USBL
11/06/2025			10:38	10:43								GC014
11/06/2025			12:27	12:31								GC015
11/06/2025			14:21	14:26								GC016
11/06/2025			16:52	16:05								GC017
11/06/2025			16:30	16:33								GC017A (2nd attempt)
11/06/2025			16:56	16:59								GC017B (3rd attempt)
11/06/2025	17:54	18:14	18:26	19:34			16:50	17:54	d	d	n	MBES EM2040, SBP, SSS, USBL
11/06/2025			20:09	21:09					d			MBES EM2040, SBP, SSS, USBL
12/06/2025			0:07	0:55					e			MBES EM2040, SBP, SSS, USBL
12/06/2025			1:18	2:08		2:09			e			MBES EM2040, SBP, SSS, USBL
12/06/2025			5:49	5:54								CP046 Segm 1
12/06/2025			6:49	6:53								CP047 Segm 1
12/06/2025			7:48	7:52								CP046 Segm 3
12/06/2025			9:27	9:30								CP045 Segm 1
12/06/2025			10:47	10:52								CP044 Segm 1
12/06/2025			12:11	12:17								CP043 Segm 1
12/06/2025			13:30	13:49								CP042 Segm 1
12/06/2025			14:46	14:53								CP041 Segm 1
12/06/2025			15:54	16:00								CP040 Segm 1
12/06/2025			17:02	17:10								GC017 Segm 1
12/06/2025			18:20	18:26								CP039 Segm 1
12/06/2025			19:44	10:50								CP038 Segm 1
12/06/2025			21:38	21:15								CP037 Segm 1
12/06/2025			23:21	23:27								CP036 Segm 1
13/06/2025			1:07	1:12								CP035 Segm 1
13/06/2025			2:52	2:57								CP034 Segm 1
13/06/2025			4:46	4:51								CP033 Segm 1
13/06/2025			6:50	6:56								CP032 Segm 1
13/06/2025			8:54	9:00								CP031 Segm 1
13/06/2025			11:11	11:18								CP030 Segm 1
13/06/2025			13:00	13:06								GC013 Segm 1
13/06/2025	19:07	19:27	20:35	20:06			18:30	19:07				USBL, CP045 Segm 3
13/06/2025			20:12	20:15								CP045 Segm 3 (2nd attempt)
13/06/2025			21:08	21:12								CP044 Segm 3
13/06/2025			22:30	22:33								CP043 Segm 3
13/06/2025			22:36	22:38								CP043 Segm 3 (2nd attempt)
13/06/2025			22:41	22:45								CP043 Segm 3 (3rd attempt)
14/06/2025			3:52	3:55								CP042 Segm 3
14/06/2025			5:07	5:09								CP042ecm Segm 3
14/06/2025			5:58	6:01								CP041 Segm 3
14/06/2025			7:01	7:02								CP040 Segm 3 (1st attempt)
14/06/2025			7:08	7:09								CP040 Segm 3 (2nd attempt)
14/06/2025			7:15	7:18								CP040 Segm 3
14/06/2025			7:49	7:59								Grab sampling (GS)
14/06/2025			8:46	8:51								CP039 Segm 3
14/06/2025			9:44	9:45								CP038 Segm 3 (1st attempt)
14/06/2025			9:50	9:52								CP038 Segm 3 (2nd attempt)
14/06/2025			9:58	10:01								CP038 Segm 3
14/06/2025			11:25	11:28								CP037 Segm 3
14/06/2025			12:27	12:32								CP036 Segm 3
14/06/2025			13:23	13:29								CP035 Segm 3
14/06/2025			14:20	14:25								CP034 Segm 3
14/06/2025			15:15	15:21								CP033 Segm 3
14/06/2025			16:04	16:09								CP032 Segm 3
14/06/2025			17:08	17:12								CP031 Segm 3
14/06/2025			18:05	18:08								CP030 Segm 3
14/06/2025			18:52	18:55								CP029 Segm 3
14/06/2025			19:42	19:45								CP028 Segm 3
14/06/2025			20:47	20:50								CP027 Segm 3
14/06/2025			22:03	22:07								CP026 Segm 3 (damage due to hard ground)
15/06/2025			3:07	3:08								CP026a Segm 3 (1st attempt)
15/06/2025			3:22	3:24								CP026b Segm 3 (2nd attempt)
15/06/2025			3:28	3:30								CP026c Segm 3 (3rd attempt)
15/06/2025			3:47	3:49								Grab Sampling (GS)
15/06/2025			5:18	5:19								CP025 Segm 3 (1st attempt)
15/06/2025			5:24	5:25								CP025 Segm 3 (2nd attempt)
15/06/2025			5:30	5:32								CP025 Segm 3 (3rd attempt)
15/06/2025			7:01	7:04								CP024 Segm 3
15/06/2025			8:10	8:12								CP023 Segm 3
15/06/2025			9:28	9:31								CP022 Segm 3
15/06/2025			10:38	10:41								CP021 Segm 3
15/06/2025			12:14	12:17								CP020 Segm 3
15/06/2025			13:17	13:21								CP019 Segm 3
15/06/2025			14:19	14:22								CP018 Segm 3 (1st attempt)
15/06/2025			14:28	14:31								CP018a Segm 3 (2nd attempt)
15/06/2025			15:25	15:29								CP017 Segm 3 (1st attempt)
15/06/2025			15:33	15:36								CP017 Segm 3 (2nd attempt)
15/06/2025			16:27	16:30								CP016 Segm 3
15/06/2025			17:12	17:15								CP015 Segm 3
15/06/2025			18:05	18:06								CP014 segm 3
15/06/2025			18:11	18:14								CP010 a Segm 3 (2nd attempt)
15/06/2025			19:02	19:05								CP013 Segm 3
15/06/2025			19:56	19:58								CP012 Segm 3
15/06/2025			20:56	20:57								CP011 Segm 3 (1st attempt)
15/06/2025			21:03	21:04								CP011a Segm 3 (2nd attempt)
15/06/2025			21:12	21:14								CP011b Segm 3 (3rd attempt)
15/06/2025			21:30	21:32								Grab Sampling (GS)
15/06/2025			22:30	22:37								CP010 Segm 3
15/06/2025			22:43	22:44								CP010a Segm 3 (2nd attempt)
15/06/2025			22:51	22:53								CP010b Segm 3 (3rd attempt)

Appendix III – JIP MMO Recording Effort Form

Table 11. Overview of visual monitoring effort conducted during the survey under Licence MUL230031 from the RV Ocean Invincible.

All effort was carried out visually; no acoustic monitoring was undertaken. White rows represent standard effort watches (EW), dark purple rows indicate pre-watches (PW), and light purple rows indicate soft start periods (SS). Source activity: f = full power, s = soft start, r = reduced power, n = not firing. Sea state: g = glassy (mirror-like), s = slight (no/few whitecaps), c = choppy (many whitecaps), r = rough (large waves, foam, spray). Swell: o = low (<2 m), m = medium (2–4 m), l = large (>4 m). Visibility: p = poor (<1 km), m = moderate (1–5 km), g = good (>5 km). Sun glare: n = no glare, wf = weak forward, sf = strong forward, vf = variable forward, wb = weak behind, sb = strong behind, vb = variable behind. Precipitation: n = none, l = light rain, m = moderate rain, h = heavy rain, s = snow.

