Biuro Konserwacji Przyrody S.C.
ul. Frezjowa 8, 72-003 Dobra, NIP 8513138392, Regon 320944756

tel. 608 208 841, 668 027 475
przyroda@bkp.szczecin.pl
www.bkp.szczecin.pl

PROJECT INFORMATION SHEET:
"DEVELOPMENT OF THE WOLIN WSCHÓD DEPOSIT"

Authors of the study: Damian Spieczyński, MSc, Eng. – head of the team of authors
Małgorzata Zimnicka-Pluskota, MSc, Eng.
Maciej Stygar, MSc, Eng.
David Bertram, P.Eng.
Alula Damte, PhD P. Geol.
Marcelina Łabaj, PhD

BIURO KONSERWACJI PRZYRODY S.C.
Damian Spieczyński

Szczecin, April 2026

TABLE OF CONTENTS

INTRODUCTION

This Information Sheet has been prepared as an attachment to the application for the issuance of a decision on environmental conditions in accordance with Article 73 and the application for determining the scope of the report in accordance with Article 69 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments, hereinafter referred to as the EIA Act (i.e. Journal of Laws of 2024, item 1112, as amended). The project information sheet has been prepared in accordance with the scope resulting from Article 62a of the above-mentioned EIA Act.

The described undertaking, consisting of the development plan of the Wolin Wschód oil field, is an undertaking of strategic importance for the country, both for economic reasons and national security. The development of the Wolin Wschód field will enable a significant increase in domestic oil production, reducing the dependence of the Polish economy on oil imports, which are associated with both significant costs and risks regarding the availability of sources of supply and logistical capabilities. For this reason, the launch of production from this field will make it possible to protect the national economy from severe losses that could result from a possible interruption in the supply of imported oil or from a sharp increase in import costs, which cannot be ruled out in the current political situation in the world. The reliability of the supply of crude oil, which is the basic raw material for the production of motor fuels and a number of other products crucial for national defence and the supply of society, is also in the vital public interest.

Within the boundaries of the sea basin and the planned investment*, the provisions of the "spatial development plan for internal marine waters, territorial sea and exclusive economic zone*" referred to as the Public Procurement Act, established *by the "Regulation of the Council of Ministers of 14 April 2021 on the adoption of the spatial development plan for internal marine waters, the territorial sea and the exclusive economic zone*" are in effect (Journal of Laws of 2021, item 935, as amended). The proceedings concern the provision and extraction of hydrocarbons from the Wolin Wschód deposit on the basis of concession No. 9/2017/Ł, located in the elementary area of the Plan - POM.08.P. Regulation of the Council of Ministers of 14 April 2021 on the adoption of the spatial development plan for internal sea waters, territorial sea and exclusive economic zone at a scale of 1:200,000 (Journal of Laws of 2021, item 935, as amended), in the scope of detailed decisions for individual bodies of water, for the POM.08.P reservoir stipulates in Part 9 point 6 letter a (§9 of Appendix No. 2) that the exploration and identification of mineral deposits is permissible in the entire body of water. At the same time, the Regulation provides for the implementation of public purpose investments in the field of exploration, appraisal and production of hydrocarbons in the above-mentioned basin (Part 8 point 6) and does not prohibit the construction of artificial islands, structures and equipment for the purpose of exploration and appraisal of hydrocarbon deposits and the extraction of hydrocarbons from deposits under concession No. 9/2017/Ł for the exploration and appraisal of oil and natural gas deposits and the extraction of crude oil and natural gas from deposits. In the light of the above, the planned project consisting in the extraction of mineral deposits in the maritime areas of the Republic of Poland is in accordance with the current content of the maritime area development plan.

The planned project is one of the projects listed in the "*Regulation of the Council of Ministers of 10 September 2019 on projects that may have a significant impact on the environment*" (Journal of Laws of 2019, item 1839, as amended) in accordance with §2 section 1 point 24, because it involves extraction from the deposit, including the drilling method, point 2:b) crude oil or its natural derivatives, in the amount of more than 500 tons per day, c) crude oil, its natural derivatives and gas (constituting an accompanying mineral) – in the maritime areas of the Republic of Poland.

1. TYPE, CHARACTER, SCALE AND LOCATION OF THE PROJECT

CEP Central European Petroleum Sp. z o.o. ("CEP" or "Company") has discovered a large deposit of oil and natural gas that it plans to develop for production. The deposit has been named Wolin Wschód and it contains estimated recoverable oil resource of approximately 21 million tonnes, making it the largest oil deposit in Poland.

The discovery well for the deposit, Wolin East 1, was drilled using a jack-up MODU drilling platform at a location in Pomeranian Bay within Polish waters and approximately 6 km offshore from Świnoujście. Using data from the well, CEP has made a plan to develop and produce the resource; an application for GID for this development project has been filed with the Ministry of Climate and Environment. The deposit is entirely contained within Polish waters.

As described in more detail below, the proposed development project consists of the following main features:

- an artificial island and attached breakwater with a total area of approximately 10 ha. The island will be enclosed by a system of concrete caissons in-filled with sand and will constitute the center for development of the deposit. The breakwater will protect the island from waves and create a port on the north side of the island for service vessel and oil barge access.
- a concrete cellar, located in the middle of the island, that is large enough to house a total of 30 production and injection wells.
- a drilling area that includes a permanently-installed skid-mounted 650-tonne deep drilling rig, which can be situated above any desired wellhead location within the cellar, together with all ancillary equipment (generators, pumps, storage tanks, pipe racks, cranes, etc.).
- a production facility to process the fluids to be produced from the deposit. The facility will separate the oil, gas and water. The oil will be cleaned to refinery specification and transported to the artificial harbour for temporary storage and loading onto tanker barges. The water will be similarly cleaned and then re-injected into the deposit to help improve oil recovery efficiency. Most of the produced natural gas will be re-injected into the deposit to help improve oil recovery efficiency and a fraction of the gas will be used to generate heat and power for the processing facility.
- a building for offices and accommodations for all production facility and drilling rig crew.
- a pier within the harbour designed for storage of 5-days of oil production from the deposit and for transfer of production to similarly-sized tanker barges, which will transport the oil to a crude oil loading terminal for further shipment to the refinery.
- a flare stack, situated down-wind of the processing facility out-board the island, for occasional use in case of upset conditions in the processing plant.
- a dredged channel that permits access of the loaded tanker barges from the island.
- an initial total of eight directionally-drilled wells, drilled to access the deposit: 6 production wells, 1 gas re-injection well, and 1 water re-injection wells. Addition of as many as 22 future wells to optimize resource recovery is anticipated.

The deposit is expected to be capable of initially producing 4100 tonne/day of crude oil and the forecast production life of the deposit exceeds 30 years. The design life of the island and breakwater exceeds 50 years. Beyond the initial development, it is expected that future additional investment will be required for more wells and additional facilities to enhance oil recovery from the deposit and to develop neighbouring gas accumulations that are expected to be commercial. The island is designed to be large enough to accommodate any future expansion of the oil project; it can also accommodate all future gas well drilling, however exploitation of the neigbouring gas reservoirs would require a separate gas processing facility located somewhere onshore. Of course, future development would be dependent on separate approvals by authorities.

This chapter describes the individual features of the current planned development in more detail. Technology to be used is described in Chapter 3 and alternative development concepts that were considered and rejected for this development plan are described in Chapter 4.

Legal right to develop

CEP Central European Petroleum Sp. z o.o. fulfils the obligation arising from the concession No. 9/2017/Ł issued by the Minister of the Environment on 1 December 2017 and transferred to the Company by the decision of the Minister of Climate and Environment of 30 September 2024, as well as pursuant to Article 72(1)(4a) of the Act of 3 October 2008 on the provision of information on the environment and its protection, on public participation in environmental protection and environmental impact assessments (i.e. Journal of Laws of 2024, item 1112, as amended), consisting in the exploration and appraisal of oil and natural gas deposits and the extraction of oil and natural gas from deposits in the "Wolin" area, part of concession blocks No. 61, 62, 81, 82.

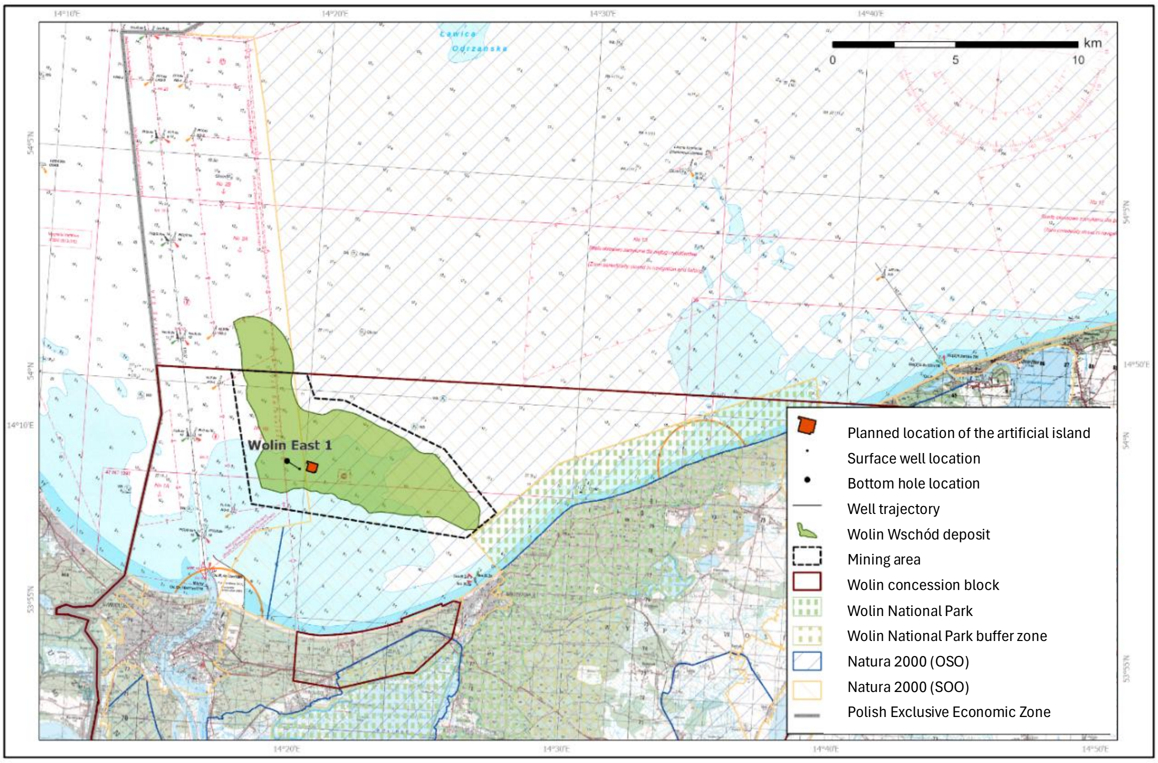


Fig. 1. Location of the Wolin Wschód deposit.

Description of Wolin Wschód and neighbouring deposits

The Wolin *Wschód* deposit is located in the territorial waters zone of the Republic of Poland in the southern part of the Pomeranian Bay, northeast of the entrance to the port in

Świnoujście (Świnoujście County, West Pomeranian Voivodeship; Fig. 1). The mapped area of the deposit is 35 km^2. The deposit itself is located at a mean burial depth of 2650 m below mean sea level and is a dolomitic grainstone that is approximately 60m thick, with estimated average porosity of 15% and average permeability of 10 to 20mD. The estimated oil in place in the deposit is between 84 and 179 mln. tonne, making it the largest oil reservoir in Poland. The reservoir oil contains approximately 106 Nm^3/t of sour solution gas (6 mol% H_2S, 2% CO_2) that will be produced together with the oil once the field is developed. The oil deposit is also underlain by a salt-saturated brine aquifer that is of limited areal extent; based on numerical simulation modeling, it is expected that this aquifer will encroach on the wells placed within the oil deposit and that a small fraction of the water will inevitably be produced together with the oil and solution gas resources.

The documented deposit fully located beneath Polish territorial waters in the immediate vicinity of the Wolin Island. In geological terms, the deposit is located in the shelf part of the Pomeranian segment of the Permian-Mesozoic Polish basin, in the substrate of which there is a Devonian-Carboniferous Pomeranian basin. There are numerous deposits and accumulations of oil or natural gas contained in these strata within a 50km radius of Wolin Wschód. They are located both on the Polish side (e.g. Kamień Pomorski (oil), Międzyzdroje (oil), Rekowo (oil), Wysoka Kamieńska (oil), Błotno (oil), Petrykozy (oil)) and on the German side (e.g. Heringsdorf (gas), Bansin (oil), Lütow (oil)). Also in this area, natural gas deposits have been discovered in the underlying reservoir rocks of the Rotliegend. Such deposits are, for example, Międzyzdroje-Przytór, and further to the east also Ciechnowo and Sławoborze. On the German side, an accumulation of high-nitrogen (96.5%) Krummin natural gas was discovered in the sediments of the Rotliegend.

