ENERGY ISLAND BORNHOLM

SCOPE OF WORK
WPF MARINE MAMMALS

ENERGINET

Project name	**Energy Island Bornholm**
Project no.	**3622100110**
Recipient	**Energinet.dk**
Document type	**Report**
Version	**V 5.0**
Date	**29-11-2022**
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Description	**Scoping report WPF Marine Mammals**

WSP DENMARK A/S

WSP.COM

Abbreviation	Explanation
BSH	Bundesamt für Seeschiffahrt und Hydrographie.
Client	Energinet
CMID	The Common Marine Inspection Document is a standard format for the inspection and auditing of offshore vessels.
C-POD	Click Porpoise Detector
Contractor	WSP with BioConsult SH as subcontractor
DEA	Danish Energy Agency
DEPA	Danish Environmental Protection Agency
EEZ	Exclusive Economic Zone
HAZID	Identification of hazards
ICES	International Council for the Exploration of the Sea
IMCA	International Marine Contractors Association
HSE	Health, Safety and Environment
mob/demob	Mobilization/demobilization
Pre-investigation area	Area which covers both windfarm areas and the area in between in Danish waters (Figure 3).
ODAS	Offshore Data Acquisition Systems
OHSAS	Occupational Health- and Safety Assessment Series
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
RAMS	Risk assessment and method statement
SEA	Strategic Environmental Assessment
Pre-investigation area in German waters	Area in German waters which in addition to the pre-investigation area in Danish waters is covered by the aerial survey transect design (Figure 3).
StUK4	Standard Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment

1 SUMMARY

Denmark plans to expand the production of energy from offshore wind by developing the so-called energy islands. These energy islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe. In the Baltic Sea, the energy islands project consists of two offshore wind farm areas,that will be constructed approximately 15 km south-southwest of the Danish island Bornholm, and electricity will be routed from the offshore wind farms to Bornhom. Bornholm will hence this, act as an electrical hub delivering electricity to grids on Zealand and neighbouring countries.

This report defines the scope of work for the environmental baseline investigations for WP-F Marine Mammals. The aim of the described study programme for the energy island on Bornholm in the Baltic Sea, Energioe Bornholm, is to determine the spatial and seasonal presence of marine mammals in order to assess the ecological importance of the pre-investigation area for marine mammals including transboundary effects in all directions (Germany, Sweden, Poland). As far as the planned export cable for the export of energy is within the pre-investigation area the monitoring programme provides data for the assessment of the impact of the export cable on marine mammals. Two different methods will be used to investigate the presence of marine mammals within the pre-investigation area: Digital aerial surveys using the HiDef video technique and passive acoustic monitoring (especially for Harbour Porpoises) by means of specialised click detectors (C-PODs). The digital aerial surveys identify not only Harbour Porpoises but also seals (Common and Grey Seal) as the only expected species in this area.

One of the major concerns regarding possible environmental conflicts is the eventual effect of the wind farm areas on the highly endangered Baltic Proper Harbour Porpoise (sub) population. Following the most recent literature (SAMBAH 2016, CARLÉN et al. 2018, CARLÉn et al. 2021) it is assumed that the areas of the windfarms are located in the winter transition zone of the Baltic Proper Harbour Porpoise and the Belt Sea Harbour Porpoise population (Figure 1).

Figure 1 **Approximate distributions of Harbour Porpoise populations in the Baltic Sea (after Sveegard et al. 2015, Carlén et al. 2018). Source: Carlén et al. 2021.**

Especially in regard to the question whether the two planned wind farm areass are part of the habitat of the highly threatened Baltic Proper Harbour Porpoise population or whether this area only is visited by animals from the Belt Sea, passive acoustic monitoring will be conducted. This monitoring will be done by establishing 15 monitoring stations with one C-POD deployed at each station. The C-POD on each station will be active for 24 months in order to cover all seasons and variations between years.

The digital aerial surveys serves to determine the abundance and spatial distribution of Habour Porpoises and seals within the pre-investigation area. Flights specifically planned for marine mammals will take place in July and August 2022. The data from these two flights and 14 further aerial surveys spread over two years and carried out as part of the resting bird monitoring will be used for the marine mammal monitoring of Work Package F.

2 INTRODUCTION

The energy islands mark the beginning of a new era for the generation of energy from offshore wind, aimed at creating a green energy supply for Danish and foreign electricity grids. Operating as green power plants at sea, the islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe.

After political agreement on the energy islands has been reached, the Danish Energy Agency plays a key role in leading the project that will transform the two energy islands from a vision to reality. The Energy island projects are pioneer projects that will necessitate the deployment of existing knowledge into an entirely new context.

In the Baltic Sea, the electrotechnical equipment will be placed on the island of Bornholm, where electricity from offshore wind farms will be routed to electricity grids on Zealand and neighbouring countries. The offshore wind farms will be constructed approximately 15 km south-southwest of the coast and will be visible, but not dominate the horizon. The turbines off the coast of Bornholm will have an installed production capacity of up to 3,8 GW including overplanting. The three planned windfarm areas for the Energy Island Bornholm are shown in Figure 2.