Date	Observer's operator's name(s)	Time of start of section of watch (UTC)	Time of end of section of watch (UTC)	Source activity	Start position - degrees latitude	Start position - minutes latitude	Start position - north/south	Start position - degrees longitude	Start position - minutes longitude	Start position - east/west	Depth of water at start position (metre)	End position - degrees latitude	End position - minutes latitude	End position - north/south	End position - degrees longitude	End position - minutes longitude	End position - east/west	Depth of water at end position (metre)	Speed of vessel (knots)	Wind direction	Wind force (Beaufort)	Sea state	Swell	Visibility (visual watch only)	Sun glare (visual watch only)	Precipitation	Comments
09/05/2025	Heleen Middel	7:30	8:18	n	51	29.28	n	8	59.57	w	48.0	51	31.75	n	8	59.60	w	28.0	4.0	sw	1	g	g	wf	n		
09/05/2025	Heleen Middel	8:18	8:34	n	51	31.75	n	8	59.60	w	28.0	51	32.12	n	9	0.95	w	31.0	1.4	sw	2	g	g	wf	n		
09/05/2025	Heleen Middel	8:34	11:46	n	51	28.96	n	9	23.27	w	65.0	51	23.75	w	9	2.76	w	90.0	4.3	sw	3	g	g	wf	n		
09/05/2025	Heleen Middel	12:17	12:37	n	51	23.75	n	9	23.75	w	65.0	51	21.66	n	9	3.13	w	95.0	7.0	sw	3	g	g	wf	n	PW1	
09/05/2025	Heleen Middel	12:37	12:47	f	51	21.66	n	9	3.13	w	65.0	51	20.77	n	9	3.37	w	95.0	6.7	sw	3	g	g	wf	n	SS	
09/05/2025	Heleen Middel	12:47	13:13	f	51	20.77	n	9	3.37	w	65.0	51	20.06	n	9	3.87	w	96.0	2.3	sw	3	g	g	wf	n		
09/05/2025	Heleen Middel	13:13	14:00	f	51	20.06	n	9	3.87	w	65.0	51	23.51	n	9	4.56	w	26.0	7.1	sw	3	g	g	wf	n		
09/05/2025	Heleen Middel	14:00	15:00	f	51	23.57	n	9	4.58	w	65.0	51	29.88	n	9	0.88	w	6.3	sw	3	g	g	wf	n			
09/05/2025	Heleen Middel	15:00	15:18	f	51	29.88	n	9	0.88	w	65.0	51	31.53	n	9	0.42	w	37.0	6.8	sw	3	g	g	wf	n		
09/05/2025	Heleen Middel	15:18	15:54	f	51	31.53	n	9	0.42	w	65.0	51	32.80	n	8	0.00	w	15.5	5.1	sw	2	g	g	wf	n		
09/05/2025	Heleen Middel	15:54	16:47	n	51	32.80	n	8	59.85	w	15.5	51	30.97	n	8	0.47	w	37.0	2.1	sw	2	g	g	wf	n		
09/05/2025	Heleen Middel	16:47	17:09	s	51	30.00	n	9	0.00	w	15.5	51		n				4.3	sw	2	g	g	wf	n	PW2		
10/05/2025	Heleen Middel	5:01	5:19	f	51	20.65	n	9	4.48	w	65.0	51	19.47	n	9	4.37	w		4.3	sw	2	g	g	wf	n	SS	
10/05/2025	Heleen Middel	5:19	6:17	f	51	19.47	n	9	4.37	w	65.0	51	23.37	n	9	4.40	w		4.2	sw	2	g	g	wf	n		
10/05/2025	Heleen Middel	6:17	7:01	f	51	23.37	n	9	4.40	w	65.0	51	25.98	n	9	3.62	w		4.3	sw	2	g	g	wf	n		
10/05/2025	Heleen Middel	7:27	7:45	f	51	27.79	n	9	3.00	w	65.0	51	28.77	n	9	1.95	w		4.1	sw	1	g	g	wf	n		
10/05/2025	Heleen Middel	7:45	8:17	f	51	28.77	n	9	1.95	w	65.0	51	29.97	n	9	1.00	w		4.1	sw	1	g	g	wf	n		
10/05/2025	Heleen Middel	8:17	8:52	f	51	29.97	n	9	1.00	w	65.0	51	30.46	n	8	59.83	w		2.0	sw	1	g	g	wf	n		
10/05/2025	Heleen Middel	11:01	12:01	f	51	29.83	n	9	1.22	w	65.0	51	27.27	n	9	3.55	w		4.1	sw	2	g	g	wf	n		
10/05/2025	Heleen Middel	12:01	12:39	f	51	27.27	n	9	3.55	w	65.0	51	29.27	n	9	1.90	w		4.4	sw	2	g	g	wf	n		
10/05/2025	Heleen Middel	12:39	12:48	f	51	29.27	n	9	1.90	w	65.0	51	29.46	n	9	1.24	w		4.2	sw	2	g	g	wf	n		
10/05/2025	Heleen Middel	16:24	17:25	f	51	32.98	n	9	32.98	n	104.0	51	33	n	9	0	w		14.5	4	sw	1	g	g	wf	n	
11/05/2025	Heleen Middel	4:58	5:18	f	51	22.83	n	9	4.82	w	65.0	51	23.82	n	9	4.83	w		3.4	sw	3	g	g	wf	n		
11/05/2025	Heleen Middel	5:18	6:49	f	51	23.79	n	9	4.83	w	65.0	51	27.61	n	9	3.32	w		3.2	sw	2	g	g	wf	n		
11/05/2025	Heleen Middel	8:02	8:50	f	51	23.84	n	9	4.72	w	65.0	51	22.23	n	9	4.72	w		3.1	sw	2	g	g	wf	n		
11/05/2025	Heleen Middel	10:27	11:15	f	51	17.54	n	9	6.58	w	104.0	51	15.74	n	9	9.39	w		3.3	sw	4	g	g	wf	n		
11/05/2025	Heleen Middel	11:15	12:01	f	51	15.74	n	9	6.58	w	104.0	51	14.21	n	9	13.08	w		3.1	sw	4	g	g	wf	n		
11/05/2025	Heleen Middel	13:36	14:29	f	51	11.23	n	9	19.31	w	111.0	51	11.89	n	9	18.09	w		2.9	sw	4	g	g	wf	n	*c30min break in SSS	
11/05/2025	Heleen Middel	16:58	17:31	f	51	17.81	n	9	6.36	w	107.0	51	19.68	n	9	4.82	w		3.0	sw	4	g	g	wf	n		
12/05/2025	Heleen Middel	5:01	5:17	f	51	13.03	n	9	15.40	w	107.0	51	13.54	n	9	14.32	w		107.0	3.1	sw	5	g	g	wf	n	
12/05/2025	Heleen Middel	6:17	6:30	f	51	13.54	n	9	14.32	w	107.0	51	14.95	n	9	11.12	w		109.0	3.3	sw	4	g	g	wf	n	
12/05/2025	Heleen Middel	9:24	10:14	f	51	15.06	n	8	15.06	w	106.0	51	14.14	n	9	12.79	w		104.0	4.0	n	g	g	wf	n		
12/05/2025	Heleen Middel	10:50	11:23	f	51	12.80	n	9	15.58	w	104.0	51	11.62	n	9	18.14	w		97.0	3.4	n	g	g	wf	n		
12/05/2025	Heleen Middel	11:23	11:49	f	51	11.62	n	9	18.14	w	104.0	51	10.87	n	9	18.57	w		98.0	3.3	n	g	g	wf	n		
12/05/2025	Heleen Middel	11:49	12:10	f	51	10.87	n	9	18.57	w	110.0	51	11.69	n	9	18.44	w		110.0	3.6	n	g	g	wf	n		
12/05/2025	Heleen Middel	12:10	13:02	f	51	11.69	n	9	18.44	w	110.0	51	8.99	n	9	21.40	w		4.1	n	g	g	wf	n			
12/05/2025	Heleen Middel	13:02	13:20	f	51	8.99	n	9	21.40	w	110.0	51	8.11	n	9	22.34	w		3.8	n	g	g	wf	n			
13/05/2025	Heleen Middel	5:04	6:12	f	51	0.97	n	9	38.30	w	129.0	50	59.02	n	9	44.09	w		129.0	3.8	n	g	g	wf	n		
13/05/2025	Heleen Middel	6:12	6:21	f	50	59.02	n	9	44.09	w	129.0	50	59.38	n	9	43.34	w		128.0	3.0	n	g	g	wf	n		
13/05/2025	Heleen Middel	6:21	6:36	f	50	59.38	n	9	43.34	w	128.0	50	59.77	n	9	42.09	w		127.0	3.8	n	g	g	wf	n		
13/05/2025	Heleen Middel	7:37	8:46	f	51	1.54	n	9	37.27	w	124.0	51	3.24	n	9	31.37	w		3.6	n	g	g	wf	n			
13/05/2025	Heleen Middel	13:01	14:17	f	51	9.07	n	9	20.48	w	111.0	51	7.31	n	9	24.42	w		118.0	3.9	n	g	g	wf	n		
13/05/2025	Heleen Middel	14:01	14:31	f	51	7.31	n	9	24.42	w	118.0	51	6.13	n	9	26.81	w		122.0	3.8	n	g	g	wf	n		
13/05/2025	Heleen Middel	15:25	16:06	f	51	3.69	n	9	30.26	w	125.0	51	2.45	n	9	33.93	w		124.0	3.6	n	g	g	wf	n		
14/05/2025	Heleen Middel	5:09	5:58	f	51	1.92	n	9	34.79	w	125.0	51	0.47	n	9	39.15	w		130.0	3.9	n	g	g	wf	n		
14/05/2025	Heleen Middel	6:58	8:49	f	50	58.29	n	9	45.20	w	128.0	50	58.89	n	9	43.85	w		129.0	4.1	n	g	g	wf	n		
14/05/2025	Heleen Middel	7:39	8:43	f	50	58.29	n	9	45.20	w	128.0	50	58.89	n	9	43.85	w		129.0	4.1	n	g	g	wf	n		
14/05/2025	Heleen Middel	10:52	11:43	f	50	57.00	n	10	0.54	w	125.0	50	47.79	n	10	4.10	w		125.0	4.0	n	g	g	wf	n		
14/05/2025	Heleen Middel	11:43	12:49	f	50	47.75	n	10	4.10	w	125.0	50	44.83	n	10	8.68	w		130.0	3.8	n	g	g	wf	n		
14/05/2025	Heleen Middel	13:24	14:26	f	50	44.83	n	10	8.68	w	130.0	50	42.42	n	10	12.41	w		135.0	3.9	n	g	g	wf	n		
14/05/2025	Heleen Middel	16:30	17:37	f	50	47.87	n	10	4.04	w	126.0	50	50.51	n	9	59.87	w		123.0	3.3	n	g	g	wf	n	SSS out of water 13:45 - 14:06	