Description of Wolin Wschód geographical location

Within the boundaries of the sea basin within which the Wolin Wschód deposit has been designated, the provisions of the "spatial development plan for internal marine waters, territorial sea and exclusive economic zone", established by the "Regulation of the Council of Ministers of 14 April 2021 on the adoption of the spatial development plan for internal marine waters, territorial sea and exclusive economic zone" (Journal of Laws of 2021, item 935) with subsequent provisions are in force amendments of 9 November 2022 (Journal of Laws of 2022, item 2518).

The Wolin Wschód deposit is located entirely on the shelf, in the southern part of the Baltic Sea, in the zone of the Pomeranian Bay, the Pomeranian Bay is the eastern limit of the Arkona basin. The average depth of the bay is 15 m, with a maximum of 20 m. It stretches from the island of Rügen in the west to Jarosławiec in the east, and its area is about 6000 km2. The volume of water in the bay is about 73 km3. The Wolin Wschód deposit is located in the part of the bay adjacent to the Wolin Island. This island is located in the megaregion of Non-Alpine Central Europe, the Central European Lowland, the subprovince of the South Baltic Coast, the macroregion of the Szczecin Coast, the mesoregion of Usedom and Wolin.

The deposit is located on an accumulation plain stretching east of the waterway to Świnoujście. This plain is characterized by a flat bottom with a depth of 9 to 12 m, and its surface sediments consist mainly of fine-grained sands of medium granulation, which turn into fine- and medium-grained sands with depth. The thickness of fine-grained sea sands in this area ranges from 5 to 10 m and slightly decreases in the direction of Dziwnów. Fine- and medium-grained sands, often additionally covered with layers of silty clays and mudstones, rest on layers from the late Pleistocene, which developed in the form of clays and moraine sands.

Due to the fact that, in the light of recent research, in the area of the Pomeranian Bay in the Late Pleistocene and Early Holocene periods, there were extensive systems of lakes and peatlands, which were flooded about 7500 years ago during the rise in the water level of the Baltic Sea, the existence of local submersible accumulations of lake sands and silts cannot be ruled out. As a result of the process of transgression, the ancient lakes and local elevations of the terrain were flooded and then covered with a thick layer of marine sediments. Currently, the areas of elevations are formed by the central parts of the south-Baltic shoals, while the areas of former lakes and peatlands have become invisible after being covered with sedimentary material. Due to the high probability that the bottom covering the areas of ancient lakes may have completely different mechanical parameters in relation to the former land areas, conducting acoustic surveys of the bottom or surveys using the high-resolution 2D seismic method becomes of particular importance for determining the uniformity of the stability of the substrate.

Below is a photo of the sea bottom (Fig. 2), which was taken during the recovery of underwater recorders with the use of remote-controlled robots, which took place during 3D seismic works. In addition, on 28.02.2022, a video inspection of the seabed in the area of the planned works was carried out, which morphologically shows a relatively flat bottom covered with typically sandy sediment. A characteristic feature of the sediment surface are the so-called ripplemarks ("wrinkles" on the surface of the bottom), in the cavities between which fine detritus material accumulates.

The scope of geotechnical surveys carried out by CEP in November 2020 included bathymetry, enabling detailed recognition of seabed relief, lateral sonar for identifying features of seabed sediments and detecting objects. Seismic surveys were also carried out and used to better understand the structure of the seabed. No offshore construction facilities, including underground infrastructure, were found in the investment area. The seabed depth in the investment area ranges from 8.6 m in the south-eastern part of the study area to 10.1 m in the northern part of the study area. The surface of the seabed is flat and even.

Fig. 2. A photo of the bottom of the Baltic Sea in the area of the project's location.

The analysed area is an area of accumulation platform. The seabed is flat with slight differences in height, reaching up to 0.2 m in the south-western part of the site. The entire bottom of the analysed area is covered with a layer of fine- and medium-grained sands. Accumulations of multi-grained sediments (sands and gravels) are found only in the south-western part of the analysed area.

In the maritime area of the southern part of the Pomeranian Bay, there are elements of maritime infrastructure operated by the Szczecin-Świnoujście seaport complex. The basic ones include the seaway to ports, an anchorage area for ships waiting for the access to the port, and others.

There are no buildings within the work area. On the basis of the analysis of nautical navigational charts obtained from the Hydrographic Office of the Polish Navy, no elements of underwater infrastructure (cables, pipelines) or installations at sea (buoys, platforms) were found.

There are no areas of historical, cultural or architectural significance in the area of impact of the planned investment. There are also no objects entered in the register of monuments or contemporary cultural goods. According to the information obtained from the Hydrographic Office of the Navy in Gdynia and the Maritime Office in Szczecin, as well as the analysis of materials for the project "Spatial Development Plan of Polish Maritime Areas", there are no historic objects on the seabed in the area of work. In this area, there are also no landscape-valuable landforms, viewpoints or panoramic platforms.

The Wolin Wschód oil field was identified by the Wolin East 1 exploration and appraisal well drilled in 2025. This deposit is currently not developed. Its planned development is presented in the following chapters of this document. The development will be possible after obtaining an appropriate investment decision under the concession No. 9/2017/Ł Wolin. There are no other exploited hydrocarbon deposits in the immediate vicinity of the Wolin Wschód deposit. The closest are the Międzyzdroje-Przytór natural gas deposits in the Rotliegend sandstones, located south of the Wolin Wschód deposit on the Wolin Island, as well as Heringsdorf, located further west on the German shelf near the island of Usedom. These deposits are not exploited.

Description of planned artificial island, breakwater, harbour and vessel access

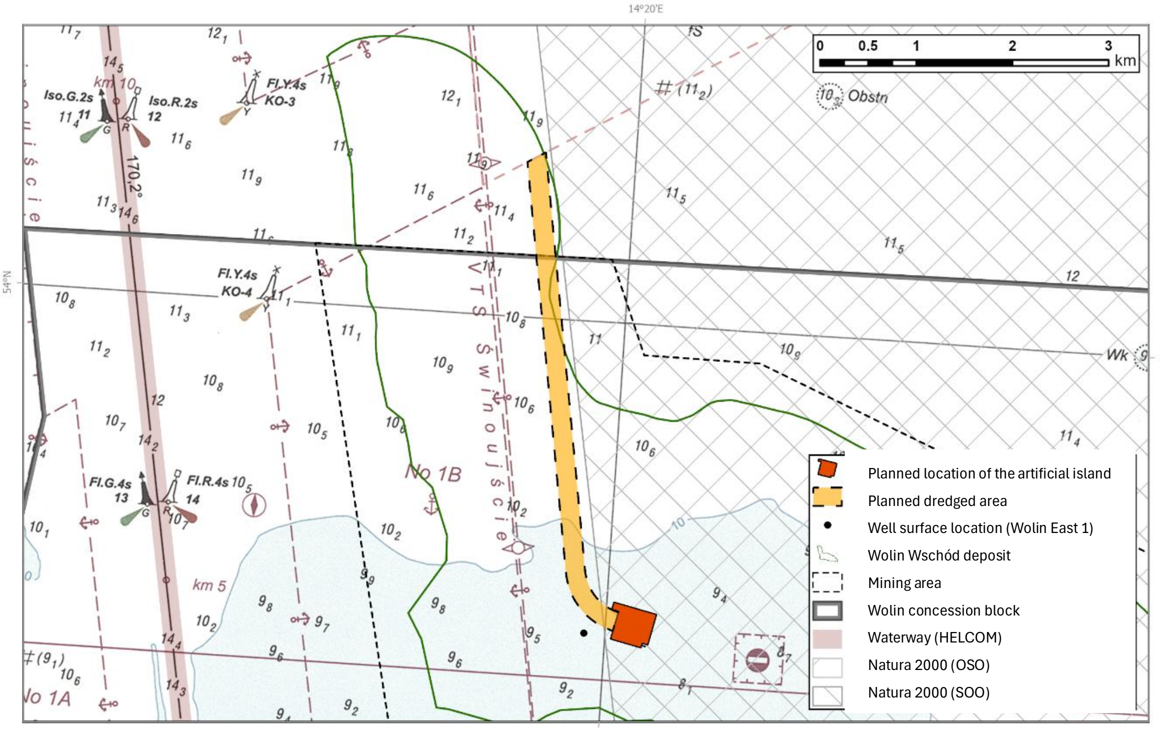


Fig. 3. Loction the artificial island and the approach track

All development of the Wolin Wschód deposit is planned to be done from a purpose-built caisson-retained island (Fig. 3). All required wells will be drilled and maintained using a permanently installed drilling rig and all production from the deposit will be processed on the island. The only exports from the island will be the crude oil that will be shipped via tanker barge to the receiving point for the selected refinery and any liquid or solid waste, which will be transported by ship to shore for appropriate disposal.

The island will be constructed approximately 6 km NNE of the entrance to port of Świnoujście, where the water depth is approximately 9,3m. The foundations for the island and breakwater cover a total area of approximately 10 ha, enclosing a harbour and pier with an additional area of approximately 8 ha (200m x 400m). The surface of the island itself measures 80m x 300m and will have a surface elevation of 4.0 m above sea level. (Fig. 4.).

The perimeter of the island will be formed by a series of custom-build caissons enclosing an interior area that is filled with sand and/or gravel that is of suitable load-bearing strength. Within this area in the center of the island, a concrete cellar will be constructed to house the wells.

The breakwater will be sloped on all sides and have an elevation of 6m AMSL; it will be constructed of rock and other suitable materials resistant to wave erosion. The northern edge of the island will be used as a dock for supply vessels and a pile-supported pier 250m in length will be constructed in the middle of the harbour for oil storage and tanker-barge docking/loading and unloading. A dredged water depth of 12m will be maintained within the harbour and along a 200m-wide channel that runs northward to provide tanker barge access.

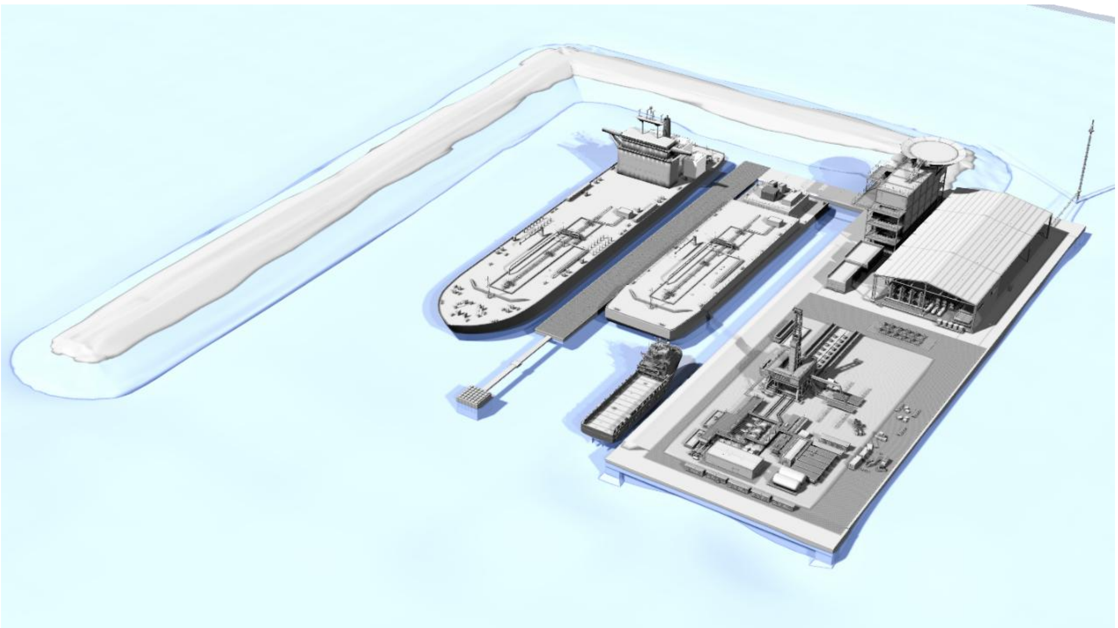


Fig. 4. 3D visualization of the planned drilling and production island.

The island is of sufficient size that future of expansion of the subsurface development and of oil export rates can be accommodated without any requirement for island expansion. In the future, a development scheme for the deposit is envisaged which would potentially double the oil export rate to 8200 tonne/day. To facilitate this, deepening of the dredged channel and harbour area to a depth of 15m would be required, however this is the only aspect of the island, breakwater and channel architecture that would require modification.

While less expensive development options certainly exist, development of Wolin Wschód deposit from an artificial island has numerous benefits compared to alternative development concepts. These benefits are enumerated in Chapter 4.