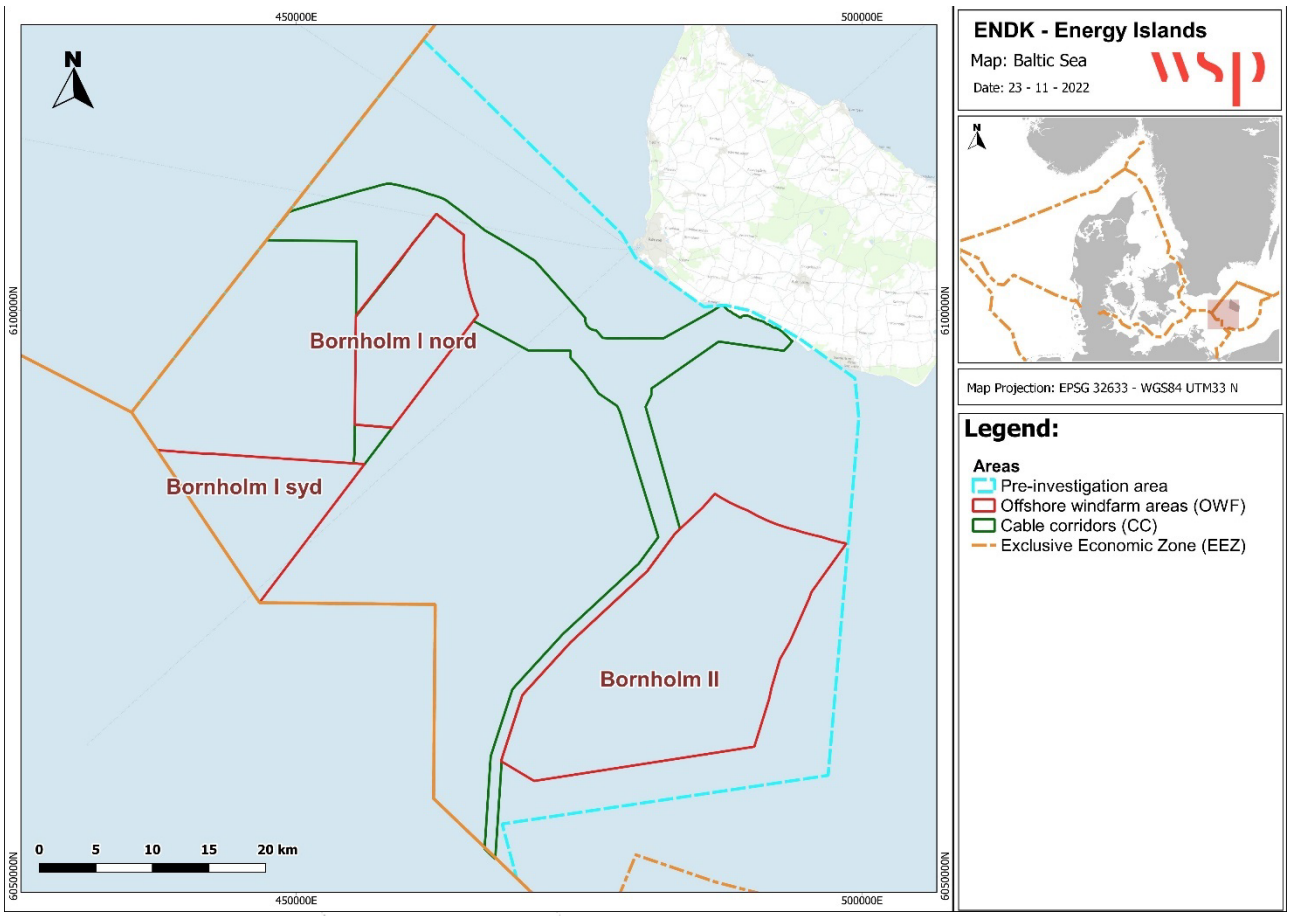

Figure 2 **Energy Island Bornholm.**

This report defines the scope of work for WP-F Marine Mammals. The aim of the monitoring is to evaluate the spatial and seasonal presence of marine mammals to assess the ecological importance of the pre-investigation area for marine mammals including transboundary effects in all directions (Germany, Sweden, Poland). The programme includes the assessment of possible effects of the export cable cable within the pre-investigation area. The scope of work is based on two different methods to investigate the presence of marine mammals within the project area.The proposed project area is known to be visited regularly by three different marine mammal species:

1. The Harbour Porpoise *(Phocoena phocoena*),
2. The Harbour Seal (*Phoca vitulina*) and
3. The Grey Seal (*Halichoerus grypus*)

Harbour Porpoise (*Phocoena phocoena*)
The Harbour Porpoise is the smallest cetacean species in Central Europe (BENKE et al. 1998) and widely distributed throughout the entire Northern Hemisphere. The life span of Harbour Porpoises is relatively short compared to other toothed whales, with few animals reaching an age of over 12 years (LOCKYER 2003). Females reach sexual maturity at an age of around five years (KESSELRING et al. 2017). It is the only cetacean species reproducing in the Baltic Sea. In the Baltic Sea, Harbour Porpoises can be subdivided into two management units which differ morphologically as well as partly genetically and can therefore be assumed to belong to two (sub)-populations, the Belt Sea- and the Baltic Proper populations (WIEMANN et al. 2010; LAH et al. 2016; TIEDEMANN et al. 2017).

According to recent findings, the delimitation line between the sub-populations is assumed to be located east of the Odra Bank (running from the Swedish mainland north of the island of Bornholm in south-eastern direction at a distance of about 30 km east of the island of Bornholm) during summer. From November to April no clear delimitation can be drawn between the management units since the animals are more dispersed in their distribution compared to summer (TEILMANN et al. 2017; CARLÉN et al. 2018) and the area between east of the island of Rügen in the west and Bornholm in the east is discussed as a so-called transition zone where animals of both management units occur (Figure 1, CARLÉN et al. 2021). Furthermore, GALLUS et al. (2012) and BENKE et al. (2014) discuss based on data from passive acoustic monitoring, that the transition zone (e.g. Pomeranian Bight) is used alternating, in winter by Harbour Porpoises of the Batic Proper sub-population and in summer by Harbour Porpoises from the Belt Sea sub-population.
The Harbour Porpoise as such is listed in the EU habitats directive, annexes II and IV (92/43/EEG). Furthermore the Baltic proper sub-population management unit is listed as “Critically endangered” by the International Union for Conservation of Nature, IUCN (BECKER et al. 2013).

According to the findings of the SAMBAH project, during which 304 C-PODs (Cetacean Porpoise Detectors) were deployed across the Baltic Sea from 2011 – 2013, the number of individuals of the Baltic Proper sub-population management unit during summer can be estimated to approx. 500 animals, so that regardless of the special protection status any disturbance or even removal of animals from this small population size can lead to the extinction of this sup-population. On the contrary, the abundance of individuals of the Belt Sea population is estimated to consist between twenty and fourty thousand Harbour Porpoises (SAMBAH 2016, VIQUERAT et al. 2014).

Harbour Seal (*Phoca vitulina)*
Harbour Seals can be found on many marine coastlines of the northern hemisphere and can be distinguished into genetically different sub-populations (ANDERSEN & OLSEN 2010). The 2016 NAMMCO

report stated an abundance of 1,000 animals in the southern Baltic population, and another 16,000 individuals in the Skagerrak and Kattegat area (CSWG 2016). For all populations, a positive trend of an increasing population size of up to 9 % per year was predicted after a massive reduction due to the Phocine Distemper Virus (PDV) breakouts in 1988 and 2002.