15/05/2025	Heleen Middel	8.15	8.25	50	50.84	50	10	8.45	132.0	50	50.42	10	7.82	10	48.30	3.7	3.6	3	0	g	af	n
15/05/2025	Heleen Middel	8.46	7.18	50	46.48	50	10	6.1	128.0	50	41.27	10	4.70	10	4.70	4.70	4.70	3	0	g	af	n
15/05/2025	Heleen Middel	7.18	8.50	50	47.22	50	10	4.70		50	50.55	9	59.46	124.0	3.1	3.1	3.1	3	0	g	af	n
15/05/2025	Heleen Middel	10.45	11.27	50	55.10	9	51.77	50	56.62	9	48.48	10	48.48		3.6	3.6	3.6	4	0	g	wf	n
15/05/2025	Heleen Middel	11.27	11.42	50	56.62	9	48.48	50	57.14	9	47.34	10	47.34	126.0	3.7	3.7	3.7	4	0	g	wb	n
15/05/2025	Heleen Middel	12.00	12.08	50	57.78	128.0	9	45.98		50	57.78	9	43.23	124.0	3.0	3.0	3.0	4	0	g	wb	n
15/05/2025	Heleen Middel	12.47	13.18	50	59.40	9	42.53	124.0	51	0.11	9	41.55	125.0	2.2	2.2	2.2	4	0	g	wb	n	
15/05/2025	Heleen Middel	13.18	13.49	51	0.11	9	41.55	125.0	50	59.10	9	43.78	126.0	3.1	3.1	3.1	3	0	g	wf	n	
15/05/2025	Heleen Middel	15.08	16.06	50	56.38	9	49.61	127.0	50	54.65	9	53.35	124.0	3.4	3.4	3.4	3	0	g	wf	n	
15/05/2025	Heleen Middel	16.06	17.39	50	56.38	9	52.61	120.98	50	56.72	9	59.27	120.98	3.4	3.4	3.4	3	0	g	wf	n	
16/05/2025	Heleen Middel	5.03	6.21	50	57.56	50	46.35	130.0	50	54.93	9	52.06	130.0	3.5	3.5	3.5	2	0	g	n	n	
16/05/2025	Heleen Middel	6.21	7.02	50	54.93	9	52.06	130.0	50	53.28	9	55.07		3.6	3.6	3.6	2	0	g	sb	n	
16/05/2025	Heleen Middel	7.54	8.54	50	50.92	50	58.80	121.0	50	48.31	9	2.89		4.1	4.1	4.1	3	0	g	sb	n	
16/05/2025	Heleen Middel	10.30	11.03	50	44.01	50	5.81	131.0	50	42.60	10	11.73	133.0	4.1	4.1	4.1	3	0	g	wf	n	
16/05/2025	Heleen Middel	11.03	11.25	50	42.60	10	11.75	133.0	50	43.09	10	10.96	132.0	3.7	3.7	3.7	3	0	g	wf	n	
16/05/2025	Heleen Middel	12.34	13.37	50	40.91	10	14.82	124.0	50	38.19	10	19.13		3.5	3.5	3.5	3	0	g	wf	n	
16/05/2025	Heleen Middel	14.43	15.40	50	25.41	10	23.50	124.0	50	33.05	10	27.20		3.5	3.5	3.5	3	0	g	wf	n	
16/05/2025	Heleen Middel	15.40	15.60	50	33.05	10	27.20	161.0	50	29.33	10	28.39	164.0	3.8	3.8	3.8	4	0	g	wf	n	
16/05/2025	Heleen Middel	16.43	17.23	50	30.08	10	30.47	163.0	50	30.07	10	30.47		3.6	3.6	3.6	4	0	g	wf	n	
17/05/2025	Heleen Middel	4.59	5.55	50	41.11	10	14.48	141.0	50	38.88	10	17.95	162.0	4.0	4.0	4.0	2	0	g	n	n	
17/05/2025	Heleen Middel	5.55	6.06	50	38.88	10	17.95	152.0	50	38.88	10	20.03		3.5	3.5	3.5	2	0	g	sb	n	
17/05/2025	Heleen Middel	7.20	8.21	50	35.33	50	23.54	159.0	50	32.78	10	27.53	163.0	3.9	3.9	3.9	3	0	g	sb	n	
17/05/2025	Heleen Middel	8.21	8.31	50	32.78	10	27.53	163.0	50	32.28	10	28.24	163.0	3.9	3.9	3.9	3	0	g	sb	n	
17/05/2025	Heleen Middel	8.31	8.55	50	32.28	10	28.24	163.0	50	31.11	10	27.73	163.0	3.7	3.7	3.7	3	0	g	af	n	
17/05/2025	Heleen Middel	10.40	11.50	50	25.39	10	24.41	163.0	50	25.39	10	24.41	163.0	3.2	3.2	3.2	3	0	g	af	n	
17/05/2025	Heleen Middel	13.48	14.36	50	27.60	10	33.27	162.0	50	29.84	10	30.55	162.0	3.9	3.9	3.9	5	0	g	wb	n	
18/05/2025	Heleen Middel	5.02	6.06	50	23.78	10	34.96	124.0	50	27.43	10	33.87	166.0	4.0	4.0	4.0	4	0	g	n	n	
18/05/2025	Heleen Middel	6.06	6.30	50	27.43	10	33.87	166.0	50	26.68	10	33.08		4.0	4.0	4.0	5	0	g	vf	n	
18/05/2025	Heleen Middel	8.30	7.12	50	26.68	10	33.08	164.0	50	31.11	10	30.42	163.0	3.1	3.1	3.1	5	0	g	vf	n	
18/05/2025	Heleen Middel	7.54	8.50	50	32.48	10	28.46	164.0	50	34.77	10	24.86	161.0	3.8	3.8	3.8	5	0	g	vf	n	
18/05/2025	Heleen Middel	10.37	11.06	50	39.32	10	17.69	150.0	50	40.45	10	15.92		3.7	3.7	3.7	5	0	g	af	n	
18/05/2025	Heleen Middel	14.14	16.02	50	38.89	10	17.83	149.0	50	34.52	10	24.55	124.0	3.8	3.8	3.8	4	0	g	af	n	
19/05/2025	Heleen Middel	10.32	17.35	50	33.17	10	26.65	160.0	50	26.65	10	29.53	163.0	3.8	3.8	3.8	4	0	g	af	n	