Description of drilling area and cellar for wells

The western half of the island is planned for well construction activities. A concrete well cellar will be placed in the center of the island with space for a total of 30 wells, with conductors for the wells placed in a 15 x 2 arrangement.

The 3m-deep cellar will measure approximately 40m x 7.5m. The conductors will all be driven during initial island construction and used as needed. Currently, it is anticipated that the use of the cellars will be as follows:

- 8 cellars for the initial production and injection wells to be drilled into the deposit
- 12 cellars for future wells to be drilled into the deposit, as needed
- 10 cellars for possible future development of adjacent gas accumulations or as contingency for additional drilling within the deposit.

All drilled wells will have suitable wellheads and surface valves (“Christmas trees”) that will be connected to the manifold systems that gather fluid from the producing wells or distribute injected fluids into the injection wells. Over top of the cellar, rails will be fixed for skidding the drilling rig into position for drilling or workover operations.

The main equipment that will be placed on the island for drilling and maintaining the wells is the following:

- 650-tonne skid-mounted drilling rig. Total height above the sea will be approximately 65m. This will be one of the defining visual features for the island.

- 5 diesel-fired generators
- 3 triplex pumps for pumping drilling mud and other fluids during drilling or well maintenance operations
- Silos for dry materials (cement, barite, etc)
- mud tanks and diesel storage tanks
- racks for laying out the pipes that will be used to construct the well
- crane for lifting loads onto and off of the island via supply vessels

When constructing or maintaining a specific well, the rig will be situated over that wellhead cellar. When not in operation, the rig will be in its normal 'parked' position to one side of the cellar.

The installation of a permanent drilling rig on the island also is not necessarily the least expensive option available for this development, but again this is the optimal design considering the long-term plans for development of the target oil deposit and potentially the neighboring gas deposits. These benefits are enumerated in Chapter 4.

Description of processing facilities, accommodations and flare stack

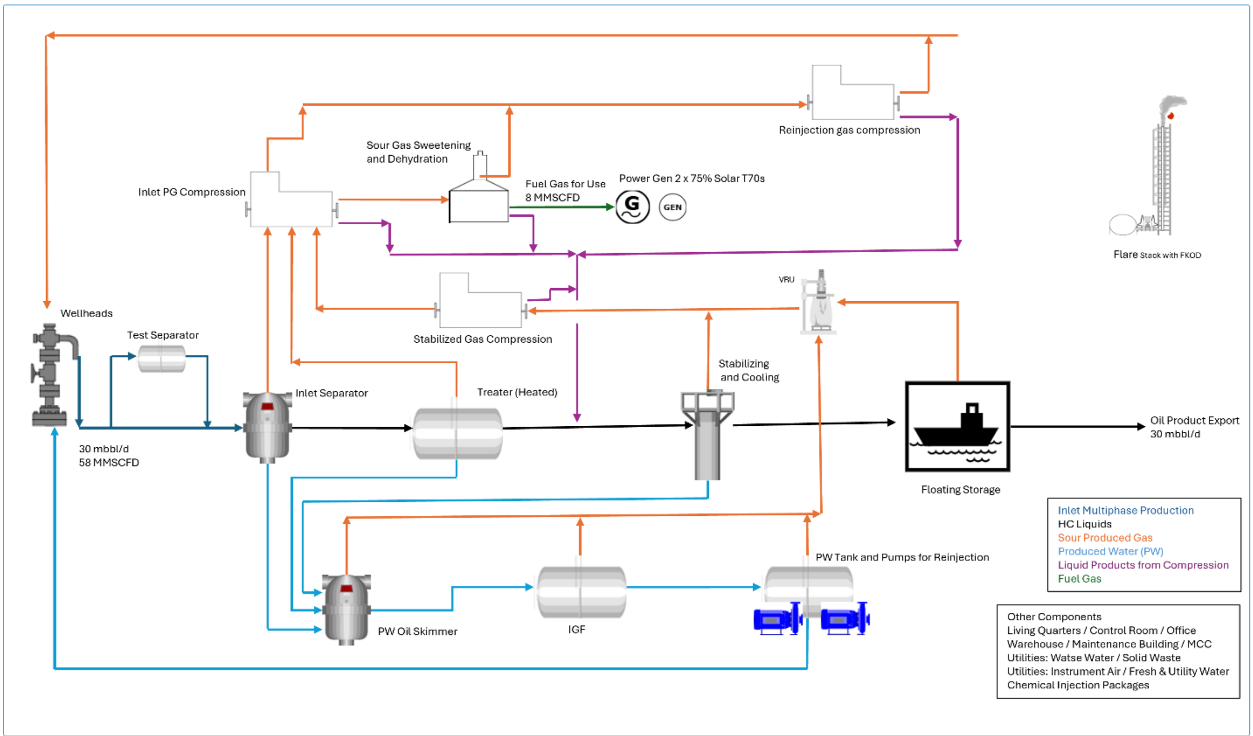


Fig. 5. Diagram of the processing facility.

The facilities for processing fluids produced from the deposit will include the following main elements (Fig.5):

- **three-phase inlet separation**, where the oil, solution gas (gas dissolved in the oil) and water will be separated from one-another and flow rates of all three phases will be measured.
- **second-stage separation**, where the produced oil is heated to remove residual water and gas; from here the sales-quality crude oil is sent to the oil storage barge.
- **double-hulled oil storage barge**, with storage capacity of 20,5 thousand tonnes of crude oil. From here, the oil is pumped via fixed pipes to double-hulled tanker barges for shipping to the refinery receiving facility. A residual gas vapor that

evolves in the storage barge is collected by a vapor recovery unit and sent to the gas processing facility; the oil that is shipped to the refinery is so-called "dead" crude oil.

- **water treatment tanks**, where residual oil droplets and any solids are removed. From here, the produced water is sent to water storage tanks for re-injection into dedicated injection wells (see description below)
- **gas processing facilities**, which are the most complicated part of the processing because the solution gas is sour (it contains both CO_2 and H_2S or "sour gas") and part of the gas needs to be sweetened so that it can be used for electricity and heat generation; the gas not used in the generators, including the removed sour gas, will be compressed and re-injected into the reservoir. The produced gas from the inlet and second stage separation and the vapor recovery unit is therefore handled as follows:
  - The gas is dehydrated (water vapor is removed and sent to the water processing system)
  - About 14% of the dehydrated gas will be separate for use as fuel gas. This gas will be put through an amine unit to remove the CO_2 and H_2S before being sent to the gas-fired generators. The removed sour gas will be re-mixed with the rest of the produced gas and then compressed for re-injection into the deposit.
  - During the compression process, condensate is precipitated from this (very rich) natural gas. That condensate will be stabilized and then mixed with the crude oil for export and sale.
- **a diesel-fired "black start" generator** for process start-up and re-start purposes, will also be installed. This generator provides process heat and electricity until there is enough gas produced to start (or re-start) the gas-fired generators.
- **a flare stack** will be installed about 40m to the east of the island, on the prevailing leeward side, to enable occasional flaring of the natural gas in case of process upset conditions. Usage of this flare is expected to be minimal during field life.

Re-injection of the produced water and most of the produced gas into the deposit are key features of the initial development scheme for the deposit for the following reasons:

- Re-injection of the very salty produced water is a standard oilfield practice and provides the environmental benefit that now water needs to be transported for disposal elsewhere. The injection of the water into the deposit helps to enhance oil recovery and so is beneficial to resource conservation.
- Re-injection of the sour solution gas for the purposes of partial pressure maintenance is not only beneficial to oil recovery: the process designed by CEP will ensure that CO_2 and SO_2 emissions for this project are minimized. After separation from the crude oil and water, the sour gas will be removed from a fraction of the total gas produced and the "sweetened" portion of the stream will be used as fuel for the generators. The extracted sour gas will be re-mixed with the balance of the produced gas stream and re-injected into the reservoir. This method promotes conservation of the oil resource by improving oil recovery and ensures that all of the sour gas contained in the produced gas is re-injected into the reservoir, thus reducing emissions. No SO_2 will be generated except under (exceptional) process upset conditions when process gas needs to be sent to the flare stack.

Description of accommodations for personnel on the island

A single, multi-story accommodations and office/control room structure will also be located on the island. The facility will be a self-contained living and working space for the crews of both the drilling operation (when the rig is active) and the process operations personnel. The island will be manned for 24-hour operations.

The main feature of the accommodation building is that it has been designed keeping in mind that the oil and gas produced from the Wolin Wschód deposit contains H2S. The windows in the building will be sealed and the building interior will always be maintained under positive pressure to prevent any H_2S ingress into the building in case of an unintended natural gas release.

The accommodations building is the only facility on the island that requires reliable access to potable water, which will be obtained from a dedicated desalination facility. It is also the principal source of grey water that must be sent to shore for treatment and disposal. This topic is discussed in more detail later in this document.

Description of initial planned wells

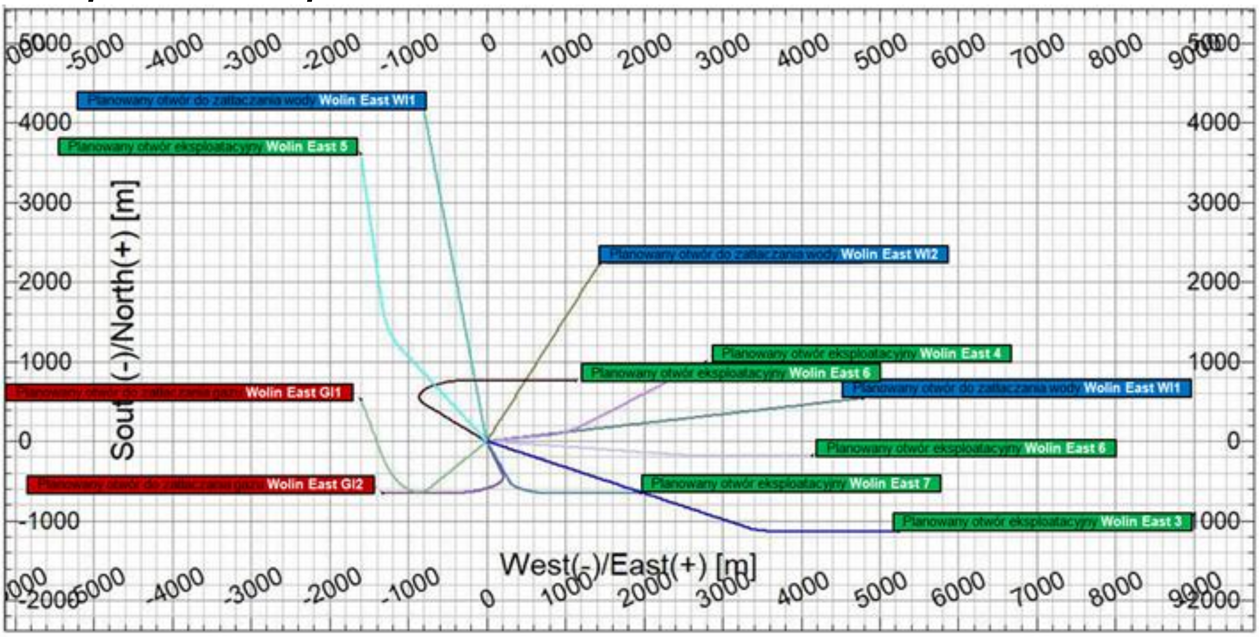


Fig. 6. Wolin Wschód notional well layout

The Wolin Wschód deposit will be developed using directional drilling technology to drill numerous production and injection wells into the deposit from a single surface location (Ryc.6). A total of 8 initial wells is planned to be drilled into the deposit, based on the initial development concept:

- **Six horizontal production wells**, each with production interval length of 1,5 to 2,0 km which will be drilled to target the best quality reservoir, as evidenced by seismic, and placed at the volumetric vertical mid-point depth of the reservoir. The wells will be placed keeping in mind that future infill drilling of additional wells for a full pressure maintenance scheme is contemplated.
- **One horizontal gas re-injection well**, of similar length to the producing wells, that will be drilled at a structural elevation that is above the producing wells. This will result in the injected gas displacing oil downward toward the producing wells (as is done in the BMB deposit, operated by Orlen) and delays the encroachment of the gas on the producing wells.
- **One sub-horizontal water re-injection well** that will be drilled into the deposit at a structural elevation that is deeper than the elevation of the production wells. This will promote displacement of oil up-dip to the producing wells and prevent premature encroachment of the injected water on the production wells.