East of Bornholm Harbour Seals occur as far east as Gotland and the population here has achieved "good status" according to the indicator threshold values defined by HELCOM (2018). According to the Helcom core indicator report, good status is achieved "*when the distribution of seals is close to pristine conditions (e.g., 100 years ago), or, where appropriate, when currently available haul-out sites are occupied (modern baseline), and when no decrease in area of occupation occurs*". The population in the Western Baltic (e.g. west of Bornholm including the Belt Sea) has failed to achieve a "good status" so far. Since no known haul-out sites of Harbour Seals are within a distance of 100 km from the pre-investigaiton area, it is expected, that Harbour Seals are only rare visitors of the pre-investigation area.

Grey Seal (*Halichoerus grypus*)

The Grey Seal can be found on most coastal regions of the western Atlantic and in distinct more or less isolated sub-populations e.g., in the North Sea or the Baltic Sea (KLIMOVA et al. 2014; FIETZ et al. 2016). During the 20th century the population of Grey Seals in the Baltic Sea region suffered from extensive hunting and environmental toxins, reducing the population to 3,000 individuals in the 1970s (HARDING & HÄRKÖNEN 1999). Since then, the population has recovered and the population increase per year has reached about 6 % in recent years (CSWG 2016). Today, Grey Seals are evaluated as having achieved "good status" with regard to the area of occupancy, breeding and moulting sites east of Bornholm, including the Odrabank. In the area west of Bornholm including the Belt Sea, the key indicator failed to reach a "good status" (HELCOM 2018).

The only haul-out site within a distance of 100 km to the pre-investigation area is at Christiansoe, where more than 600 Grey Seals regularly rest. But the resting place is on the opposite side of Bornholm from the pre-investigation area, so the animals have to travel about 100 km to the pre-investigation area. Even though the pre-investigation area is within reach of regular feeding trips of Grey Seals, it is not expected to observe high numbers of Grey Seals.

Applied survey methods

Two different methods will be applied in order to collect as much information as possible on the presence and distribution of marine mammals in the area:

1. Digital aerial surveys by using HiDef video technique, and
2. Passive acoustic monitoring (especially for Harbour Porpoises) by means of specialised click detectors (C-PODs).

Both methods meet the international requirements in connection with ICES (International Council for the Exploration of the Sea) and OSPAR (Convention for the Protection of the Marine Environment of the North-East Atlantic). The methods are described in detail in the following chapters.

Experiences from digital aerial surveys between 2015 and 2020 in the area Adlergrund, which partly overlaps with the planned windfarm areas show that overall densities of marine mammals in this particular region is very low. It took on average >1,300 transect-km to detect at least one Harbour Porpoise and even additional kilometres to detect at least one seal. Even in the peak season (summer) maximum densities of porpoises were well below 0,01 Ind./km² (BioConsult SH unpublished report for Iberdrola). However, C-POD data from

the Oderbank approximately 10 km from the pre-investigation area suggest a strong increase in detection rates during summer over the past 10 years indicating a clear increase in number of animals visiting the area during summer (BioConsult SH 2020). Thus, a combination of both methods promises the best basis for a proper assessment of the planned windfarm areas in regard to the impact on marine mammals from the construction as well as the commissioning phase of the two planned wind farm areas.

The main purpose of the C-POD monitoring programme is to determine, to which extent the planned windfarm areas and their sourroundings are used by both (sub) populations of Harbour Porpoises and to what extent the planned windfarm areas are of special importance for the respective populations by comparing detection rates of Harbour Porpoise echolocation clicks between single positions and within and between years.

Main purpose of the digital aerial surveys is to collect data on the spatial distribution of all three marine mammals species and especially to receive any informations about the presence of seals since this method does not only identify Harbour Porpoises but also seals (Common and Grey Seal).

Since the impact of the export cable on marine mammals based on our experience, is rather local and temporally short term, we find no need for conducting specific monitoring programme for the the export cable. The described monitoring programme together with known literature data will be used to assess the impact of the export cable on marine mammals.

3 AREA OF INVESTIGATION

BioConsult SH will conduct C-POD surveys covering the Danish pre-investigation area and digital aerial surveys covering both the Danish and the German pre-investigation areas (Figure 3). The studies include the entire Danish part of the Adlergrund shallow water ground and the Natura2000 area "Adler Grund og Rønne Banke". The pre-investigation-area is bordered by the island of Bornholm to the north-east and by the border to the German EEZ to the south-west. In the northwest, the pre-investigation area borders directly on the Swedish EEZ. In the southeast, the pre-investigation area extends in to German waters of about 7 km beyond the southern windfarm area. In the west, the pre-investigation area also covers the German OWFs "Wikinger" and "Arkona" and thus the three western transect lines extend into the German EEZ (pre-investigation area in German waters). Following the most recent literature it is assumed that the planned windfarm areas are located in the winter transition zone of the Belt Sea Harbour Porpoise and the highly endangered Baltic Proper Harbour Porpoise (sub) population.