19/05/2025	Heleen Middel	4.56	5.05	50	21.87	10	35.25	164.0	50	21.84	10	36.99	164.0	3.8	3.8	3.8	2	0	g	wb	n	
19/05/2025	Heleen Middel	5.05	5.38	50	21.84	10	36.99	164.0	50	22.64	10	34.63	163.0	3.8	3.8	3.8	2	0	g	vf	n	
19/05/2025	Heleen Middel	5.38	6.30	50	22.64	10	34.63	163.0	50	21.16	10	38.92		3.7	3.7	3.7	2	0	g	vb	n	
19/05/2025	Heleen Middel	7.38	8.57	50	20.11	50	18.94	164.0	50	18.94	10	18.94	163.0	3.8	3.8	3.8	2	0	g	vb	n	
19/05/2025	Heleen Middel	8.35	8.54	50	18.94	10	18.60	164.0	50	18.60	10	51.96		3.7	3.7	3.7	2	0	g	sb	n	
19/05/2025	Heleen Middel	10.59	12.04	50	18.81	10	50.47	211.0	50	20.07	10	44.05	183.0	3.9	3.9	3.9	3	0	g	wf	n	
19/05/2025	Heleen Middel	12.04	12.37	50	20.07	10	44.05	183.0	50	20.67	10	40.98		4.0	4.0	4.0	3	0	g	n	n	
19/05/2025	Heleen Middel	12.56	13.48	50	21.06	10	39.01	50	22.49	10	34.29	162.0	3.7	3.7	3.7	3	0	g	wb	n		
19/05/2025	Heleen Middel	14.29	16.01	50	21.57	10	37.85	163.0	50	19.69	10	46.66	191.0	3.8	3.8	3.8	3	0	g	wf	n	
19/05/2025	Heleen Middel	16.26	17.24	50	19.20	10	49.23	202.0	50	18.16	10	54.96	283.0	3.8	3.8	3.8	3	0	g	af	n	
19/05/2025	Heleen Middel	17.24	18.15	50	18.16	10	54.96	283.0	50	17.52	10	58.76	318.0	4.0	4.0	4.0	3	0	g	af	n	
20/05/2025	Heleen Middel	5.03	5.30	50	20.19	10	42.79	167.0	50	20.19	10	40.48	167.0	4.0	4.0	4.0	4	0	g	n	n	
20/05/2025	Heleen Middel	16.57	17.31	50	18.74	11	24.42	1160.0	50	18.58	11	23.73	1277.0	2.5	2.5	2.5	3	0	g	n	n	
20/05/2025	Heleen Middel	17.31	17.47	50	18.58	11	23.73	1277.0	50	18.45	11	22.37	1124.0	3.4	3.4	3.4	3	0	g	n	n	
23/05/2025	Heleen Middel	6.56	7.27	50	51.25	9	56.68	126.0	50	54.23	9	52.23	126.0	7.6	7.6	7.6	3	0	g	n	n	
23/05/2025	Heleen Middel	7.27	8.12	50	54.23	9	52.23	126.0	50	51.25	9	49.97	129.4	8.1	8.1	8.1	3	0	g	n	n	
23/05/2025	Heleen Middel	13.21	13.54	51	6.94	9	26.53	123.0	51	9.40	9	20.73	114.0	8.6	8.6	8.6	3	0	g	n	n	
23/05/2025	Heleen Middel	13.54	14.01	51	9.40	9	20.73	114.0	51	9.77	9	19.83	115.0	4.3	4.3	4.3	3	0	g	n	n	
23/05/2025	Heleen Middel	14.01	14.28	51	9.77	9	19.83	115.0	51	10.02	9	19.50	115.0	2.0	2.0	2.0	3	0	g	n	n	
23/05/2025	Heleen Middel	14.28	14.48	51	10.02	9	19.50	113.0	51	10.02	9	19.50	113.0	2.0	2.0	2.0	3	0	g	n	n	
23/05/2025	Heleen Middel	19.00	19.23	51	17.74	9	9.29	103.0	51	20.08	9	6.27		8.1	8.1	8.1	5	0	g	n	n	
23/05/2025	Heleen Middel	19.23	19.33	51	20.08	9	6.27	51	20.37	9	5.91		2.2	2.2	2.2	5	0	g	n	n		
23/05/2025	Heleen Middel	19.33	19.38	51	20.37	9	5.91	51	20.60	9	5.79		2.0	2.0	2.0	5	0	g	n	n		
23/05/2025	Heleen Middel	19.39	20.00	51	20.60	9	5.79	103.0	51	21.38	9	4.91	100.0	2.5	2.5	2.5	5	0	g	n	n	
08/06/2025	Claudia di Petta	17.03	18.03	51	47.58	8	15.59	30.0	51	40.61	8	16.41	67.0	7.3	7.3	7.3	4	0	g	wf	n	
08/06/2025	Claudia di Petta	18.03	19.12	51	40.61	8	16.41	47.3	51	35.50	8	27.09	40.5	7.4	7.4	7.4	4	0	g	n	n	
09/06/2025	Claudia di Petta	10.58	10.58	50	32.99	10	41.92	50	29.87	10	48.28	206.8	7.0	7.0	7.0	3	0	g	n	n		
09/06/2025	Claudia di Petta	11.25	11.25	50	54.18	10	30.98	309.8	50	54.18	10	58.08	333.33	6.9	6.9	6.9	4	0	g	n	n	
09/06/2025	Claudia di Petta	11.25	12.15	50	25.33	10	58.08	364.5	50	21.90	11	5.40		6.7	6.7	6.7	4	0	g	n	n	
09/06/2025	Claudia di Petta	12.15	13.28	50	21.90	11	5.40		50	17.70	11	13.83	364.9	1.9	1.9	1.9	5	0	g	af	n	
09/06/2025	Claudia di Petta	13.28	13.49	50	17.70	11	13.83	364.9	50	17.70	11	14.67	355.8	2.7	2.7	2.7	5	0	g	n	n	
09/06/2025	Claudia di Petta	13.48	14.00	50	17.91	11	14.67	355.8	50	17.95	11	15.56	890.1	2.9	2.9	2.9	5	0	g	n	n	
09/06/2025	Claudia di Petta	15.00	17.00	50	18.06	11	19.80	1077.8	50	18.33	11	23.92	1261.3	2.6	2.6	2.6	5	0	g	n	n	
09/06/2025	Claudia di Petta	16.00	16.45	5																		