Description of additional possible future development

The planned resource extraction from Wolin Wschód is based on depletion drive (extraction is based on the energy provided by expansion of the reservoir fluids) augmented by the energy provided by the re-injected solution gas and formation water. This is the method that has been used in almost every other similar reservoir in the region and is the basis for the current GID. However, this is expected to result in relatively low resource recovery efficiency (CEP estimates 25 to 30% recovery of the oil in place) and Company intends to use the early drilling and production information to evaluate and design a revised extraction process that will improve recovery efficiency. This secondary process would involve either:

- injection of additional water into the deposit (so-called "waterflooding") to drive more oil out of the reservoir. Waterflooding would require the use of seawater, together with produced water, to drive the crude oil to the producing wells, or
- injection of more sour gas into the reservoir (mostly CO_2), likely together with additional water, to drive more oil out of the reservoir. Sour gas is preferred because it can be made miscible with the oil and provide the most efficient possible oil recovery. If a suffient source of sour gas can be found locally, miscible flooding could provide the highest resource recovery efficiency for the deposit.

Both secondary processes would result in the following future physical changes to the development:

- drilling of additional injection and possibly production wells
- installation of additional equipment on the island, particularly to facilitate the added injection volumes
- installation of pumps for acquisition of seawater
- increased oil storage and tanker barge size. It is expected that the deposit will be deliver oil at a rate of 8200 tonne/day under by either waterflooding or miscible flooding.

Most of these changes would only be noticeable on the island itself, however the following additional activities would be noticeable:

- deepening of the dredge harbour and tanker-barge access route to 15m
- increased ship traffic during the construction of the additional facilities and wells.

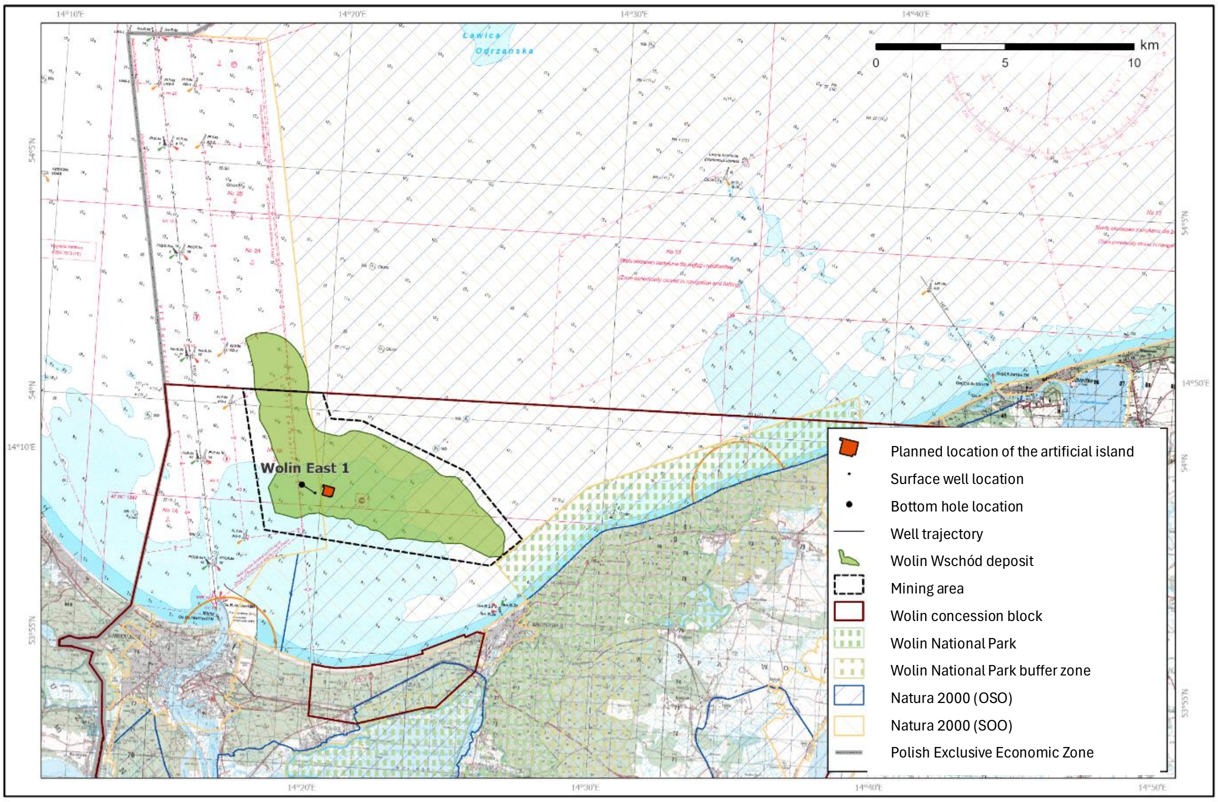
Additional to the plan to change the depletion mechanism for the deposit, other minor changes might be required to maintain proper function of the planned operations: for example, use of seawater to remove salt from the produced oil (if this proves to be necessary) and injection of the used water into the deposit together with the water produced from the wells.

Finally, CEP continues to appraise the gas resources that are known to exist adjacent to and beneath the Wolin Wschód deposit. Exploitation of such resources would require additional drilling on the island and, possibly, construction of a pipeline to a new shore-based gas processing facility. In late 2026, Company plans to drill a well appraising the Rotliegend gas deposit that is expected to exist immediately beneath the island.

All of the anticipated future developments listed above will require specific regulatory approvals, the applications for which will be filed in due course.

2. THE AREA OF THE OCCUPIED REAL ESTATE, AND THE CONSTRUCTION STRUCTURE AND THEIR CURRENT USE, VEGETATION COVER AND WILD ANIMALS

An undertaking concerning the management of the Wolin deposit, through the construction of boreholes made of an artificial caisson-type drilling and production island built for this purpose, located approx. 6 km northeast of Świnoujście, in the area of the sea waters of the Pomeranian Bay and the Baltic Sea (Fig. 7.).



Ryc. 7. Wolin Wschód- location of the artificial island.

The Baltic Sea is a relatively shallow and small sea, characterized by a very limited exchange of waters through the narrow and not very deep Danish Straits. The Baltic Sea is characterized by different physical and chemical properties compared to other sea basins, which are reflected in its biological resources.

It is planned to drill all wells from an artificial caisson-retained island, breakwater and harbour built for this purpose, where all extracted reservoir fluids will also be processed, and from which the extracted oil will be further transported by tankers to a refinery. The area of the island at the seabed will 4 ha, the breakwater 6 ha, and the enclosed harbour 8 ha.

The Pomeranian Bay is a relatively shallow body of water, in which the maximum depths do not exceed 15 meters, and within the Oder Shoal they reach only 6–9 m. Similar depth parameters are achieved in the area in the estuary zone of the Świna River. The ten-metre isobath runs almost parallel to the shoreline at a distance of 1–2 mm, with the exception of the mouth of the Dziwna, in the area of which there is a shoal, stretching towards Cape Święta Kępa and reaching about 5–6 mm wide from the shore.

At the height of the western breakwater of the mouth of the Świna River, the Western Shoal emerges into the Pomeranian Bay. Its range is limited by an isobath running parallel to the coastline at a distance of about 380 m and only in the zone adjacent to the breakwater does the shallow go deep into the sea at a distance of up to 1900 m.

The marine environment and its physico-chemical properties are an important parameter determining the occurrence and development of individual species or groups of organisms defining the bioton of its ecosystem. Its form and richness are determined by more than one factor, and the exponent of living conditions is the complex of all the parameters of the abiotic environment.

The uniform nature of the bottom is also confirmed by the recently conducted post-investment monitoring surveys, which are carried out for the purposes of assessing the impact of the built external port on the eastern side of the mouth of the Świna River on the natural environment of this part of the Pomeranian Bay.

The latest research carried out in this area in 1998 using the method of direct underwater monitoring indicates that:

- the main part of the bottom of the Pomeranian Bay on the eastern side of the approach track for ships entering the ports of Świnoujście and Szczecin has a uniform character:
- The surface of the bottom is covered with fine gray sand, heavily compacted and devoid of vegetation.

This form of the bottom and its nature are also confirmed by the research carried out as part of the monitoring carried out for the needs of the impact of the investment related to the construction of the external port. Information about the character and its type was included in the study of the meiofauna of this region. These studies contain information that on the northern side of the breakwater of the outer harbour the bottom is covered with: fine-grained sand, shell scrap, fairly abundant detritus, shells of the mussel *Cypria ophtalmica*, redox *boundary* at a depth of about 4 cm.

Bathymetry describes the underwater landscape, which is an important factor both in the design of the location of the foundation of the production island and from the point of view of marine life in this part of the Baltic Sea. The bathymetry of the sea is a derivative of the geological situation. Activities carried out as part of the Project (at various stages of its implementation) may have an impact on the shape, structure and processes occurring on the surface of the seabed, such as the displacement of sediments of the dynamic layer or the formation of sedimentary structures.

With regard to the use of the seabed during the construction and operation of the designed installation, the basic legal conditions are indicated by the United Nations Convention on the Law of the Sea, drawn up in Montego Bay on 10 December 1982 (Journal of Laws of 2002, No. 59, item 543) ("UNCLOS Convention"). It obliges countries to take into account the welfare of the marine environment when making decisions related to the use of the sea. This applies both to the exclusive economic zone ("EEZ") (Article 58), but also to the continental shelf (Article 79) and the high seas (Article 94 and Article 112) of UNCLOS.

The legal and environmental conditions for taking this element of the environment into account in this study are also based on point 4 of Annex IV to Directive 2011/92/EU, as a description of the elements specified in Article 3(1) of the Directive, on which the Project may have a significant impact. This obligation is reflected in national regulations m.in Article 66(1)(2)(b) of the Environmental Protection Act, on the basis of which the description of the environment in terms of bathymetric conditions was made. In addition, the provisions of the UOM and the conditions resulting from the decision of the Minister of Maritime Economy and Inland Navigation were taken into account. The regulations issued in this regard by the Director of the Maritime Office in Szczecin were analysed and taken into account.

Any interference with the seabed and the management of dredging material is also subject to the HELCOM Guidelines for the disposal of dredged material at sea, adopted at the 21st meeting of Heads of Delegation (June 2007).

The depth of a given sea basin, as well as its variability dictated by the morphology of the seabed, has a direct impact on salinity, irradiation and water temperature, thus determining the occurrence and ecology of biotic elements, such as: phytoplankton, zooplankton, plant and animal benthos or nekton organisms - fish, marine mammals, and, as a result, seabird populations.

The depth of the sea basin and the variability of bottom morphology may be affected by anthropogenic pressures resulting from human activity. The most important potential anthropogenic pressures that may occur in the area of implementation of the projected project are:

- laying cables, pipelines on the seabed;
- extraction of aggregates from the seabed;
- hydrotechnical structures located on the seabed.

According to current data and information, no anthropogenic pressures have been recorded in the area of the planned project, which may have a significant impact on bathymetry.

Previous studies of seabed morphology and bathymetry in the area of the projected project provide detailed knowledge, which is conditioned by the intensive use of the body of water for the needs of maritime transport. Detailed maps show the depth of the reservoir in the area associated with the seaports in Świnoujście and Szczecin. They are updated on an ongoing basis by the services of the Maritime Office in Szczecin. On the basis of the bathymetric map of this body of water, it can be stated that the seabed in the entire area is slightly diverse and morphologically changed. The analysis of depth fluctuations in the area of the project indicates that the differences between individual points of the area are very small and over a length of about 3 km from south to north they are on average about 1.4 m, reaching a maximum of up to 1.9 m between the most distant points. Only in the zone of the fairway leading to the ports, the bottom drops to a depth of 14.7-14.9 m, which is the result of works enabling safe navigation. Such a small variability in the analysed area indicates that there are no major processes resulting from natural erosion, agitation or transfer and accumulation of sediments. Gradual, a slight change in depth is therefore a natural phenomenon.

As the underwater video footage shows, the area of the seabed in the area of the investment in terms of morphology shows a relatively flat bottom covered with typically sandy sediment. A characteristic feature of the sediment surface are the so-called ripplemarks ("wrinkles" on the surface of the bottom), in the cavities between which fine detritus material accumulates. In addition, aggregations of mollusks, formed by mussels (*Mytilus edulis*), are visible on the surface of the bottom. These sludges lead a sedentary lifestyle by attaching themselves to hard fragments of the ground with the help of linen threads, and as indicated by the literature data, on the shallower, sandy bottom of the Bay, which covers the monitored investment area, these aggregations, especially during stormy conditions, are moved along the surface of the sediment by bottom currents. Therefore, when assessing the abundance of this species, it is difficult to estimate their actual density. In addition to mussels, other mussels are visible in the videos, such as sandclaws (*Mya arenaria*), which are among the largest representatives of mussels (Bivalvia) in the Baltic Sea, growing up to 70 mm in length. However, based on the footage, it is difficult to determine whether the visible representatives of these mussels belonged to living individuals, or whether they were just their remains in the form of empty shells.

The biological environment of the sea in the zone of the planned project is defined by both plant and animal organisms. These are two interrelated groups, constituting successive, interdependent links in the trophic chain. They participate in the circulation of matter and energy at the same time, giving the ecosystem a relatively natural and stable arrangement.