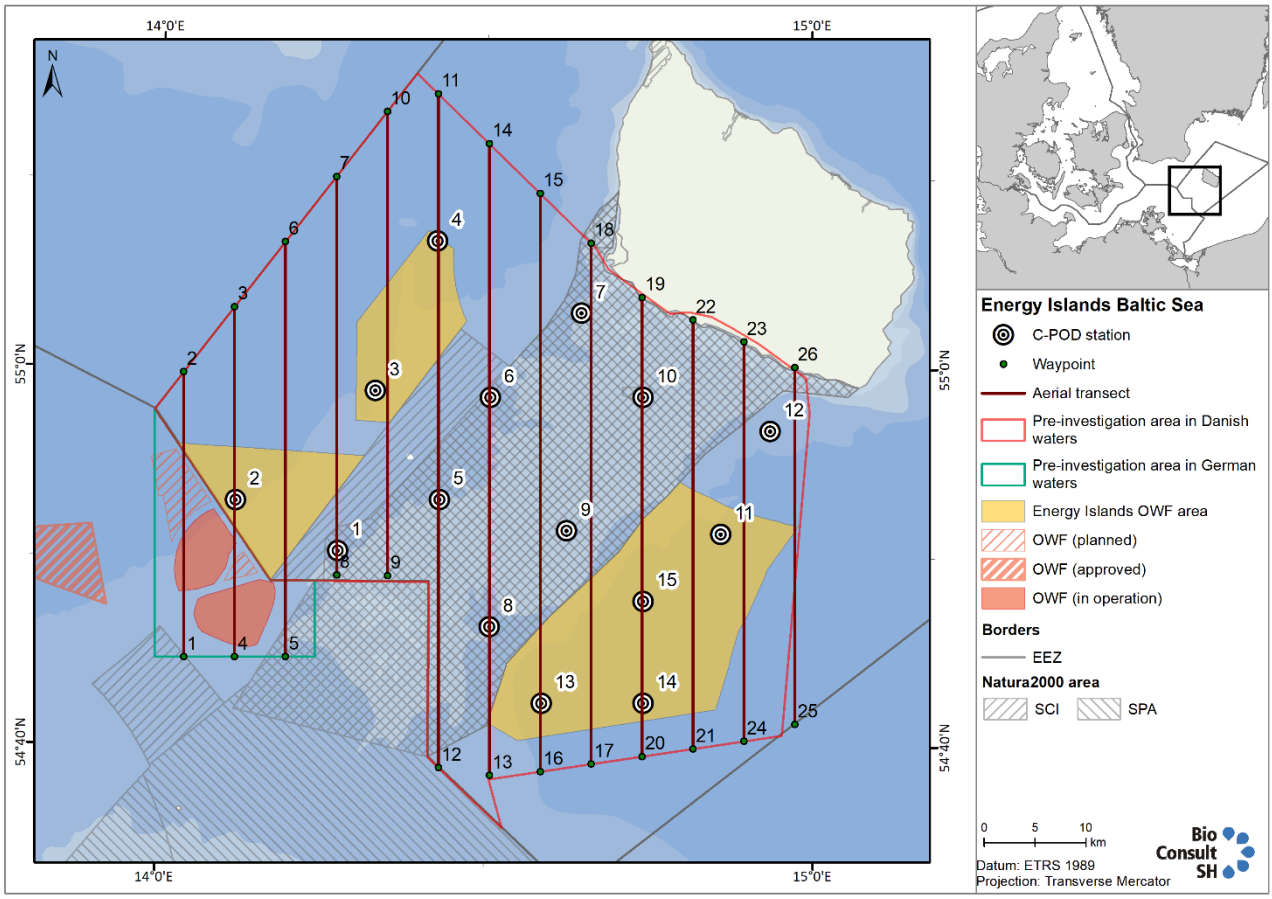

Figure 3 **Outline of the pre-investigation area for the monitoring programme for Energy Island Bornholm in the western part of the Baltic Sea with aerial survey-transects and positions of C-POD stations.**

For the digital aerial surveys, we designed a transect design with a flight distance of 585 km covering an area of 2,775 km². The distance between the individual transect lines is 5 km (Figure 3). With this transect

design, we achieve an area coverage of > 10 %. The transect lines are arranged in a north-south direction to cross the depth gradient perpendicularly and to fully cover the nearshore area where more seals are expected. The transect design for both work packages F (marine mammals) and G (birds) is identical.

For the C-POD monitoring programme the following set-up was chosen in order to cover the pre-investigation area relatively even (Figure 3):

- Three PODs in northern wind farm area,
- Four C-PODs in the southern wind farm area,
- Three C-PODs in the Natura 2000 area “Adler Grund og Rønne Banke”,
- Three C-PODs along the southern coast line of the island of Bornholm, and
- Two C-PODs between the planned windfarm areas)

Since data between neighbouring positions with distances of less than 5 km can be highly correlated a minimum distance of 10 km between single C-POD positions was chosen.

4 METHODOLOGY

4.1 STUK 4 METHOD

The survey design developed by WSP and BioConsult SH is based on the requirements of the German assessment standard StUK 4 (BSH 2013) but does not meet the requirements of StUK 4 in all aspects. As envisaged in StUK 4, the survey design presented here includes surveys to determine abundance and spatial distribution as well as methods for the determination of habitat use. Furthermore, as also envisaged in StUK 4, two consecutive full years of surveys shall be conducted prior to the construction of the wind farms.

Despite its high importance for the Baltic Proper Harbour Porpoise (sub)population, the pre-investigation area generally has a very low abundance of Harbour Porpoises. For this reason, and because ship-based surveys are generally considered to be of limited suitability for recording Harbour Porpoises due to a high sensitivity to weather and waves (TEILMANN et al. 2002), ship transects are abandoned. Instead, and contrary to the wording in StUK 4, exclusively digital aerial surveys (16 flights in two years, Table 3) are planned to determine the abundance and spatial distribution of marine mammals.

In addition, the study design for passive acoustic monitoring provides a much more elaborate study of habitat use than envisaged by StUK 4. StUK 4 requires the installation of two C-POD stations per wind farm project if the project area is located close (< 20 km) to a protected area important for Harbour Porpoises. With the installation of a total of 15 C-POD stations (Table 1 and Figure 3), the survey design offered significantly exceeds to the German standard (StUK4).

4.2 DIGITAL AERIAL SURVEYS

The HiDef system, specifically designed for this type of work, follows a methodology that is widely accepted by the industry and relevant authorities. Since 2014, BioConsult SH has conducted more than 600 survey missions in the North Sea and the Baltic Sea, most of them in relation to offshore wind farms, gaining images of several hundred thousand birds and some thousand marine mammals. Digital aerial surveys have been developed and established in the UK only a few years ago and in 2014 became the standard method for offshore wind farm studies in Germany (BSH 2013). The method has proven to be highly suitable for offshore surveys and to consolidate the basis for consenting offshore wind farms.

The HiDef method has also been used for several years in various studies in the western Baltic Sea, some of which are in the direct vicinity of the pre-investigation area.

Digital aerial line transect surveys following the method of WEIß et al. (2016) are proposed as the best method for monitoring marine mammals in the investigation area, as the method provides the best possible data for the purpose of this study from a scientific point of view and due to safety reasons. A high-resolution video system (HiDef) is used to film the sea surface from an airplane.

The airplane, a Partenavia P68, is equipped with a rig of four HiDef cameras (see Figure 4). At a survey altitude of 549 m, the four cameras (A, B, C, D) record a combined strip width of 544 m at a ground sampling resolution of approx. 2 cm. With the standard settings, there is a gap of 20 m between camera strips to avoid double counts. The transect design with a spacing of 5 km between transects results in a > 10 %. coverage

of the survey area. The position of the airplane (with 1 m precision) will be logged with a Garmin GPSMap 296 receiver with differential GPS, recording the location every second, for later matching with marine mammal and bird observations. AIS signals of vessels within the survey area will be recorded by an AIS receiver in the airplane. All airplanes for digital surveys are equipped with a PowerFLARM collision warning system.