11/06/2025	Claudia di Petta	7:18	7:40	50	18,85	11	35,19	50	18,85	11	33,79	1572,8	2,1	w	n			
11/06/2025	Claudia di Petta	8:10	8:10	50	18,85	11	35,19	50	18,85	11	33,79	1572,8	2,1	w	n			
11/06/2025	Claudia di Petta	9:10	10:00	50	18,20	11	17,13	50	18,20	11	17,13	1580,0	7,1	sf	n			
11/06/2025	Claudia di Petta	10:00	10:43	50	18,53	11	22,81	50	18,53	11	22,95	1197,8	3,1	sf	n			
11/06/2025	Claudia di Petta	11:32	12:30	50	18,57	11	20,72	50	18,06	11	16,54	932,9	6,1	sf	n		Geotechnical coring	
11/06/2025	Claudia di Petta	12:30	13:15	50	18,06	11	16,54	50	18,57	11	13,85	910,0	0,5	sf	n		Geotechnical coring	
11/06/2025	Claudia di Petta	14:10	15:14	50	17,43	11	8,29	50	17,48	11	3,83	490,0	0,4	sf	n		Geotechnical coring	
11/06/2025	Claudia di Petta	15:14	16:14	50	17,48	11	3,83	50	17,53	10	58,96	332,8	6,5	sf	n		Geotechnical coring	
11/06/2025	Claudia di Petta	16:14	17:17	50	17,53	10	58,96	50	17,55	10	59,07	332,2	0,3	sf	n		Geotechnical coring, PW7 for next geophysical line	
11/06/2025	Claudia di Petta	17:17	17:44	50	17,44	10	59,07	50	17,45	10	59,39	350,0	1,3	sf	n		Deployment geophysical equipment	
11/06/2025	Claudia di Petta	17:54	18:14	50	18,18	10	59,39	50	17,84	10	57,73	319,5	1,7	sf	n		SS	
11/06/2025	Claudia di Petta	18:14	18:14	50	17,84	10	57,73	50	17,84	10	57,73	319,5	3,3	sf	n		FP	
13/06/2025	Claudia di Petta	7:32	8:32	50	18,57	11	23,13	50	18,69	11	26,55	1340,0	1,0	sf	n		CPT	
13/06/2025	Claudia di Petta	8:32	9:30	50	18,69	11	26,55	50	18,69	11	26,55	1340,0	0,5	sf	n		CPT	
13/06/2025	Claudia di Petta	9:30	10:30	50	18,69	11	26,55	50	18,83	11	29,95	1476,6	0,3	sf	n		CPT	
13/06/2025	Claudia di Petta	10:30	10:52	50	18,83	11	29,95	50	18,83	11	29,95	1476,6	0,3	sf	n		CPT	
13/06/2025	Claudia di Petta	11:54	12:57	50	18,92	11	29,95	50	18,83	11	29,07	1443,9	0,9	sf	n		CPT	
13/06/2025	Claudia di Petta	12:57	14:00	50	18,80	11	29,07	50	18,80	11	28,18	1398,0	0,5	sf	n		Geotechnical coring	
13/06/2025	Claudia di Petta	15:15	16:15	50	20,49	11	15,38	50	22,02	11	4,89	350,0	6,1	sf	n		Transect	
13/06/2025	Claudia di Petta	16:15	16:50	50	22,02	11	4,89	50	22,57	10	58,83	305,0	7,0	sf	n		Transect	
13/06/2025	Claudia di Petta	19:07	19:27	50	23,86	10	58,83	50	23,86	10	58,83	305,0	6,2	sf	n		SS	
13/06/2025	Claudia di Petta	19:27	19:27	50	24,10	10	35,92	50	24,10	10	35,92	110,2	2,5	sf	n		SS USBL	
13/06/2025	Claudia di Petta	19:27	19:27	50	24,26	10	34,60	50	24,26	10	34,60	167,8	0,4	sf	n		FP USBL	
14/06/2025	Claudia di Petta	7:43	8:43	50	32,36	10	28,23	50	33,92	10	25,83	161,6	0,3	sf	n		CPT	
14/06/2025	Claudia di Petta	8:43	9:43	50	33,92	10	25,83	50	33,92	10	25,83	161,6	0,3	sf	n		CPT	
14/06/2025	Claudia di Petta	10:18	11:01	50	35,34	10	23,23	50	37,46	10	20,35	153,2	4,6	sf	n		CPT, abandon ship drill at 10:00h	
14/06/2025	Claudia di Petta	11:37	12:35	50	37,39	10	20,33	50	38,77	10	18,21	150,2	0,4	sf	n		CPT	
14/06/2025	Claudia di Petta	12:35	13:35	50	38,77	10	18,21	50	40,27	10	15,80	145,9	0,5	sf	n		CPT	
14/06/2025	Claudia di Petta	13:35	14:00	50	40,27	10	15,80	50	41,37	10	14,06	139,8	0,4	sf	n		CPT	
14/06/2025	Claudia di Petta	14:25	15:25	50	41,96	10	13,36	50	43,48	10	10,77	133,1	0,3	sf	n		CPT	
14/06/2025	Claudia di Petta	15:25	16:25	50	43,48	10	10,77	50	44,93	10	7,84	129,7	1,0	sf	n		CPT	
14/06/2025	Claudia di Petta	16:25	17:00	50	44,93	10	7,84	50	46,81	10	5,59	126,2	5,0	sf	n		CPT	
15/06/2025	Claudia di Petta	8:07	9:05	50	58,52	9	41,36	50	59,83	9	41,36	125,8	0,3	sf	n		CPT	
15/06/2025	Claudia di Petta	9:05	10:07	50	59,80	9	41,36	50	125,9	51	0,65	9	39,60	124,9	1,2	sf	n	CPT
15/06/2025	Claudia di Petta	10:07	10:55	51	0,65	9	39,60	50	124,9	51	0,98	9	38,17	127,1	5,1	sf	n	CPT
15/06/2025	Claudia di Petta	11:35	12:30	51	0,82	9	37,95	50	124,4	51	1,73	9	35,77	122,9	3,6	sf	n	CPT
15/06/2025	Claudia di Petta	12:30	13:30	51	1,73	9	35,77	50	122,9	51	2,78	9	32,42	122,3	1,0	sf	n	CPT
15/06/2025	Claudia di Petta	13:30	14:00	51	2,78	9	32,42	51	3,65	9	29,86	121,4	3,1	sf	n		CPT	
15/06/2025	Claudia di Petta	14:30	15:30	51	3,75	9	29,63	50	121,6	51	4,85	9	27,35	121,5	0,3	sf	n	CPT
15/06/2025	Claudia di Petta	15:30	16:38	51	4,85	9	27,35	50	121,5	51	6,29	9	25,97	121,2	0,1	sf	n	CPT
15/06/2025	Claudia di Petta	16:38	17:00	51	6,29	9	25,97	50	121,2	51	7,07	9	24,57	117,3	2,7	sf	n	CPT
16/06/2025	Claudia di Petta	7:18	8:20	51	26,67	9	3,44	50	72,0	51	26,62	9	3,68	72,8	2,9	sf	n	CPT
16/06/2025	Claudia di Petta	8:20	9:20	51	26,62	9	3,68	50	72,8	51	31,10	9	1,23	42,6	0,1	sf	n	CPT
16/06/2025	Claudia di Petta	9:20	10:20	51	31,10	9	1,23	50	42,6	51	33,08	9	0,13	19,6	4,8	sf	n	CPT
16/06/2025	Claudia di Petta	10:20	10:57	51	33,08	9	0,13	50	42,6	51	33,08	9	0,85	31,4	2,0	sf	n	CPT
16/06/2025	Claudia di Petta	11:38	12:30	51	30,08	9	0,65	50	46,8	51	28,17	9	3,08	58,6	0,3	sf	n	CPT
16/06/2025	Claudia di Petta	12:30	13:05	51	28,17	9	3,08	50	58,6	51	26,39	9	3,70	72,1	0,2	sf	n	CPT, PW9, interrupted due to Sighting 38
16/06/2025	Claudia di Petta	13:05	13:36	51	26,39	9	3,70	50	72,1	51	22,92	9	4,94	92,5	7,2	sf	n	PW9 restarted
16/06/2025	Claudia di Petta	13:36	13:58	51	22,92	9	4,94	50	72,1	51	22,44	9	5,06	94,9	2,2	sf	n	SS
16/06/2025	Claudia di Petta	13:56	14:00	51	22,44	9	5,06	50	94,9	51	22,36	9	5,06	95,6	1,3	sf	n	FP
16/06/2025	Claudia di Petta	14:28	15:30	51	20,78	9	9,9	50	99,6	51	21,59	9	4,99	98,6	4,0	sf	n	Geophysical
16/06/2025	Claudia di Petta	15:30	15:40	51	21,59	9	4,99	50	99,6	51	22,07	9	4,99	98,8	4,1	sf	n	Geophysical
16/06/2025	Claudia di Petta	15:40	16:40	50	9,9	9	99,6	50	18,58	99,6	4	15,97	229,9	7,1	sf	n	All equipment off and onboard, transit to Segm 1	
16/06/2025	Claudia di Petta	16:40	17:01	51	18,58	9	12,97	50	16,97	9	15,97	229,9	7,1	sf	n	Transect		
17/06/2025	Claudia di Petta	4:15	5:15	50	21,70	11	1,99	50	490,0	50	17,11	11	8,80	630,0	7,3	sf	n	PW10
17/06/2025	Claudia di Petta	5:15	6:00	50	17,11	11	8,80	50	17,43	11	8,04	615,2	2,6	sf	n		SS SBES	
17/06/2025	Claudia di Petta	6:38	6:38	50	17,43	11	8,04	50	17,51	11	5,55	546,4	0,6	sf	n		FP, CPT rod alignment	
17/06/2025	Claudia di Petta	6:38	7:30	50	17,51	11	5,85	50	17,42	11	8,14	619,1	3,1	sf	n		CPT	
17/06/2025	Claudia di Petta	7:50	8:50	50	17,28	11	7,76	50	17,19	11	4,58	499,0	5,0	sf	n		wf	
17/06/2025	Claudia di Petta	9:50	10:50	50	17,19	11	4,58	50	17,58	11	1,23	388,1	0,1	sf	n		wf	
17/06/2025	Claudia di Petta	9:50	10:50	50	17,36	11	1,23	50	17,52	10	58,96	332,2	0,3	sf	n		CPT	
17/06/2025	Claudia di Petta	10:50	11:00	50	17,52	10	58,96	50	17,51	10	58,86	328,1	0,2	sf	n		CPT	
17/06/2025	Claudia di Petta	12:51	14:06	50	24,98	10	44,12	50	30,98	10	32,47	287,0	7,5	sf	n		Transit to port	
17/06/2025	Claudia di Petta	14:06	14:10	50	30,98	10	44,12	50	30,98	10	32,47	287,0	7,5	sf	n		wf	
17/06/2025	Claudia di Petta	14:52	15:40	50	34,66	10	25,37	50	38,64	10	17,60	135,0	7,9	sf	n		sb	
23/06/2025	Claudia di Petta	15:41	16:40	51	53,87	8	23,28	50	51,07	8	15,80	15,0	7,7	sf	n		Leaving port	
23/06/2025	Claudia di Petta	16:40	17:00	51	50,27	8	15,80	50	51,47	8	15,64	16,9	7,9	sf	n		sb	
23/06/2025	Claudia di Petta	17:25	18:23	51	44,62	8	7,5	50	42,1	8	19,62	42,1	7,5	sf	n		Sighting #39	
23/06/2025	Claudia di Petta	18:25	18:41	51	38,79	8	19,62	50	42,0	8	22,00	57,0	7,7	sf	n		sb	
23/06/2025	Claudia di Petta	18:41	18:52	51	37,55	8	22,00	50	57,0	8	23,82	56,0	7,6	sf	n		sb	
23/06/2025	Claudia di Petta	18:52	19:30	51	36,62	8	23,82	50	56,0	8	27,73	53,0	7,8	sf	n		Strong rain, stopped watch	