2.1. Ichthyofauna

To date, research on ichthyofauna in the Pomeranian Gulf has been carried out by various scientific centers, mainly by the Marine Fisheries Institute in Gdynia and specialized scientific units of the Faculty of Food Sciences and Fisheries of the Agricultural University in Szczecin. However, these studies were limited in scope and usually concerned selected species, periods, places, as well as the efficiency of the fishing gears used. They were not of a permanent nature, conducted systematically in specific places and periods for subsequent seasons.

For the ichthyofauna of the Pomeranian Bay, its location and complex hydrodynamics are of great importance. The Pomeranian Bay belongs to the Oder estuary, which is why there is an intensive exchange of waters between the Szczecin Lagoon and the Pomeranian Bay, which takes place through three straits, i.e. Świna, Dziwna and Piana. Taking into account the Polish part of the Bay and the conditions of water exchange in the movement of fish, the connection through the Świna River plays the biggest role. The average annual inflow of fresh water into the Gulf is relatively large, which has a significant impact on the ichthyofauna occurring in its waters at particular times of the year.

The interaction of the waters of the lagoon and the sea is an important factor influencing the environmental conditions of the Gulf. An important factor is also the large variation in salinity throughout the year, both horizontal and vertical. According to studies, it ranges on average from 2.7‰ in the estuary zone to 7.7‰ inland. The sweetening and fertilizing influence of the waters of the Szczecin Lagoon creates favorable feeding conditions for the existence of many species of freshwater fish, which periodically migrate to the Pomeranian Bay. The range of hikes into the Gulf varies and depends, among other things, on the season.

The results of the research monitoring allow to characterize ichthyofauna both in terms of species composition and population size of individual taxa. The characteristics of ichthyofauna in the area of the designed project are:

- on the basis of the fishing hauls made in the studied part of the reservoir, the occurrence of 41 species of fish and one representative of mandibles represented by the river lamprey *Lampetra fluviatilis was found in its zone*;
- fish species found in the Pomeranian Bay are a mixture of freshwater fish species accounting for 4.717-10,173-44.28%, marine fish species accounting for 52,744-89,333-95.24% and very few bi-environmental fish;
- The sea ichthyofauna in this body of water is represented mainly by: sprat, herring, flounder, plaice, turbot, cod, devil's hen, eel, sand plantain, Tobiasz dogfish, as well as the invasive species of the bull's gopher. Occasionally there are: belona and needle tree;
- In the area covered by the study, the occurrence of fish belonging to the following species was not recorded: mackerel, horse mackerel, plantain, fox, tash, snakefish, overlay, whiting, anchovy;
- There are only 13 taxa that are permanently occurring in the ichthyofauna of the studied area, including two freshwater species - perch and zander, two migratory species - smelt and whitefish, nine whitefish - flounder, herring, sprat, devil's hen, turbot, plaice, tobiasz, dobijak and bull goby. Other taxa of fish found in the waters of the Pomeranian Bay sporadically. The presence of some individual specimens was recorded in only one haul;
- in the ichthyofauna of the Pomeranian Bay, representatives of freshwater fish have a significant share. The main species are: perch, zander, less often roach, bream and unexploited fisherman. Occasionally, migratory species also appear here, mainly trout, whitefish and smelt

- the behaviour of the populations of fish species found here is greatly influenced by changes in the directions of surface sea currents reaching speeds of 1-2 Mm/h caused by winds
- an important factor determining the species diversity of ichthyofauna during the year, in different parts of the Gulf, is the temperature of the waters. Their thermals determine the start of spawning and condition their migrations. Hence, in the region, the species composition of ichthyofauna changes both in the annual cycle and in a longer period of time.

Among the 44 species of fish caught in the Pomeranian Bay, only a few, although economically important, have their spawning grounds in this basin. For many species of inland fish, whose adult forms occur in the bay, the salinity of this body of water causes that they do not spawn and migrate to waters with lower salinity (freshwater fish). In addition, due to the life cycle and characteristic features of the breeding sites, the possibility of reproduction in the Pomeranian Bay of migratory fish should be excluded: salmon, sea trout, eel, whitefish, whitefish, river and sea lampreys, and probably smelt.

For the possibility of fish reproduction in this region of the Pomeranian Bay, the bottom substrate on which fish can reproduce is important. The bottomof the Pomeranian Bay, including the investment area, is not subject to significant anthropogenic processes. In the area of the investment, the bottom structure is dominated mainly by sand fractions, to a much lesser extent gravel and stony formations. In addition, the area of the projected project is characterized by significant poverty of phytobenthos formations. The reasons are seen in the sandy nature of the bottom and moving masses of water, which prevent or hinder the deposition of thallus. Taking into account the data contained in the available literature, the Pomeranian Bay may be a breeding site for herring (spring breed). In addition, these places can be potential spawning grounds for gopher fish (May-July), in the period from May to September they can be potential spawning grounds for tobias, and from May to November they can be spawning grounds for the whitefish. In addition, from April to August, they can be a spawning place for turbot.

In the waters of the Pomeranian Bay, the period in which herring larvae are usually observed suggests that these larvae come from spring herring. Usually, spawning in the bay begins at the beginning of April and lasts until the end of May.

Therefore, during the spawning period of these fish, in particular species whose reproduction is massively (spring herring), investment activities that could cause significant losses in fish stocks should be minimized or measures should be applied to limit the impact (screens limiting the spread of the suspension).

2.2. Marine mammals

Monitoring and inventory of marine mammals as part of the search phase was carried out in the period from March 2021 to February 2022. As well as monitoring of the presence of mammals during the exploration borehole at the turn of 2024/2025 Mammal counts were carried out in a strip of up to 500 m on each side of the side, passing by motor boat along the designated transect. During all 10 inspections carried out in 2021, a total of 2 individuals of the sea charity seal (grey seal) - *Halichoerusgrypus - were recorded*. Seals were observed from the deck of a boat on 1 transection, on 26.03.2021 During an inspection carried out on 14 June 2021, 1 dead seal was found on transsection 0. The state of decomposition of the animal did not allow for the designation of the species. In the following months, the presence of mammals was not recorded on any of the transects during monitoring.

At the same time, a collection of data and information on the occurrence of marine mammals in the vicinity of Świnoujście was kept. Interviews with fishermen provided information about the mass occurrence of seals in the waters of the bay in the spring, i.e.

from March to the end of May. The migration of seals during this period should be associated with the migration of herring herring herds to spawn, and thus with food richness.

In the situation of such a small sea as the Baltic Sea, actively and passively migrating organisms (fish, mammals, birds and macroalgae) penetrate its entire area and cannot be unambiguously assigned to a given location. Among the fauna species that may turn out to be the most sensitive to the threats resulting from the drilling rig are marine mammals. Marine mammals include mammals that spend most of their lives in water.

Data on marine mammal observations were obtained from the WWF Poland database operating since 2010 as part of the project "Support for the restitution and protection of Baltic mammals in Poland", currently continued as part of the project "Protection of marine mammals and birds - continuation" co-financed by the European Union from the Cohesion Fund under the Operational Programme Infrastructure and Environment, data obtained from the Wolin National Park, available published data (including from the Professor Krzysztof Skóra Marine Station, Institute of Oceanography, University of Gdańsk) and own observations. The chapter also refers to the results of monitoring of marine mammals carried out in the waters adjacent to the investment area, for the purposes of the Environmental Impact Report for the amendment of the decision on environmental conditions for the Offshore Wind Farm of the Baltic Sea Wind Farm II project and the results of porpoise monitoring carried out as part of the National Environmental Monitoring and the SAMBAH project, as well as other nature studies and publications on marine mammals. Institutions for the study and observation of marine mammals on the southern coast of the Baltic Sea

The most important Polish research centre dealing with the study and observation of marine mammals on the southern coast of the Baltic Sea is the Prof. Krzysztof Skóra Marine Station of the Institute of Oceanography of the University of Gdańsk (based in Hel). This center is a national center for research on marine mammals found in the Polish part of the Baltic Sea. One of the main objectives of the Station is to collect data on the occurrence of seals and porpoises in the Polish part of the Baltic Sea and the scale of anthropogenic threats to these mammals and their habitats (www.hel.ug.edu.pl). The Marine Station closely cooperates with the WWF Poland Foundation, as a result of this cooperation and field needs, the WWF Blue Patrol has been operating on the coast since 2010. The WWF Blue Patrol is currently a group of over 200 volunteers from local communities, operating throughout the Polish coast. Since the beginning of its operation, the Patrol has been monitoring the seashore in search of seals and porpoises, intervening in these species – the Patrol is currently the first element of the response in the event of reports of (live or dead) Baltic mammals on the Polish coast. As part of the functioning of the WWF Blue Patrol, a database on the observation of Baltic mammals was created. A similar database has also been maintained by the Hel Marine Station for years, and possible discrepancies in the databases may result from interventions undertaken directly by the Marine Station in the area of the Hel Peninsula. Data on the observation of seals and porpoises in the coastal zone (shore + 500 m) for the west coast during the period of operation of both databases (since 2010) are identical in 99.9% of cases - the data are based on the same data, mainly confirmed and documented in the field by WWF Blue Patrol volunteers, verified by the Marine Station. In addition to the data collected on the basis of WWF Blue Patrol volunteers, the Marine Station has carried out (in the area of the Bay of Gdańsk) and is currently carrying out (on the entire coast) research on porpoise monitoring with the use of hydroacoustic detectors – C-POD. The results of these studies have not yet been developed and made public.

In addition, research on marine mammals is carried out as part of the National Environmental Monitoring commissioned by the General Directorate for Environmental Protection (carried out by various entities), as well as National Parks – Wolin National Park (West Pomeranian Voivodeship) and Słowiński National Park (Pomeranian Voivodeship), as part of conservation tasks, including external projects. In the years 2015-2017, as part of the project entitled "Protection of the habitats of the grey seal (Halichoerus *grypus*) and porpoise (*Phocoena phocoena*) in the area of the Słowiński National Park" implemented under the Operational Programme PL02 "Protection of biodiversity and ecosystems" under the European Economic Area Financial Mechanism, the Słowiński National Park implemented a project involving pedestrian monitoring of the seashore and listening using hydroacoustic detectors (C-POD).

In the Baltic Sea, there are four species of marine mammals – porpoise (*Phocoeana phocoena*) and three species of seals – the grey seal (*Halichoerus grypus*), the common seal (*Phoca vitulina*), and the ringed seal (*Pusa hispida*).

The porpoise is one of the smallest species of toothed cetaceans, with an adult body length of 1.5-1.9 m in the Baltic Sea and a body weight of 50-70 kg (females grow larger than males). It looks like a dolphin, although the head is devoid of a "beak" - it is characterized by a short, truncated nose. The color of the back is dark, almost black, and the dorsal fin is small and triangular. Porpoises swim alone or in small groups, numbering 2-3 individuals. During the feeding season or during migrations, it happens that they form flocks. These animals lead a very secretive lifestyle. Their behavior on the surface is mostly inconspicuous, and the inhalation of air (inhalation and exhalation) is almost invisible. They permanently need access to air, which involves regular surfacing every 8-12 minutes. They prefer shallow coastal waters, small bays and estuaries, but it is also found far from the shores (Bjørge 2003, Lockyer and Kinze 2003, Jefferson et al. 2008). Porpoises are also seen in ports. They usually move near the surface or dive in search of food. Then they can also feed at the very bottom. The porpoise feeds on herring, sprat, small cod, and a variety of bottom fish such as shrimp and gobies. The species has a wide range in temperate waters in the Northern Hemisphere. There are three porpoise populations in the Baltic region: in the Baltic Proper and the north-north-east, in the Belt Sea and the South Kattegat, and in the North Kattegat, the Skagerrak and the North Sea.

Porpoises are characterized by a strong maternal instinct. A female can give birth to an average of 3-4 young throughout her life. Immediately after birth, it tows the young to the surface of the water, where they can take their first breath. Then the calf returns under the water to drink its mother's milk. The mother feeds them and provides them with caring care, and when the child grows up, they often continue to travel the sea routes together. The life span of porpoises is on average several years (www.sambah.org, www.wwf.pl/zagrozone-gatunki/morswin). Porpoises are very sensitive to underwater sounds, and thus very exposed to high sound levels associated with the stage of operation of the drilling rig. Their sensitivity to the sound generated during the operation of the spinning wheel is lower.

The migration routes of marine mammals (porpoises and seals) in the area of the investment are difficult to unambiguously determine. There are few sightings of porpoises. It occurs primarily in shallow waters, which are its preferred feeding area. Previous studies indicate that this species is more often recorded in the western part of Polish marine areas, but its occurrence is not limited to specific bodies of water (Barańska et al., 2018). In the years 1990-2009, both sightings of live and dead animals found on the shore and reported bycatch were recorded. Since 2004, by-catch data have become incidental, but the number of reports of dead animals washed ashore has increased (Porpoise Protection Programme - Project, 2012).