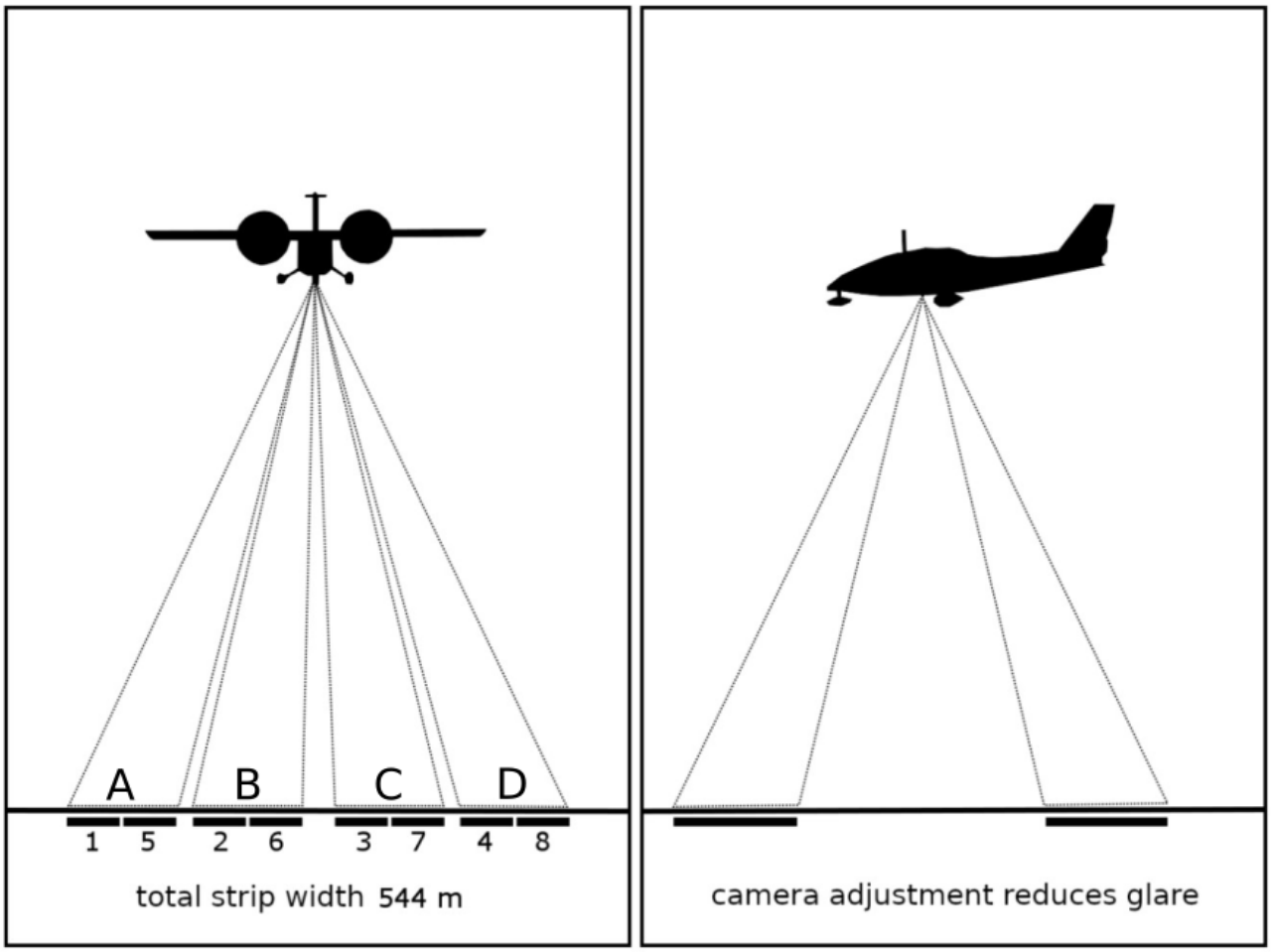

Figure 4 **Digital-aerial survey using HiDef-System. A four camera (A, B, C, D) approach for surveying birds and marine mammals.**

Two airplanes are equipped with camera systems and are constantly on stand-by at the airport of Roskilde. BioFlight A/S ensures that trained pilots and operator for the camera systems are available continuously. If weather conditions, restrictions due to military activities or other reasons mean that only a short period of time is available for coverage, an additional aircraft from the UK equipped with HiDef camera systems may be used.

Data will be screened by an experienced team of 20 reviewers, who mark any objects in the footage that require further analysis. For Quality Assurance, an additional 'blind' review of 20 % of the raw data will be carried out and the results compared with those of the original review. The QA process is passed only if 90 % agreement is achieved between both review results, otherwise data are re-reviewed.

Along with object detection, it is marked, whether transects or parts of transects were flown under valid conditions. Transect parts with adverse survey conditions will not be analysed. Adverse conditions include for example clouds or dust between the aircraft and the sea surface, which hinder object detection. In addition, environmental parameters are logged every 500 frames along the transect lines. These parameters include sea state, water turbidity, haze and glare and will be used for data analysis and quality assessment.

Objects marked as requiring further analysis will be identified to the lowest possible taxonomic level by experienced zoologists and ornithologists; 20 % of objects are chosen randomly and identified independently by a second person. If both persons disagree on the identification of more than 10 % of all objects, all data are re-identified by a third person. Along with species identification, age, sex and behaviour are recorded where possible.

Each individual sighting (birds and marine mammals) will be geo-referenced considering the offset from the transect line of the cameras and compiled into a single output spreadsheet for further analysis. This makes it possible to correlate sightings with e.g. data on benthic flora and fauna.

Surveys are flown along parallel transects at a flight height of 1,800 ft and can cover large areas within a short time period. This method can thus provide information on abundance and distribution of marine mammals and, unlike with observer-based flights, no distance correction is needed.

Digital aerial surveys are suggested to be preferred over observer-based methods due to several advantages (ZYDELIS et al. 2019). Although species identification rates were similar between methods, overall, observer-based surveys have been shown to underestimate the abundance of several species (BUCKLAND et al. 2012, VILELA et al. 2021). Due to the quality assurance during analysis of video material, any observer-bias can be ruled out, and video material can be stored for potential re-analyses in the future.