25/06/2025	Claudia di Petta	10:23	10:23	50	20:25	10	43.47	178.1	50	20:25	10	43.47	178.1	0.3	sw	4	o	m	n	n	
25/06/2025	Claudia di Petta	11:27	12:30	50	20:55	10	42.31	175.9	50	21:05	10	40.20	172.1	0.5	sw	4	o	m	n	m	
25/06/2025	Claudia di Petta	12:30	12:54	50	21:05	10	40.20	172.1	50	21:05	10	36.95	165.6	5.1	sw	4	o	m	n	m	
25/06/2025	Claudia di Petta	12:54	14:00	50	21:09	10	36.95	165.6	50	22:16	10	35.89	164.4	5.2	sw	4	o	g	n	n	
25/06/2025	Claudia di Petta	15:00	16:00	50	22:23	10	35.80	163.9	50	22:01	10	35.80	163.3	0.4	sw	4	o	g	af	n	
25/06/2025	Claudia di Petta	16:00	17:00	50	22:01	10	35.80	163.3	50	22:02	10	35.76	163.8	0.9	sw	4	o	g	af	n	
25/06/2025	Claudia di Petta	17:30	18:30	50	22:03	10	35.14	163.0	50	22:03	10	34.55	163.0	0.7	sw	4	o	g	n	n	
25/06/2025	Claudia di Petta	18:30	18:30	50	22:03	10	34.55	163.0	50	22:03	10	34.55	163.0	0.9	sw	4	o	p	n	s	
28/06/2025	Claudia di Petta	5:05	5:35	51	30:82	9	0.82	37.0	51	30:74	9	0.08	50.0	3.0	sw	4	o	m	n	n	
28/06/2025	Claudia di Petta	5:35	5:55	51	30:74	9	0.08	50.0	51	30:78	9	0.05	42.0	0.8	sw	4	o	m	wb	n	
28/06/2025	Claudia di Petta	9:56	11:00	51	30:78	9	0.76	37.0	51	30:72	9	0.09	30.0	2.3	sw	4	o	m	wf	n	
28/06/2025	Claudia di Petta	12:27	13:28	51	30:72	9	0.09	37.0	51	30:72	9	0.09	36.0	0.4	sw	4	o	g	sb	n	
28/06/2025	Claudia di Petta	13:28	14:41	51	30:72	9	0.09	36.0	51	30:72	9	0.09	37.0	0.2	sw	4	o	g	n	n	
28/06/2025	Claudia di Petta	14:41	14:50	51	30:72	9	0.09	37.0	51	30:72	9	0.09	37.0	0.4	sw	4	o	m	n	n	
28/06/2025	Claudia di Petta	15:30	16:05	51	30:72	9	0.09	36.0	51	31:48	8	60.00	39.8	0.4	sw	4	o	m	n	n	
28/06/2025	Claudia di Petta	16:05	16:05	51	31:48	8	60.00	39.8	51	31:48	8	60.00	39.8	3.3	sw	4	o	p	n	n	Heavy fog
29/06/2025	Claudia di Petta	11:32	12:30	51	19:55	9	5.10	89.5	51	19:07	9	5.24	101.3	3.6	sw	4	o	m	wb	n	No effort during the morning due to heavy fog, zero
29/06/2025	Claudia di Petta	12:30	13:30	51	19:07	9	5.24	101.3	51	17:29	9	7.66	101.0	0.7	sw	4	o	g	wb	n	
29/06/2025	Claudia di Petta	13:30	14:01	51	17:29	9	7.66	101.0	51	15:46	9	10:02	105.0	5.1	sw	4	o	g	n	n	
29/06/2025	Claudia di Petta	14:01	14:01	51	15:46	9	10:02	105.0	51	15:46	9	10:02	105.0	0.9	sw	4	o	m	n	n	Moderate to poor visibility, heavy fog
29/06/2025	Claudia di Petta	14:35	15:35	51	15:41	9	10:02	104.8	51	13:33	9	14:67	104.2	4.9	sw	4	o	m	wb	n	
30/06/2025	Claudia di Petta	9:19	10:10	51	4:42	9	28.24	121.7	51	4:46	9	27.83	121.6	0.8	s	4	o	g	n	n	
30/06/2025	Claudia di Petta	10:10	11:00	51	4:46	9	27.83	121.6	51	4:27	9	28.54	122.3	1.7	s	4	o	g	n	n	
30/06/2025	Claudia di Petta	12:55	14:00	51	4:18	9	28.64	122.5	51	2:68	9	33.57	117.0	0.3	s	4	o	g	n	n	
30/06/2025	Claudia di Petta	14:00	15:00	51	2:68	9	33.57	117.0	51	1:26	9	37.69	123.4	5.1	s	4	o	g	n	n	
30/06/2025	Claudia di Petta	15:00	16:05	51	1:26	9	37.69	123.4	51	1:93	9	36.64	120.9	0.3	s	4	o	g	n	n	
01/07/2025	Claudia di Petta	12:20	13:20	50	59:83	9	41.21	126.8	50	59:30	9	43.05	127.6	5.9	nw	3	o	g	n	n	
01/07/2025	Claudia di Petta	13:20	14:20	50	59:30	9	43:05	127.6	50	59:30	9	43:05	126.5	0.5	nw	3	o	g	af	n	
01/07/2025	Claudia di Petta	14:20	15:21	50	59:30	9	43:05	126.5	50	59:29	9	49.40	128.4	0.5	nw	3	o	n	af	n	
01/07/2025	Claudia di Petta	15:21	16:20	50	56:29	9	49:40	128.4	50	55:83	9	50:39	128.5	5.7	nw	4	o	g	af	n	
01/07/2025	Claudia di Petta	16:20	17:00	50	55:83	9	50:39	128.5	50	55:86	9	50:39	128.8	1.0	n	3	o	g	sb	n	
01/07/2025	Claudia di Petta	17:27	18:30	50	54:27	9	52:79	126.8	50	52:03	9	57:35	122.6	6.0	nw	4	o	g	af	n	
01/07/2025	Claudia di Petta	18:30	19:30	50	52:03	9	57:35	122.6	50	52:03	9	57:35	122.6	0.6	nw	4	o	g	af	n	
02/07/2025	Claudia di Petta	6:30	7:30	50	22:07	10	36:07	164.8	50	22:12	10	35:41	164.6	0.2	nw	4	o	g	wf	n	
02/07/2025	Claudia di Petta	7:30	8:38	50	22:12	10	35:41	164.6	50	24:52	10	30:77	135.0	0.9	nw	4	o	g	wf	n	
02/07/2025	Claudia di Petta	8:38	9:32	50	24:52	10	30:77	135.0	50	26:95	10	26:51	134.0	4.2	nw	4	o	g	af	n	Transit to port
02/07/2025	Claudia di Petta	9:32	10:00	50	26:95	10	28:27	134.0	50	28:27	10	24:40	134.0	4.3	nw	4	o	g	af	n	