An international study carried out on a sea-wide scale by the SAMBAH project between 2011 and 2013 confirmed that the shallow coastal zone can be an important part of the habitats used by Baltic porpoises. In the years 2020-2023 (September 2020 – May 2023), porpoise activity was monitored throughout the Polish coastal zone of the Baltic Sea. The research was carried out using the passive acoustic monitoring (PAM) method. For the listening, 60 C-POD stations were used, arranged in two rows – on the first and third mile from the shore, at intervals of 8 miles. The lowest number of detections (DPD) was recorded in the approaches to the ports of the Bay of Gdańsk and on the maritime side of the Hel Peninsula, where there is intense ship traffic. The highest PPM was recorded in the Pomeranian Bay, between Kołobrzeg and Świnoujście, with particularly high values in the vicinity of Dziwnów and the island of Wolin. In the area of the island of Wolin, higher detection values were recorded on the third mile. As in the case of approaches to the ports of the Bay of Gdańsk, the number of detections in the area of the approach to the port of Świnoujście was lower – this could have been influenced by the intensity of ship traffic.

Analysing the available data from 2024, it should be admitted that in the area of the Polish coast, porpoises are most abundant in the Pomeranian Bay region, however, when analysing the data, it can be noted that the percentage of days with porpoise detections in the six nearest measuring stations ranged from 2.4% to a maximum of 13.3% of days with porpoise registration.

The results of the SAMBAH project showed the division of the year into two seasons in the context of the distribution of porpoise populations in the Baltic Sea, i.e. from May to October and from November to April. Koza and Pawliczka (2024) confirm this division, with their observations of radical changes in PPM numbers in the Pomeranian Bay already taking place in April, both in 2021 and 2022.

In Polish marine areas, the only repopulated (since about 2010) place of permanent stay of seals is a hatch in the area of the Vistula Estuary – these are Sandy Sand Banks away from the shore. In the case of high water levels of the Baltic Sea (waves), seals use the eastern steering wheel of the Vistula Estuary. At the moment, seals can be observed almost every day in the area of the Vistula Estuary. In the report from the WWF Poland Foundation project, in the years 2010-2023, 1469 records of live seal sightings were recorded on the entire Polish coast (without the observation of seal colonies in the Mewia Łacha reserve – seals occur systematically there). The presence of all three species of seals inhabiting the Baltic Sea was recorded, with the vast majority of sightings involving grey seals – 1390 (95% of all sightings). Common seals were seen 40 times (<3%), and ringed seals only 8 times (<1%). Seals not specified to the species (nn) were registered 31 times (2%).

In the area of the Pomeranian Bay, among the three species of seals, the most common are gray seals. In the period from January 1, 2022 to September 2024, sightings of live grey seals were recorded 171 times in the WWF Poland Foundation database (they accounted for >90% of all sightings in this body of water), some of these observations concern the same individuals, but in the database such a case is recorded once a day for reports in the same location (town).

Seals are mainly found in the sea, but they also migrate upstream. They like to relax on the beach, but also in less typical places, they often use hydrotechnical facilities (breakwaters, slipways) for this purpose. In particular, during the high tourist season, when the sandy seashore is occupied by beachgoers, seals choose calmer elements of anthropogenic origin.

Periods of particular importance for Baltic mammals in the vicinity of the investment are the period of reproduction (in the case of porpoises – from May to August) and childbirth and molting (in the case of grey and ringed seals in February-March, in the case of common seals at the turn of June and July).

The monitoring consisted in conducting visual observations by qualified marine mammal observers (MMOs) from the deck of the ship in accordance with the methodology defined by the JNCC committee combined with Passive Acoustic Monitoring (PAM) based on the use of a set of hydrophones (PAM detectors) placed in the water. Measuring buoys equipped with an omnidirectional hydrophone recording underwater sounds in the frequency range from 10 Hz to 20 Hz were used for the monitoring.

Environmental monitoring carried out during the implementation of the investment concerning the construction of the Wolin East 1 borehole provided detailed information on the impact of the investment on biotic and abiotic elements of the marine environment: on the presence of porpoises and the level of underwater noise. The analysis of the results showed that in the first phase of monitoring, i.e. before the start of drilling, porpoises were detected at all measuring stations. In the second phase of monitoring, the number of positive detections of porpoises decreased significantly, and at some stations their presence was not recorded at all. Real-time monitoring using the VPAM system also showed no porpoise activity within a radius of 500 meters from the platform. This is also confirmed by the report on the monitoring of the presence of marine mammals, consisting in conducting visual observations by qualified marine mammal observers (MMOs), who also did not detect the presence of marine mammals during drilling work.

2.3. Avifauna

During all 18 inspections of birds at the search stage, a total of 16980 birds belonging to 40 species were recorded. The most numerous species recorded during all inspections was the long-tailed duck – 6936 individuals and the cormorant – 6639 individuals. A total of 40 species of birds were recorded on all transects, of which 33 are under strict species protection, 3 are under partial protection and 4 game species, among the species listed in Annex I of the Birds Directive there are 6 species, while 5 species are on the list of the Polish Red Book of Animals. There are 8 species on the Red List of Polish Birds.

The area of the Pomeranian Bay is used by many species of birds, both migrating and wintering in the Szczecin Lagoon. Very important from the point of view of migratory and wintering avifauna in this area is the food abundance of this area, both in terms of ichthyofauna and bentofauna. In the case of bentophages, the indicator is the abundance and biomass of bottom fauna, but in this case of ornithofauna, the one with larger size fractions is of particular importance.

Bird monitoring as part of the investment entitled. "Assessment of commercialization of natural gas deposits located in Permian-age rocks about 2600 m below the seabed" was carried out in the period March 2021 – February 2022 (a total of 18 inspections). For the purpose of monitoring, a route was laid out in the studied area, along which bird counts took place.

The applied method of ornithological monitoring allows for the conversion of the number of birds found within the transects into densities expressed in the number of individuals per 1 km2, in accordance with the standards adopted in the world and in Poland. Monitoring of waterfowl during the migration period. Methodological guide. GDOŚ, Warsaw. Bird monitoring including Natura 2000 special protection areas, 2018-2021. Stage 3. Part II. Monitoring of seabirds including Natura 2000 special protection areas, 2018-2021. Report on field work and elaboration of results obtained in the Monitoring of Wintering Seabirds in 2020. Marki, Warsaw.

Estimated densities and abundances of individual species varied depending on the date of the inspection (season) and the transect of the study. Out of the observed 43 bird species, as many as 28 species reached very low maximum densities below 1 person/km2 (i.e. 65.1% of the total species). At the same time, only 4 species reached maximum densities above 10 individuals/km2 (i.e. 9.3% of the total species). These were:

1. Long-tailed duck – maximum density 91.83 people/km2,
2. Kormoran – maximum density 80.85 people/km2,
3. Silver gull – maximum density 15.15 persons/km2,

4. Common scoter – maximum density 10.26 people/km2.
   None of the species has reached a maximum density exceeding 100 individuals/km2.

2.4. Phytoplankton

The plant world in the marine environment is represented mainly by thallows representing various systematic groups. Sea waters, due to their special ecological parameters, and above all salinity and considerable depths, prevent the occurrence of vascular plants. The only species adapted to exist in their salty habitat are the seagrass *Zostera marina* L. (= tapeworm), which inhabits the shallow coastal waters of the seas of the Northern Hemisphere, and Posidonia ssp. its counterpart mainly in the Southern Hemisphere, whose species are found in the waters of the Mediterranean Sea off the coast of Hong Kong and along the southern coast of Australia.

Results of the study of phytoplankton assemblies. can be summarized as follows:

a) taxonomic composition of phytoplankton:

- the phenomenon evident in the taxonomic diversity (biodiversity) of phytoplankton in the area of research was primarily seasonal changes, having the character of seasonal succession;
- the differences between the positions, although existing, were of a secondary nature and did not show a definable direction or arrangement;
- in the taxonomic composition of phytoplankton, only sporadically the occurrence of the cyanobacteria *Nodularia spumigena*, known for the formation of toxic blooms in the Baltic Sea, was recorded; another cyanobacteria forming blooms in the Baltic Sea, *Dolichospermum flosaquae* (previously given as *Aphanizomenon flos-aquae*), was more often present;

b) phytoplankton density (abundance):

- As in the case of taxonomic structure, seasonality was the factor that most strongly shaped the quantitative relationships between the individual species that make up the phytoplankton groups in the studied area;
- the analysed phytoplankton reached the abundances that would allow for the detection of a bloom, and it was a bloom of diatoms; in the other seasons, no bloom was observed, and this was a particularly unusual situation for August, when cyanobacterial blooms are a typical phenomenon;
- a toxic species of cyanobacteria, *Nodularia spumigena*, although observed in phytoplankton, occurred sporadically and in small numbers;
- the differences in the distribution of the abundance of individual taxa between sites were much less significant compared to the overwhelming influence of seasonal changes;

c) dominance structure:

- The factor most strongly shaping the quantitative relationships (percentages of individual taxa) in phytoplankton assemblages in the studied area were, as in the case of taxonomic structure and abundance structure, seasonal changes expressed primarily in the fundamental exchange of the dominant phytoplankton group during the year: the dominance of diatoms in March gave way to the codominance of cyanobacteria, cryptovillia and diatoms in June, cryptoflagella and greenflies (and locally diatoms and cyanobacteria) in and cryptoflagellum (locally with greenery and cyanobacteria) in November;
- The differences in the dominance system between positions were blurred compared to the overwhelming influence of seasonal changes.

(d) no species of any protected species have been identified in the phytoplankton studied.

2.5. Zooplankton

The results of monitoring zooplankton assemblies can be summarized as follows:

a) Taxonomic composition and richness of zooplankton
   - 37 taxa were found – 5 species of paddlefish (Cladocera), 16 taxa of copepods (Copepoda) and 10 species of rotifers (Rotatoria). June turned out to be the richest in terms of the number of taxa, and November the poorest. On the other hand, taxonomic differentiation expressed by the Shannon-Wiener coefficient (H') showed the highest values (1.8-1.6) in March at CEP2, CEP3, CEP4, June at CEP1 and August at CEP2.

b) Seasonal variability was the most important factor shaping zooplankton groupings. This trend was confirmed by the analysis of taxonomic wealth variability, dominance structure and density. The observed differences ran over the course of seasonal succession (from season to season).

c) Domination Structure
   - in the dominance structure, rotifers accounted for 36%, Bivalvia larvae for 29%, copepods for 27%. The dominant taxa were: *Keratella quadrata quadrata (25%), Keratella cochlearis cochlearis* (5%), larval stages Calanoida (nauplii) (8%), *Acartia bifilosa* (7.5%) and larval stages Calanoida (copepodite) (6%).

d) Phytoplankton density (abundance)
   - The average density of zooplankton was 84 individuals/dm3. The highest densities were recorded in June and August (212-90 individuals/dm3) and the lowest in March and November (7-40 individuals/dm3).

e) Between groups of samples from different research seasons, large differences were found in zooplankton assemblies, ranging from 94 to 88%.

f) No species were found in the zooplankton that would be subject to any protection.

2.6. Phytobenthos

The analyses of phytobenthos samples taken allow for the following conclusions:

a) Taxonomic composition and richness of phytobenthos:

- The phytobentos of the study area were characterized by a fairly high taxonomic richness, consisting of 152 taxa of species, variety and subspecies rank.
- This wealth was the result of the accumulation of benthic and periphytonic diatoms from other regions carried by sea currents and the decline of dead planktonic diatoms. The analysed material bore the hallmarks of taphocenosis and not biocenosis, as evidenced by the high degree of destruction of the so-called feathery diatoms in the studied samples and a significant share of centric species, typical of plankton formations.
- Many phytobenthos taxa identified in the studied material are taxa appearing with low frequency, the so-called adventitious species, and they were the ones who determined the large differences between individual sites.
- Despite the moderate taxonomic richness of phytobenthos in the study area, the core of this ecological category consisted of a dozen or so diatoms taxa (m.in. *Cyclotella atomus, Paralia sulcata, Pantocsekiella comensis, Coscinodiscus centralis, Actinocyclus normanii, Thalassiosira pseudonana, Staurosira martyi, Diploneis didyma, Cyclotella meneghiniana, Cyclotella choctawhaheeana*, *Thalassiosira baltica*, *Ulnaria ulna, Nanofrustulum sopotensis, Amphora marina, Amphora inariensis* and *Aulacoseira granulata*).
- The vast majority of taxa, with a share constituting a small percentage of the total relative abundance of diatoms, qualify them as regressor groups and, above all, as sub-

recensors, i.e. taxa that contribute a minimum percentage to the abundance of the entire phytobenthos complex.

b) dominance structure

- The phytobenthos of the studied sites were characterized by a strong dominance of diatoms with a wide spectrum of tolerance to the degree of salinity, overfertility and water pollution, and a significant part of the species belonged to the so-called anthropogenic syndrome, i.e. associated with conditions of significantly increased trophy and organic pollution, caused by human activity.

c) diatomaceous index

- The results of the diatomaceous indices used to assess the ecological status of the studied region (IPS, IDG and IBD) confirm the poor or poor ecological status of the waters of the studied region.