Also, for comparability with potential future aerial surveys, digital surveys are to be preferred already during baseline monitoring. After construction of wind farms in an area, the use of digital surveys is more suitable due to the high flight-altitude, allowing fly-over of OWFs. Using a similar survey method for baseline and construction/operation monitoring allows for an improved analysis of possible effects of the project on resting birds and marine mammals.

Since digital aerial surveys cover birds and marine mammals at the same time, the survey effort for Work package F and G can be combined, so that the number of aerial surveys during the two-year study period could be increased from 2 surveys to 16 surveys.

4.3 PASSIVE ACOUSTIC MONITORING WITH C-PODS

Fifteen specialised click detectors (C-PODs), one for each monitoring station, will be be active for the entire investigation period in order to monitor the presence Harbour Porpoises in the pre-investigation area in all seasons as well as variations between years (See Figure 3, Table 1).

A C-POD (Cetacean POrpoise Detector, Chelonia Ltd, UK; http://www.chelonia.co.uk;Figure 5) is an autonomous recording device ("datalogger") that logs high-frequency clicks of Harbour Porpoises and also clicks of dolphins in a slightly lower frequency range up to a distance of approx. 300 m. Since 2010 C-PODs are used worldwide to monitor cetacean presence. C-PODs consist of an 80 cm long plastic tube with the

hydrophone at one end. Directly below are an amplifier and an electronic filter. The hydrophone records all sound events omnidirectionally in a frequency range from 20 to 160 kHz. Click characteristics such as main frequency, frequency curve, loudness duration, intensity (in 8-bit steps), bandwidth and envelope of the frequency spectrum are stored for each individual click. A total of ten 1.5 Volt D batteries supply the device with sufficient voltage for at least six weeks. SD cards provide an easy-to-read memory unit of up to four GB. The devices are calibrated by the manufacturer to the main frequency of porpoise clicks (130 kHz) and set to the same hearing threshold (±3 dB). The sensitivity of the units had been standardized when built by rotating the complete instrument in a sound field and adjusted to achieve a radially averaged, temperature corrected, maximum source pressure level (SPL) reading within 5% of the standard at 130 kHz (60.5 dB). The radial values were taken at 5° intervals. The calibration and standardization process is described in detail on the manufacturer's website (www.chelonia.co.uk).

Data from passive acoustic monitoring (e.g., C-PODs) are highly valuable especially in areas, like the pre-investigations area, which have a very low density of Harbour Porpoises. C-POD data are the only possibility to get information about presence, relative abundance, seasonality and to some extent also about behaviour of Harbour Porpoises in the investigated area.

C-PODs do not only register Harbour Porpoise clicks but all tonal signals i.e., signals that have a characteristic peak within the power spectrum of porpoise clicks. Thus, "clicks" can originate from other sources such as sonar, noise from sediment suspension, surface noise from waves, etc. Therefore, the quality of C-POD recordings has to be tested with respect to the effects that a noisy environment may have on the probability of recording Harbour Porpoise clicks. Two problems emerge from high background noise:

1. In a noisy environment the memory card of a C-POD may quickly fill up. To prevent this, C-PODs can be programmed to contain a recording limit per minute, which means that during one minute only a maximum number of "clicks" is registered. If this click limit within one minute is reached, the POD stops recording for the remainder of this minute. This limits the amount of data that will maximally be stored per minute on the memory card and prevents the card from an overflow of data, which would result in no more data until the next data recovery. After the click limit is reached nothing will be recorded for the remainder of that particular minute. If not controlled, this could lead to an underestimation of Habour Porpoises activity. The default click limit for C- PODs is set to be 4096 clicks per minute.

1) Substantial noise also affects the performance of the detection algorithm of the C-POD.exe software, as Harbour Porpoise clicks will be harder to distinguish from background noise, when the noise is substantial (a phenomenon called masking). Thus, the likelihood that the algorithm identifies Habour Porpoises clicks during the recorded time interval, decreases with increasing amount of background noise. This will then result in an underestimation of Habour Porpoises detection rates if background noise is not controlled for.

In a first approach we will address this issue by our custom-made deploying system, which incorporates our many years of experience in the deployment of C-PODs. This system is optimized so that there is no background noise from the mooring system itself. In a second step we will address these issues by visually exploring 1) the relationship between Habour Porpoises detections and the number of minutes during an hour, when the scan limit was reached, and 2) between Habour Porpoises detections and the number of all clicks other than Harbour Porpoise clicks that were recorded during that hour. Based on these relationships, hours where data exceed a certain threshold (e.g., >100,000 clicks + > 2 minutes when the scan limit was

reached) will be excluded from further analysis. If a negative relationship between hourly Habour Porpoises detections and all clicks recorded still remains, the variable “noise clicks” (all clicks without identified Habour Porpoises clicks) will be included into each analysis approach in order to control for its effect.

Depending on the number of recordings different parameters like Habour Porpoises positive minutes per day will be used for data analysis, allowing later evaluation of Harbour Porpoise presence.

Figure 5 C-PODs to investigate Harbour Porpoise presence.

Mobilisation for each vessel survey will be in Sassnitz in Rügen, Germany. Vessels as Skoven or similar type of vessel are provided by WSP and have been contracted by BioConsult SH for various projects earlier. All contracted vessels and onboard personel have experience with the deployment and recovery of our moorings and have been reliable partners in the past. Our storage in Sassnitz/Mukran guarantees short mobilisation times and avoids travel and transportation costs.

Prior to departure of the vessel, a toolbox talk is carried out by the vessel master. The talk contains but is not limited to the procedures included in the method-specific HSE risk assessments and the safe execution of the assignment by the POD-workers while on board. Topics of the discussions are e.g., emergency procedures, RAMS, site rules etc. Minutes of the meetings are to be prepared.

BioConsult SH has a stock of >150 C-PODs, from which a certain number has been made available exclusively for this project, ensuring that C-PODs will permanently rotate between the chosen monitoring stations. Since hydrophones can change their sensitivity over time, all C-PODs are calibrated once a year at the manufacturer in order to keep data comparable. C-POD data will be downloaded offshore, but the SD-card containing the original data will be stored as back-up until final data review in the office. At the office all data is secured daily on two external servers according to the ISO and OHSAS standards.