Appendix IV – JIP MWO Recording Sightings Form

Table 12. Overview of all visual marine mammal sightings recorded during the survey conducted under Licence MUL230031 from the RV Ocean Invincible.

All observations were made visually; no acoustic monitoring was undertaken during this project. No sightings occurred during pre-watch periods, and no mitigation actions were required in response to any sightings. Direction of travel is recorded relative to vessel movement: t = towards ship, a = away, s = parallel (same direction), o = parallel (opposite direction), c = crossing ahead, v = variable, m = milling, i = stationary, x = other, u = unknown. Airgun/source activity is indicated as: f = full power, s = soft start, r = reduced power, n = not firing.

Sighting number	Date	Time at start of encounter (UTC)	Time at end of encounter (UTC)	How were the animals first detected?	Observer's name	Position lat and long (degrees, minutes, seconds)	Position north-south (degrees, minutes, seconds)	Position east-west (degrees, minutes, seconds)	Water depth (metres)	Species or species group	Description	Bearing	Range (km)	Total number of adults (visual sightings only)	Number of juveniles (visual sightings only)	Number of calves (visual sightings only)	Photo taken	Behaviour (visual sightings only)	Direction of travel (relative to ship)	Direction of travel (compass points)	Airgun/ source activity when animals last detected	Airgun/ source activity when animals last detected	Closest distance from animals (metres)	Time of closest approach (UTC)	What action was taken?	Comments
01	08/05/2025	6:34	6:41		Heleen Middeld	51° 27.71'n	9° 03.03'w	58.0	Minkie whale	small baleen whale, tall sickle-shaped dorsal, rounded surfacing	210	1400	1	0	0	0	0	travelling	s	sw	n	n		6:34 n		
02	08/05/2025	7:16	7:18		Heleen Middeld	51° 26.00'n	9° 00.06'w	51.0	Minkie whale	small baleen whale, tall sickle-shaped dorsal, rounded surfacing	260	10	1	0	0	0	0	only saw one surfacing	s	sw	n	n		7:18 n		
03	08/05/2025	7:28	7:29		Heleen Middeld	51° 26.28'n	9° 00.57'w	44.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	310	100	12	0	0	0	0	travelling	s	sw	n	n				
04	08/05/2025	7:35	8:42		Heleen Middeld	51° 26.01'n	9° 00.11'w	33.0	Dolphin	to fins, dark above, small dorsal with falcate dorsal	90	2000	0	0	0	0	0	travelling	s	sw	n	n				
05	08/05/2025	12:05	12:09		Heleen Middeld	51° 26.28'n	9° 24.59'w		Dolphin	small dolphins	19	1800	7				0	fast travel, surface active	s	sw	n	n		1300	12:09	first sighted by splashes
06	08/05/2025	12:41	12:43		Heleen Middeld	51° 26.77'n	9° 31.77'w		Minkie whale	small baleen whale, tall sickle-shaped dorsal, rounded surfacing	290	400	1	1	0	0	0	only saw one surfacing	s	sw	n	n		2143		
07	08/05/2025	12:43	12:48		Heleen Middeld	51° 26.77'n	9° 31.77'w		Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	250	500	17				0	slow swimming, intermittent approach/away from ship	s	sw	n	n		205	12:48	
08	08/05/2025	12:54	13:07		Heleen Middeld	51° 26.36'n	9° 3.65'w	99.0	Dolphin	long pointy beak, tall falcate dorsal fin	118	1800	2				0	surface active, porpoising towards ship	s	sw	n	n		700	13:06	
09	08/05/2025	13:02	13:02		Heleen Middeld	51° 26.36'n	9° 3.65'w		Minkie whale	small baleen whale, tall sickle-shaped dorsal	130	1700	1	1	0	0	0	one surfacing, seen near dolphins in S23	s	sw	n	n		700	13:02	
10	08/05/2025	13:20	13:23		Heleen Middeld	51° 26.30'n	9° 4.57'w	99.0	Dolphin	small cetacean, pointy beak, falcate dorsal	280	1100	6				0	slow travel	s	sw	n	n		1100	13:20	
11	08/05/2025	13:24	13:28		Heleen Middeld	51° 26.79'n	9° 4.57'w	99.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	600	450	12				0	porpoising	s	sw	n	n		400	13:28	
12	08/05/2025	13:49	13:54		Heleen Middeld	51° 23.57'n	9° 4.58'w	88.0	Dolphin	small dolphins, falcate dorsal, looked dark in glare	330	250	11				0	head slap	s	sw	n	n		50	13:50	
13	08/05/2025	13:57	14:10		Heleen Middeld	51° 24.30'n	9° 4.56'w	81.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	340	50	68				0	fast swimming, boarding, following ship	s	sw	n	n		10	13:58	
14	08/05/2025	14:12	14:16		Heleen Middeld	51° 26.02'n	9° 3.80'w	91.0	Common dolphin	small dolphins, chelion coloration on back, white band on dark eye patch	20	300	6				0	slow swimming	s	sw	n	n				
15	08/05/2025	14:48	14:49		Heleen Middeld	51° 26.80'n	9° 1.00'w	56.7	Minkie whale	small baleen whale, chelion coloration on back, white band on	19	20	1	1			0	sectoral fin	s	sw	n	n		25	14:48	
16	10/05/2025	7:33	7:37		Heleen Middeld	51° 26.45'n	9° 2.53'w		Common dolphin	small cetacean, pointy beak, falcate dorsal, light coloration on flank	50	900	10				0	feeding (many birds around, rapid surfacing)	s	sw	n	n		800	7:35	
17	10/05/2025	7:35	7:37		Heleen Middeld	51° 26.47'n	9° 2.50'w		Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	340	200	3				0	travel	s	sw	n	n		700	7:36	
18	10/05/2025	7:37	11:38		Heleen Middeld	51° 27.77'n	9° 3.55'w	65.0	Minkie whale	small baleen whale, no spot, rounded surface, tall falcate dorsal fin	130	1400	1				0	travel	s	sw	n	n		800	11:37	
19	10/05/2025	11:49	11:59		Heleen Middeld	51° 27.28'n	9° 3.47'w	66.0	Minkie whale	small baleen whale, no spot, rounded surface, tall falcate dorsal fin	143	1700	1				0	travel	s	sw	n	n		700	11:57	
20	10/05/2025	12:23	12:32		Heleen Middeld	51° 26.32'n	9° 3.52'w	66.0	Minkie whale	small baleen whale, no spot, rounded surface, tall falcate dorsal fin	130	1700	1				0	travel	s	sw	n	n		700	12:30	
21	10/05/2025	13:39	13:41		Heleen Middeld	51° 31.20'n	9° 0.37'w	45.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal	360	10	4				0	travel, briefly boarding	s	sw	n	n		10	13:40	
22	11/05/2025	5:46	5:56		Heleen Middeld	51° 25.25'n	9° 4.70'w		Large baleen whale	tail spout	325	1600	1				0	feeding (many birds around, gangets shown)	s	sw	n	n		1400	5:49	
23	11/05/2025	5:50	6:28		Heleen Middeld	51° 25.40'n	9° 4.63'w		Fin whale	pointy, backswep dorsal, long body, tall narrow blow, showed tailback	357	2700	2	2			0	travel	s	sw	n	n		800	6:20	
24	11/05/2025	6:04	6:47		Heleen Middeld	51° 26.00'n	9° 4.08'w	79.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	340	3000	35				0	first porpoising, then joined the whales from S23, when closer to the ship started boarding. More and more dolphins joined in	s	sw	n	n		10	6:27	stayed with the ship 06:26-06:47 until EOL, ship turning
25	11/05/2025	6:14	6:17		Heleen Middeld	51° 26.56'n	9° 3.96'w		Fin whale	pointy, backswep dorsal, long body, tall narrow blow, showed tailback	80	2000	1	1			0	travel	s	sw	n	n		1500	6:16	
26	11/05/2025	6:31	6:47		Heleen Middeld	51° 27.30'n	9° 3.57'w	63.0	Fin whale	pointy, backswep dorsal, long body, tall narrow blow, showed tailback	35	900	2				0	travel, dolphins with them	s	sw	n	n		500	6:45	
27	14/05/2025	6:58	6:23		Heleen Middeld	51° 0.47'n	9° 38.15'w	130.0	Large baleen whale	high but weak blow, only showed tip of dorsal	225	3500	1				0	loosely, 1 weak blow every 3-4 minutes	s	sw	n	n		1000	6:20	
28	14/05/2025	6:24	6:32		Heleen Middeld	50° 59.57'n	9° 41.55'w	129.0	Bofferdorsea dolphin	large dolphins, mostly grey with darker dorsal cape and lighter underside, falcate dorsal fin, stubby beak	235	900	15				1	travel, porpoising	s	sw	n	n		700	6:30	
29	25/05/2025	17:00	17:04		Heleen Middeld	50° 18.63'n	11° 24.51'w	190.0	Pilot whale	mostly black body, large bulbous head, wide dorsal fin	250	150	4				0	travel	s	sw	n	n		150	17:00	
30	25/05/2025	17:35	18:07		Heleen Middeld	51° 11.84'n	9° 18.06'w	110.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	54	100	40				0	travel, some bow riding	s	sw	n	n		10	18:00	
31	25/05/2025	18:18	18:22		Heleen Middeld	51° 39.69'n	8° 28.39'w	44.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	169	50	3				0	briefly boarding	s	sw	n	n		15	18:20	
32	25/05/2025	18:12	18:18		Heleen Middeld	51° 29.05'n	8° 28.39'w	44.0	Atlantic white-sided dolphin	short beak, yellow blow towards tailback	230	100	5				0	travel, boarding	s	sw	n	n		10	18:16	
33	25/05/2025	18:42	18:44		Heleen Middeld	51° 41.37'n	8° 16.42'w	43.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	153	10	3	3	0	0	0	riding on wake	s	sw	n	n		10	18:42	
34	08/06/2025	18:00	18:01		Claudia & Petta	51° 51.82'n	8° 19.77'w	15.0	Harbour seal	dark color, round face, V shaped nostrils	80	50	1	1	0	0	0	swimming in the surface	s	sw	n	n		50	17:00	
35	08/06/2025	17:48	17:49		Claudia & Petta	51° 41.86'n	8° 14.68'w	43.0	Dolphin	falcate dorsal fin, dark grey color	50	10	1	1	0	0	0	travel, boarding	s	sw	n	n		10	18:40	
36	08/06/2025	17:57	17:57		Claudia & Petta	51° 41.07'n	8° 15.54'w	43.0	Dolphin	falcate dorsal fin, dark grey color	350	150	2	1	0	0	0	travel	s	sw	n	n		100	18:57	seen just once
37	18/06/2025	18:18	18:18		Claudia & Petta	51° 18.12'n	8° 19.77'w	15.0	Harbour seal	dark color, round face, V shaped nostrils	330	10	1	1	0	0	0	swimming underneath surface, briefly porpoising	s	sw	n	n		20	18:18	seen just once
38	18/06/2025	12:57	14:03		Claudia & Petta	51° 27.24'n	9° 3.95'w	66.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	90	20	4	4	0	0	0	breaching at 20m aside vessel, travelling fast	s	sw	n	n		20	18:21	
39	24/06/2025	12:20	17:21		Claudia & Petta	51° 39.01'n	8° 19.20'w	42.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	330	50	3	5	0	0	0	travel, porpoising	s	sw	n	n		20	18:21	
40	24/06/2025	4:10	6:13		Claudia & Petta	51° 39.23'n	8° 23.28'w	34.0	Common dolphin	hourglass coloration, yellow flank in front of dorsal, long pointy beak	290	150	2	2	0	0	0	travel, breaching, porpoising	s	sw	n	n		400	6:13	
41	28/06/2025	7:33	7:34		Claudia & Petta	51° 30.69'n	9° 0.69'w	40.0	Dolphin	falcate dorsal fin, dark grey color	180	400	1	0	0	0	0	breaching	s	sw	n	n		400	7:33	Seen twice