(d) no protected species have been found in the phytobentos studied.

2.7. Macrobenthos

The results of the macrobenthosis syndrome study can be summarized as follows:

a) taxonomic composition and macrobenthos richness:

- The macrobenthos of the study area were generally characterized by poor taxonomic richness (19 taxa of phylum, genus and species rank); the taxonomic richness (total number of taxa) of macrobenthos was subject to some spatial and temporal variability, in individual phenological seasons (i.e. months representing the seasons in which material for research was taken).
- in the spatial distribution of taxonomic richness, sites from the investment area (CEP1 and CEP2) were characterized by a slightly smaller number of taxa in all phenological seasons.
- The effect visible in the taxonomic diversity (biodiversity) of macrobenthos in the study area was mostly seasonal changes, reflected in the taxonomic composition of this ecological formation as a seasonal succession. The differences between the positions were of a secondary nature and did not show a definable direction or arrangement. Such a great similarity in taxonomic composition between the sites was probably due to the fact that they were all located at a short distance, one from the other, and were also characterized by similar parameters of the sedimentary environment and water level.

b) Domination Structure

- The factor that most strongly shaped the relations between the percentages of individual taxa in macrobenthos assemblages in the studied area were, as in the case of the taxonomic structure, seasonal changes. They were expressed in a sequence of dominant taxa, ranging from polychaetes (Polychaeta) in March and June to the dominance of bivalves (Bivalvia) in November. The differences in the dominance system between the sites were blurred in comparison with the overwhelming influence of changes over time, associated with the phenological cycle of this formation of organisms;

g) macrobenthos abundance

- As in the case of taxonomic structure and dominance, seasonality was the most strongly influencing the quantitative relationships between the individual taxa that make up the macrobenthic assemblages in the studied area;
- Fluctuations in the seasonal system have been observed: lower values in the winter season (March), higher at the beginning of the phenological season (late spring - June), when new generations of organisms appear, a recurrence in summer (in

August) because the overwintering generations die out, and another increase in autumn (November), when new cohorts appear.
- there was also a fairly high variability between sites in a particular season, which was particularly characteristic of the CEP1 and CEP2 sites, which were characterized by generally lower abundances of bottom macrofauna.

h) biomass
   - In the structure of dominance in macrobenthos biomass, taking into account the main systematic groups, a decidedly different reflection of this structure was observed at all sites than in relation to the structure of dominance in macrofauna abundance. The differences in both of these structures result primarily from the size and weight of individual taxa, primarily molluscs, represented by bivalve molluscs (Bivalvia).
   - the dominant group in the share of the main macrobenthic taxa in biomass were bivalve molluscs (Bivalvia), the share of other macrobenthic taxa, such as: Turbellaria, Oligochaeta, Polychaeta, Gastropoda and Crustacea in the biomass dominance structure, was small, at the level of a maximum of a few percent, and usually less than 1%.
   - The analysis of the similarity of the dominance structure in macrobenthic biomass at individual sites of the studied area showed, as in the case of the taxonomic structure, dominance and abundance, the main and outstanding influence of seasonality on the formation of this aspect of macrobenthic assemblages. With such a pronounced impact of seasonal changes, small spatial differences between the sites, although existing, were much less important.

i) The analysis of changes in macrobenthos biomass in the studied area showed a significant role of seasonality as a factor exerting the strongest influence on the formation of qualitative relationships (in terms of biomass) between individual taxa forming demersal macrofauna assemblages, as in the case of taxonomic structure, dominance in abundance and biomass.

j) Seasonally, fluctuations between biomass values have been observed in individual phenological periods: clearly low values in the winter season (March), higher at the beginning of the phenological season (late spring - June), when new generations appear, regrowth in summer (August), as organisms increase their mass, although at this time there was a general decrease in macrobenthos and a further increase in autumn (November), when new cohorts emerge and the body weight of other organisms also increases.

k) No protected species were found in the studied macrobenthos.

3. TYPE OF TECHNOLOGY

3.1. Overview

The type of technology to be used for this project and the way that it promotes conservation and protects the environment is summarized here as follows:

- Island and construction-related technology
- Drilling and well design technology
- Oil and gas production-related technology

For each of these project elements, the basic design objectives, the selected technology, and they way this technology promotes conservation and environmental protection is discussed.

3.2. Design objectives:

1. Construct an island, breakwater and harbour that is fit for both the current purpose (initial development of the Wolin Wschód deposit) and anticipated additional future purposes (projects to enhance oil recovery from the deposit or to exploit adjacent deposits) as described in Chapter 1
2. Ensure the island and breakwater are designed to withstand and be operable in the full foreseeable range of local weather conditions and sea states
3. Minimize the overall footprint of the project and the extent to which this footprint might have to be increased with future development
4. Ensure that the island is situated and constructed in a way that ensures the integrity of the installed equipment, the safety of all personnel, and uninterrupted operability
5. Ensure that the impact of the island and breakwater on local wildlife and third-party human activity is minimized.

3.3. Island and breakwater technology

To minimize the footprint of the island, a so-called “caisson-retained” island will be constructed. Such an island is an artificial island consisting of a series of caissons placed around the perimeter, which is then filled with a rock or sand to form an artificial island. Concrete caissons are prefabricated structures with open chambers, consisting of a thick foundation slab and various interconnected internal walls. The caissons are installed on a rockfill mattress that provides an even support surface. Once installed, they rely on their own weight to withstand design loads and provide a solid foundation for a variety of surface load applications such as building contours, cranes, and mobile equipment. The cap wall, which extends to the final height of the deck surface, is inserted into the upper part of the front (facing the water) caisson wall to accommodate mooring cones and fenders.

Each caisson is dimensioned according to the load actions; However, its width is usually dependent on the range of the height maintained. The overall width must meet various geotechnical design criteria (safety factors), such as overall stability, displacement resistance, tipping resistance, rotation resistance, etc. The structural design of the caisson includes determining the required reinforcement in the caisson foundation slab, internal and external walls, and the structure of the crowning wall.

For the Wolin Wschód project, an island measuring 80m x 300m has been designed. The island will be enclosed on all sides by 21 concrete caissons that will reside on a gravel foundation pad. The surface of the island will be 4m above mean sea level.

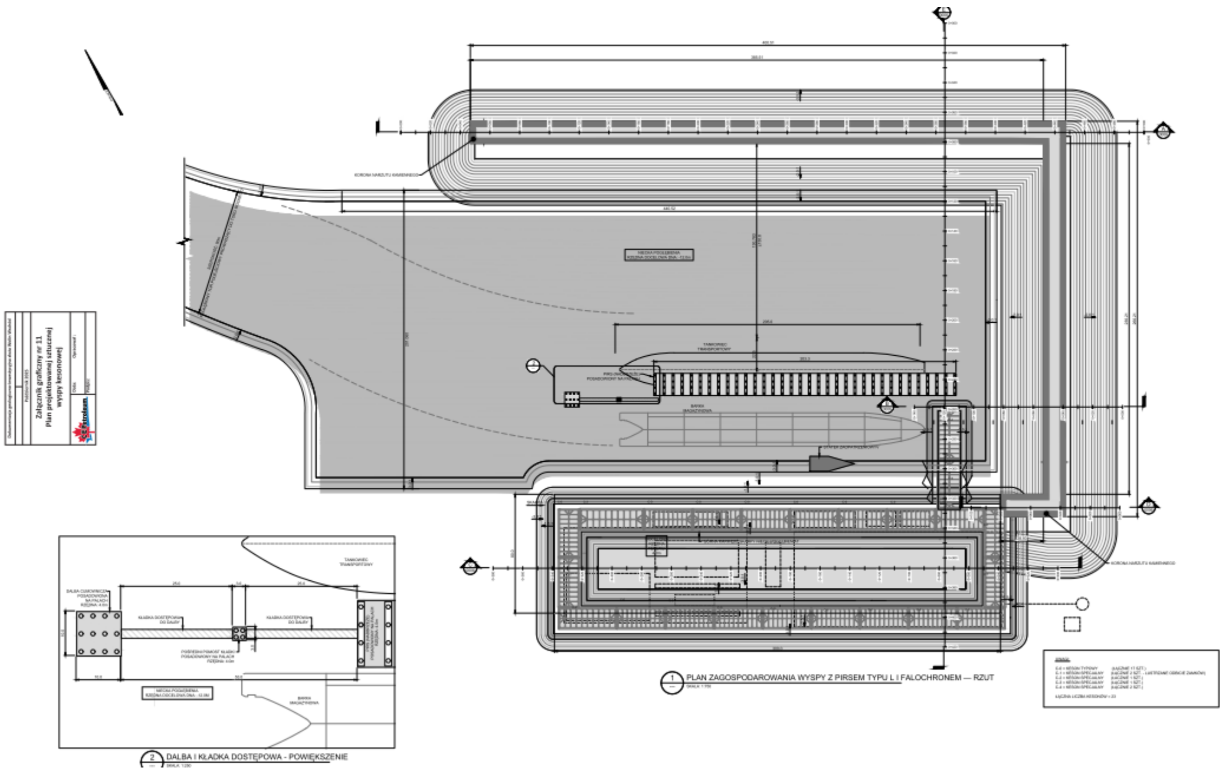


Fig. 8. Planned island and breakwater, including a breakwater.

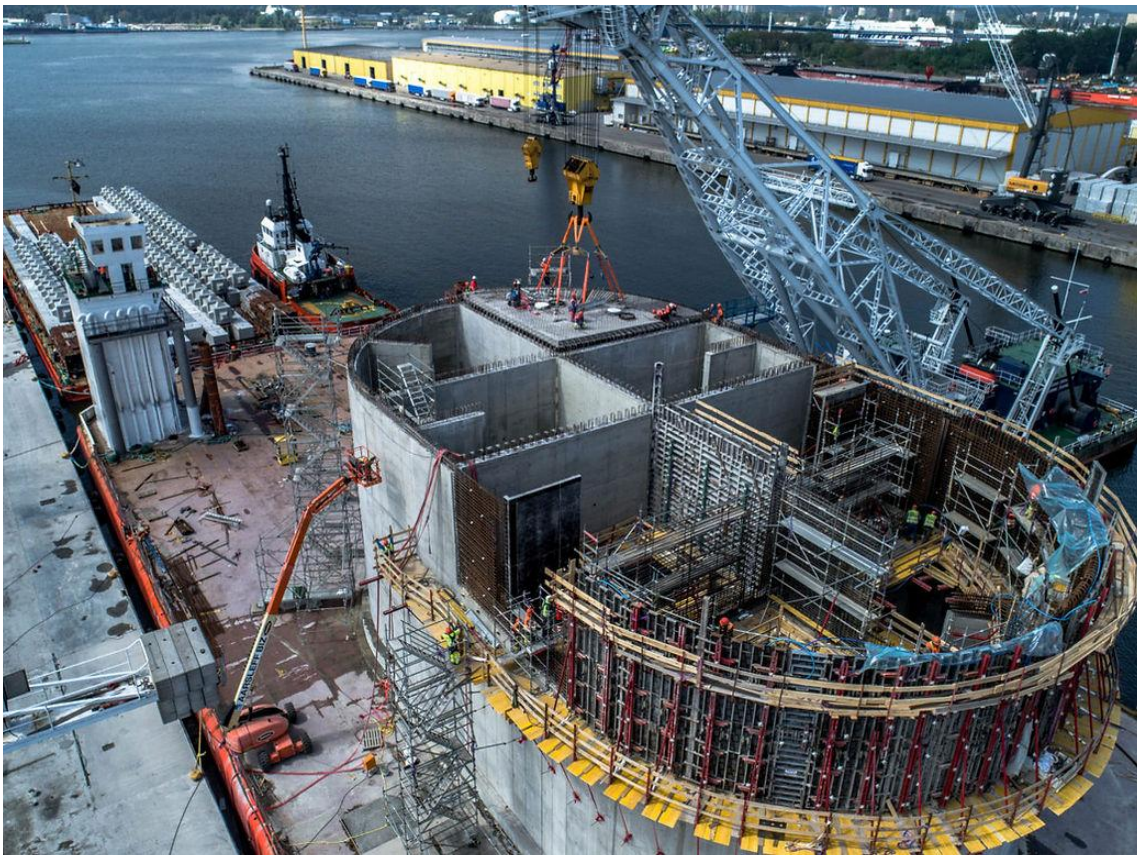


Fig. 9. Construction of caissons manufactured in the port of Świnoujście (source: https://www.aarsleff.biz).