4.4 MOORINGS

For ensuring continuous data coverage by acoustic monitoring over a two year period, the choice of mooring systems plays a crucial role. A secure and reliable mooring guarantees maximum safety for the the deployed systems and for their recovery as well as maximum safety for the shipping and fishing industry utilizing the same area. According to the international guideline for offshore data acquisition systems (ODAS) each C-POD will be maked by a yellow rubber marker buoy as well as a 6 m sparbuoy, equipped with a yellow 3NM flashlight, a radar-reflector and a yellow top-cross (Figure 6). The two surface marker are connected via a rope on the sea floor. Positioning of PODs, ropes, anchor stones and buoys can be taken from Figure 6.

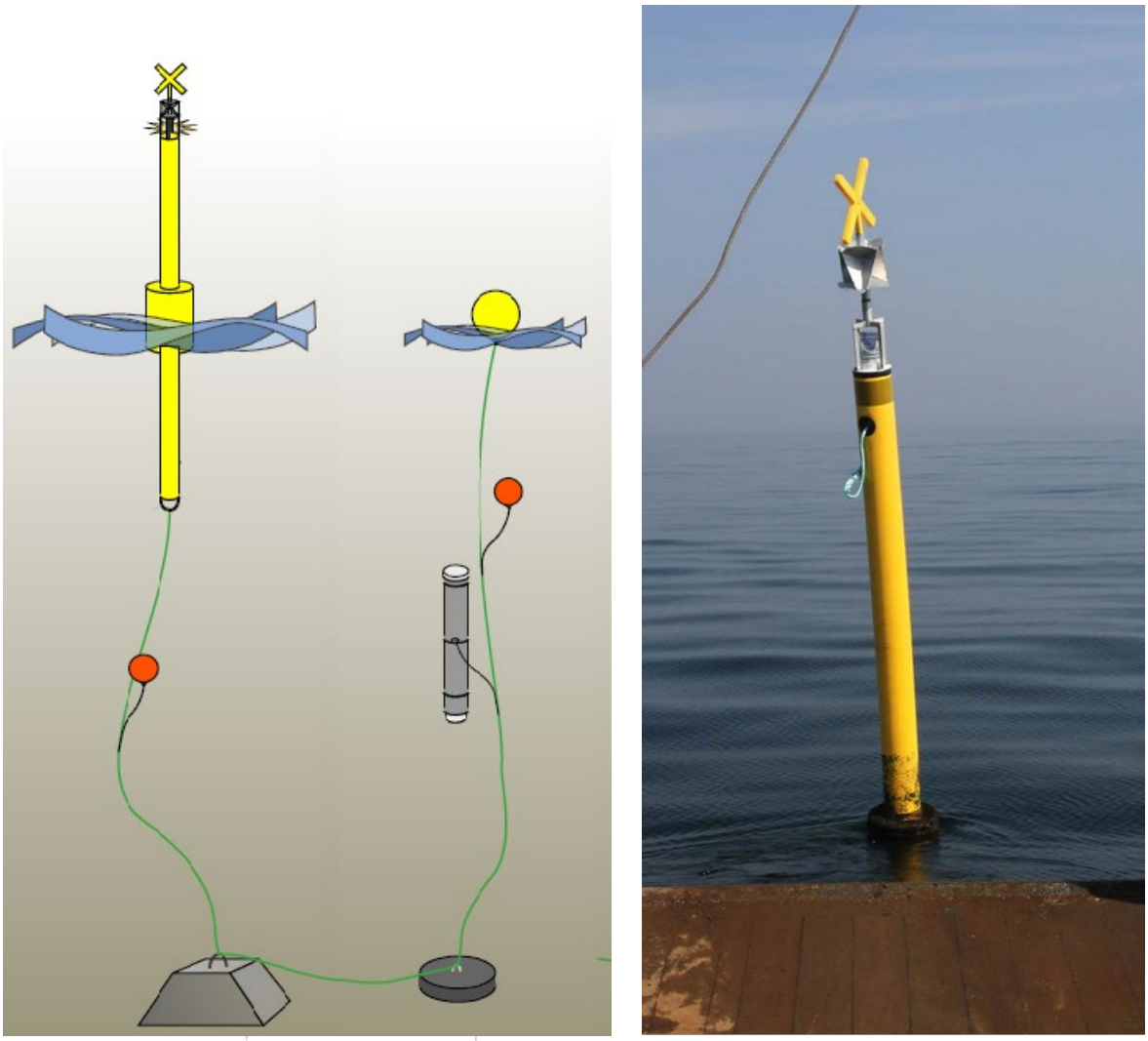

Figure 6 Design of a single C-POD station.

C-POD deployment is planned for 24 months period. It began in November 2021 after a permissions from the Danish Maritime Authority for deployment was acquired. Data collection over two complete years is strongly recommended, in order to securely identify seasonal patterns in the pre-investigation area and to minimize or at least be able to sufficiently control for random effects due to extrinsic stochasticity (e.g., climatic uncertainty, variability of prey resources, etc). The maintenance of C-PODs at sea is planned every 8-10 weeks to avoid potential data gaps due to losses or malfunctions as short as possible. Maintenance

work will be conducted by well-equipped working vessels (M/S Skoven or a similar vessel), which is adequate for this kind of work in the Baltic Sea.

Table 1 Coordinates of C-POD stations. The staions are illustraively shown in Figure 3.

Station	(WGS 84, DD°MM)	(WGS 84, DD°MM)	(WGS 84, DD)	(WGS 84, DD)
1	54° 50.34' N	14° 16.46' E	54,8390118	14,2743266
2	54° 52.97' N	14° 07.06' E	54,8829094	14,1176595
3	54° 58.82' N	14° 19.80' E	54,9804015	14,3300611
4	55° 06.77' N	14° 25.42' E	55,1128945	14,4236763
5	54° 53.09' N	14° 25.76' E	54,8847734	14,4293883
6	54° 58.50' N	14° 30.37' E	54,9749764	14,5062260
7	55° 02.99' N	14° 38.76' E	55,0498894	14,6459452
8	54° 46.37' N	14° 30.42' E	54,7727805	14,5070071
9	54° 51.47' N	14° 37.47' E	54,8577788	14,6244922
10	54° 58.54' N	14° 44.43' E	54,9757019	14,7405676
11	54° 51.32' N	14° 51.62' E	54,8553234	14,8602665
12	54° 56.77' N	14° 56.13' E	54,9461062	14,9355779
13	54° 42.34' N	14° 35.23' E	54,7056757	14,5871000
14	54° 42.37' N	14° 44.54' E	54,7061050	14,7422912
15	54° 47.76' N	14° 44.50' E	54,7959720	14,7417198

5 DELIVERABLES

Deliverables included in this work package:

- A marine mammal survey scope report
- Operational reports for each digital-based aerial survey and for each C-POD survey.
- An environmental baseline report based on all publicly available data from the pre-investigation area and its surroundings.
- A two-year technical report on all field data collected during the two years study period.
- Data from field investigations of marine mammals
- Entering the collected data into relevant official databases, as required by Danish environmental regulations and practices.