Appendix V – Sighting Images

Images of sightings recorded during the project. Not all sightings were photographed due to factors such as brief duration, distance from the vessel, or prioritisation of real-time data recording over photography.



Figure 8. Sighting #08 (Common dolphins), a. shows the yellow flank, b. shows the long pointy beak, and c. shows dorsal shape



Figure 9. Sighting #09 (Minke whale), a-c show surfacing sequence.



Figure 10. Sighting #13 (Common dolphins)



Figure 11. Sighting #17 (Common dolphins)



Figure 12. Sighting #16 (Common dolphins), a. shows the yellow flank, b. shows the long pointy beak, and c. shows dorsal shape



Figure 13. Sighting #18 (Minke whale)



Figure 14. Sighting #19 (Minke whale)

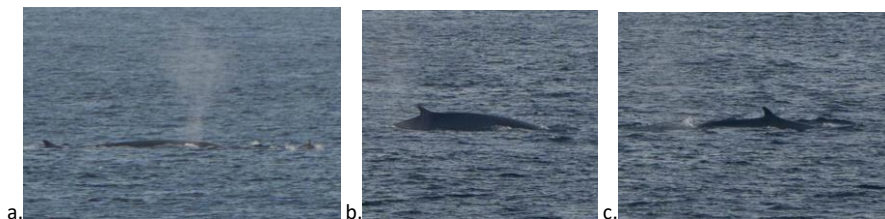


Figure 15. Sighting #23 (Fin whale), a-c show dive sequence, a shows size compared to common dolphins



Figure 16. Sighting #24 (Common dolphins)

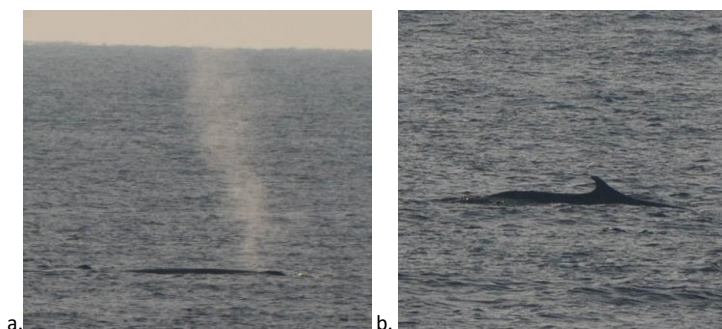


Figure 17. Sighting #25 (Fin whale), a. shows tall blow b. shows tailstock before dive



Figure 18. Sighting #26 (Fin whales), a and b show blow, dorsal fin, and size comparison with common dolphins



Figure 19. Sighting #27 (unidentified large baleen whale), a. shows tall blow, b. shows tip of dorsal fin, c. shows back

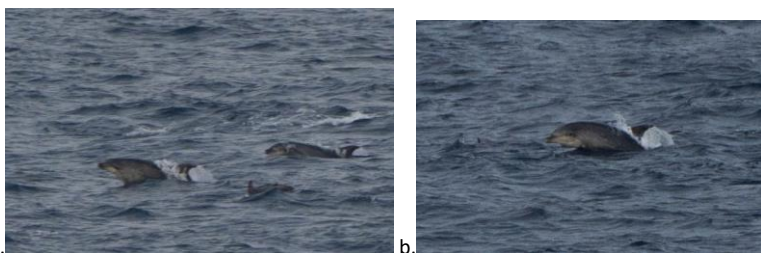


Figure 20. Sighting #28 (Bottlenose dolphins)



Figure 21. Sighting #30 (Common dolphins), a. and b. show typical common dolphin colouration

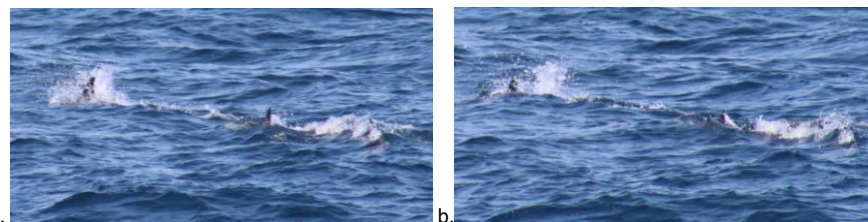


Figure 22. Sighting #38 (Common dolphins), a. and b.

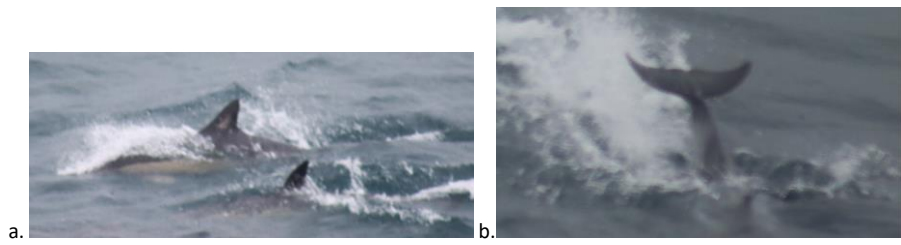


Figure 23. Sighting #39 (Common dolphins), a. and b.



Figure 24. Sighting #40 (Common dolphins), a. and b.