5.1 MARINE MAMMAL SURVEY SCOPE REPORT

This is the document at hand and constitutes the fourth draft of the marine mammal survey scope report. First draft was delivered to Energinet in week 38, second draft after a meeting and acceptance of the program by Energinet before the end of 2021. This fourth and final draft considers all remarks from the client to the former versions and describes in detail the planned program and explains the applied methods

5.2 OPERATIONAL REPORT

During vessel-based field work (C-POD service), daily updates will be sent from the cruise leader by e-mail to the Client. The reports will contain information regarding:

- Name of POD-position that is surveyed:
- Date:
- Name of company performing:
- Survey number:
- Purpose of survey:
- Name of ship:
- Name of harbour of departure:
- Date and time leaving / returning:
- Vessel master:
- Names of other crew members:
- Name of observers:
- Observation start / end:
- Weather information: wind speed, wind direction, sea state, precipitation, visibility etc.
- Information about whether the survey was done completely in accordance with the methods outlined in this scope report
- Experienced limitations and/or special events – description
- Specific incidents – description

- Other relevant information – description
- HSE reporting

After each survey has been completed, the information from the daily updates is combined in an operational report, which summarises the above information.

After each digital aerial HiDef survey a survey completion report will be sent by e-mail to the Client a few days after the survey was conducted. The reports will contain information regarding:

- HiDef lead
- Project name
- Project reference zone
- Survey date:
- HSE reporting
- Survey mobilisation
- Survey demobilisation
- Hours in flight
- Souls on Board
- Meteorological conditions
- Comments and remarks to the survey
- Activity Log of the airplane

5.3 ENVIRONMENTAL BASELINE NOTE

WSP and BioConsult will provide an environmental baseline note to Energinet Q1 2022. This report will present the existing data for marine mammals in the investigation area based on data and baseline mappings from other projects in the area. This report is an internal document that will support the writing of the Strategic Environmental Assessment (SEA).

5.4 TECHNICAL REPORT

The technical report will be delivered as a final and approved version to Energinet (in English) including a review process. The report includes the description of the spatial distribution, seasonal abundance and the habitat usage of marine mammals.

6 MILESTONES

Reporting and time schedules for WPF will strictly follow the deadlines given in Table 2.
A Client Review period of 15 days has been incorporated into the schedule to review the 1st Draft Version of the Technical report (M29). For the second Client Review, a period of 10 days has been incorporated to review the Final Draft Version of the Technical report (M30).

Table 2 Overview of WP F Milestones. * The present report.

WP F			
Milestone No.	Milestone	Deadline	Predecessors
M25	Scope Report, 1st Draft, Marine Mammals	Week 38 - 2021	-
M26	Scope Report, Final Version, Marine Mammals (present report)*	Week 1 - 2022	-
"M27"	Environmental baseline note, 1st Draft, Marine Mammal Report (Internal)	Q1 - 2022	-
"M28"	Environmental baseline note, Final version, Marine Mammal Report (Internal)	Q1 - 2022	
M29	Technical report, 1st Draft, Marine Mammal Report (both years)	Q4 – 2023	
M30	Technical Report, Final Draft, Marine Mammal Report (including appendices and data both years)	Q4 – 2023	-
M31	Technical Report, Final Version, Marine Mammal Report (both years)	Q1 - 2024	-

6.1 MARINE MAMMAL SURVEY

WSP/BCSH started the field operations in November 2021 by deploying 15 C-PODs within the project area. Service of all C-PODs will be conducted every 8-10 weeks, depending on weather conditions. The contractors have an availability statement for M/S Skoven that is unlimited, in order to provide a buffer contingency, which is adequate for the Baltic Sea. Additionally, WSP has a back-up agreement with FOGA in case it becomes necessary. Within 14 days after each C-POD survey all data will be checked for quality and time stamps. After a thorough quality control all data will be transferred into a database.

C-PODs will be deployed for 24 months to cover all seasons and variations between years. Two digital flights in July and August 2022 are planned for marine mammals specifically and 14 more aerial surveys are planned for the two-year bird monitoring (Table 3). All marine mammals sightings from the birds surveys will also be analysed for this work package. Thus data from a total of 16 aerial surveys over a two year study period will be available for the analyses of marine mammal abundance.

Table 3 **Data Matrix of the programme for WP F. * indicate available marine mammals count-data from the flights in WP-G. The C-PODs are serviced approximately every two months to guarantee one month of data per season.**

Investigation area	C-POD Service	Flights Resting Birds*	Flights Marine Mammals
Nov 2021	Deployment of 15 C-POD-Stations	1	
Dec 2021		5	
Jan 2022	Service 15 stations with C-PODs		
Feb 2022			
March 2022	Service 15 stations with C-PODs		
April 2022			
May 2022	Service 15 stations with C-PODs		
June 2022		1	
July 2022	Service 15 stations with C-PODs		1
August 2022			1
Sep 2022	Service 15 stations with C-PODs	1	
Oct 2022			
Nov 2022	Service 15 stations with C-PODs		
Dec 2022		5	
Jan 2023	Service 15 stations with C-PODs		
Feb 2023			
Mar 2023	Service 15 stations with C-PODs		
Apr 2023			
May 2023	Service 15 stations with C-PODs		
Jun 2023		1	
Jul 2023	Service 15 stations with C-PODs		
Aug 2023			0
Sep 2023	Recovery of 15 stations	0	0

7 PERMITS

WSP has applied for a permit to deploy 15 C-POD stations in the Energioe Bornholm pre-investigation area and in Danish waters west of Bornholm by the 27th of September 2021. The permission was issued by the Danish Maritime Authorities by the 15th of October and is valid from the 2nd of November 2021 after proper notification of seafarers in the area. The permit is valid until 1st of December 2023.

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