The construction of a caisson-retained island can be divided into five main construction stages: dredging of the bottom, installation of the foundation (rock mattress), construction and assembly of the caisson, filling/backfilling/filling, and surface works.

Bottom dredging – Involves extracting material from the seabed to a substrate suitable for the foundation (Rockfill mattress) and caisson structure.

Rockfill Mattress Installation – Involves placing rock material to provide a stable, level surface for the caisson placement. The rockfill mattress helps to evenly distribute the load from the caisson along with the filling material to the seabed.

The construction of caissons is most often carried out on a semi-submersible barge or on land. The two main elements of the caisson are the foundation slab and the walls. The foundation slab is a typical slab that is poured on site, while the walls are built using the slipforming method. It is a method of continuous concrete laying in which the formwork is gradually lifted at a rate that allows it to harden enough to support the structure during construction. When the caisson reaches a height at which it can float on its own, it is launched by submerging the barge or launched from land using airbags. Caissons are constructed and launched in a sheltered harbor with sufficient draft to allow them to float on the water. While floating on the water, the formation of the walls resumes to the planned height of the wall. The barge or quay is then prepared for the next caisson base plate. Caissons are typically built individually unless multiple forms are available. After production, the caissons are towed to their destination and ballasted with seawater to sink onto the prepared ground (rock mattress).

Fig. 10. Transport of caissons produced in the port of Świnoujście (source: https://www.aarsleff.biz)

The design concept also includes a protective breakwater that will enclose a harbour for loading of transport tanker barges and that will also protect the island from waves during large storms. An oil storage barge is also located inside the harbor areafor the storage of production prior to being pumped to the transport tankers. The breakwater would prevent the largest waves from hitting directly. The breakwater will be constructed from the seabed up to a height of 6m above mean sea level and will be made of suitable durable materials (quarry stone, dolos, or tetrapods).

For island and breakwater construction, approximately 58 thousand m^3 of sand must be dredged from the seabed and this will be used to be built into the island or, if it is not suitable for embedding, it will be put away on the flaps.

Once the caissons are sunk in place, the inner chambers are filled with rock or sand l until the material is placed on top. Backfilling is then performed behind the caisson, creating a terrain. If geotechnical analysis suggests that subsidence may be a problem, the caissons can be supercharged with additional rock fill, which increases the weight of the caissons to speed up subsidence before surface work is performed. This includes underground infrastructure, profiling, paving, mooring infrastructure and construction works.

According to the initial design, the harbour and breakwater will be placed on the northeast side of the island, which is the predominant side exposed to large waves approaching the coast from the sea during storms. The proposed height of the island is +4.0 m, which provides a reserve of about 1.92 m from the extremely high water height of +2.08 m (100-year period). The breakwater will have an elevation of +6.2 m to protect the island and harbour from overflowing waves. This height is determined on the basis of the sum of extremely high water (+2.08 m) and the design wave height of 3.03 m (assumed as 2/3 of the height of the 100-year extreme wave height (4.55 m) with 97.5% certainty) and a 1-meter reserve.

The height of the caisson is dictated by the height of the island and takes into account feasibility. The resulting caisson should be about 12.5 m high with an extension of 1 m height on the wall facing the water. This results in the underside of the caisson plate being placed at a height of -9.5 m, which coincides with the bathymetric elevation of the surrounding area. A caisson of this size can be built in the port of Świnoujście and towed to the site using a nearby shipping channel.

Studies and drilling results to date have demonstrated the absence of shallow gas, so it is not considered a risk. The seabed has been demonstrated locally to have sufficient strength to support a jack-up drilling rig, however, additional geotechnical works will be necessary throughout the planned area of the island's location to finally design the foundation for the island and breakwater at it's planned location. Dredging to remove weak-bearing material and replacing it with a rock filling will allow the ground to be strengthened in the event of weak-bearing soils. Unexploded ordnance is also a potential hazard that will require geo-magnetic surveys and clearing the bottom of all metal objects in and around the planned site.

For the installation of a caisson, appropriate foundation layers at a shallow depth are required. On the basis of geotechnical studies carried out so far, it has been found that at a depth of 4.9 to 9.2 meters under the seabed there is a moderately compact to dense layer of Pleistocene sand. This layer would be a suitable foundation layer for the caisson mattress and structure. It would be necessary to deepen the soft/weak Holocene soils above this unit. It is likely that these materials will need to be disposed of off-site, as they would not be reusable in most engineering applications. If off-site disposal is too costly, they can be reused as filling in caisson cells. However, this typically increases the required width of caisson structures, unless soil compaction/enhancement is applied to the compaction extracted during the dredging of material in caisson chambers. Within the main area of the island, it will not be possible to leave these soft/weak sediments in situ without mitigation measures to reduce the impact of subsidence caused by the loading of these soils. These mitigations may include soil improvement or pre-loading the soil for an extended period of time to ensure that subsidence is completed before operational land use.

To facilitate the transit of tanker barges from the open sea to and from the island, additional dredging must be undertaken. In the design case, a north-south channel running parallel to the eastern edge of the neighboring anchorage areas outside Świnoujście harbour will be constructed. That channel will be 200m wide and dredged to maintain a mean water depth of 12m for safe tanker barge transit.

Example of Drilling and Production Island

Drilling and production islands are common in the Black Sea and in the Arabian Gulf, however the nearest example of such a structure is located on tidal flats in the German sector of the North Sea. Harbour Energy operates the Mittelplate deposit, which was developed and produced from a similar structure that was constructed by Wintershal Dea in 1985 (Fig. 12, 13). Similar to the planned Wolin Wshcód, Mittleplate island was constructed to house a permanent drilling rig, oil processing facility, and crew accommodations.

This island is located in the immediate vicinity of the Schleswig-Holstein Wadden Sea National Park (German: *Nationalpark Schleswig-Holsteinisches Wattenmeer*) in the Elbe River estuary. It is somewhat more compact than the island planned by CEP because the oil contains very little solution gas and that gas is sweet, so the amount of required gas processing equipment is minimal.

Fig. 11. Mittelplate Drilling & Production Island (offshore North SeaGermany)

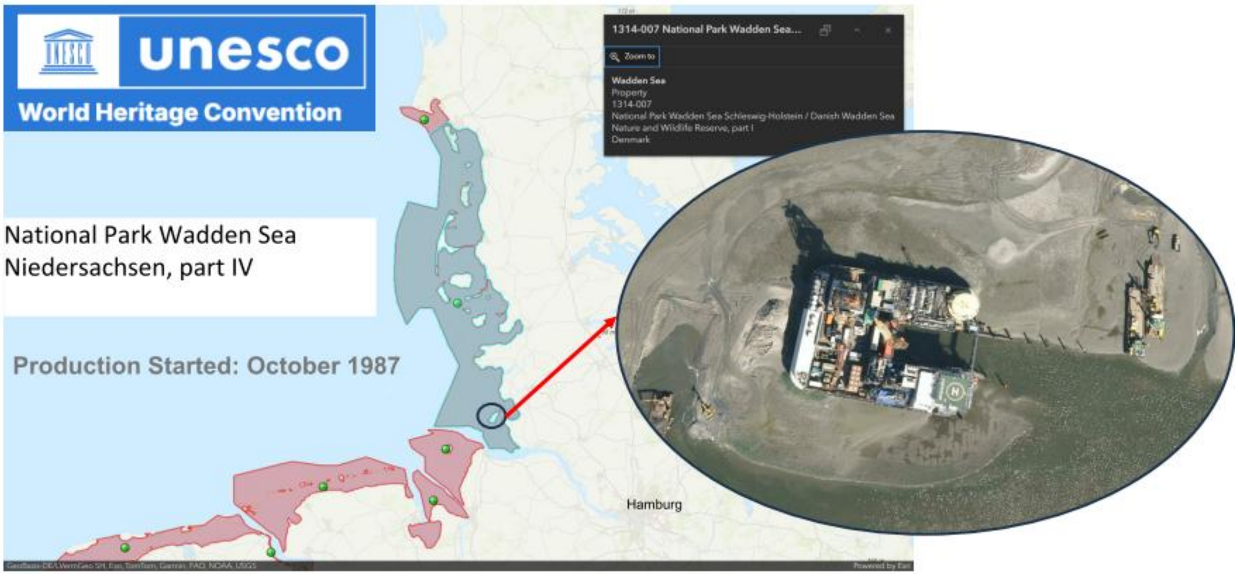


Fig. 12. Location of the oil production platform against the background of the Wadden Sea National Park (Germany)

3.4. Drilling and Well design technology

Design objectives:

1. Implement a system for drilling wells into the deposit that recognizes the likelihood of additional drilling (beyond the initial wells) and that minimizes disruption and risk associated with future drilling and well maintenance activities.
2. Physically position all wells to ensure that oil recovery from the entire deposit is facilitated, to ensure that encroachment of injected fluids on producing wells is delayed as long as possible, and to ensure that additional future development drilling to improve recovery efficiency (for example, by waterflooding) can be done in an orderly fashion
3. to maximize the potential productivity or injectivity of each individual well by targeting potentially productive features within the deposit using long horizontal wells and by ensuring efficient connection between the wellbores and the reservoir rock
4. Ensure that all wells are designed and constructed to prevent any possible leak paths to shallower strata or the surface, both during well construction and during production operations
5. Ensure that all wells are designed with a view to extended life and minimum necessary intervention
6. Ensure that all production wells are completed in such a way that flow can be assured for a variety of conditions (wax precipitation, high water cut, etc)
7. Ensure that all wells are secure against the possibility of uncontrolled eruption in the event of surface disruption or damage to the wellheads

As discussed in Chapter 1, 8 wells are planned to be drilled into the Wolin Wschód deposit to initiate production from the field: 6 production wells, 1 water injection well and 1 gas injection well. Production from the field is planned to commence in 2030 and will take 2 years to attain the design capacity of 4100 t/d of oil. Depending on the geological findings in these first 8 wells and on further studies, a further 3 to 12 wells may be required to completely develop the deposit over time. In addition, 5 to 10 gas production wells may be drilled into adjacent deposits from the island to recover the associated resources.

Every well will be directionally drilled to a target location that is designed using a dynamic mathematical model of the reservoir that is calibrated to the geological and geophysical data collected from 3D seismic measurements and from wells drilled into the deposit; the model is updated continuously throughout the lifetime of the project.

Every well is designed for long life and safe operation, with particular attention payed to constructing wells that will remain leak-free throughout their operating life and that contain safety features to ensure that they only flow to surface as and when intended.

A drilling rig is needed to construct every well and is also occasionally needed when remedial work must be done on a well (for example, if the production tubing inside the well is too small and has to be changed). Because of the cost, disruption and environmental disturbance that would be associated with re-installing this major piece of equipment on the island every time it is required, CEP has decided to purchase and install a drilling rig that will be capable of drilling all of the required wells.

A brief description of the technology associated with placing and constructing the wells and with the drilling rig itself is presented below.

Well Design and Placement Technology

Choosing proper well designs and placing them strategically within the deposit is key to maximizing eventual resource recovery efficiency. Correct well design and placement minimizes the number of wells to be drilled, which is both commercially and environmentally beneficial. The technology used to achieve this objective is as follows:

- Seismic and well data from the deposit are used to construct a mathematical model of the deposit. This so-called "static reservoir models" ("SRM") maps the interpreted shape of the deposit (vertical depth and thickness throughout the deposit area), the variations in reservoir quality throughout the deposit (porosity, productivity-enhancing features such as natural fractures, and any potential barriers to flow), and the fluid distribution within the deposit (free gas, oil, and water saturation). Such SRMs are used to quantify the resource distribution throughout the deposit area. To complete the SRM, data acquired from analysis of deposit rock samples and from well production tests are used to derive a relationship between the porosity of the deposit and its permeability, the distribution of which is added to the model.
- The SRM is used as input to a "dynamic reservoir model" ("DRM"), together with pressure and temperature information and reservoir fluid properties to create a mathematical representation of the deposit. This DRM is then used to forecast resource recovery with time for the various methods that might be used to extract the resource (e.g. waterflooding); to examine what sort of wells (horizontal or vertical) would be best suited for developing the deposit: and to estimate how many wells are required to develop the deposit using a particular development concept and where the wells should be placed within the deposit.

In the case of Wolin Wschód, not enough information is yet known to make a final determination of the optimum method of field development: additional information regarding the deposit rock properties, the distribution of water and oil in the deposit, and production information is required. Therefore, a scheme to acquire this early information has been devised and this forms the basis of the initial development concent described in Chapter 1.

All of the eight initial wells, whether injector or producer, are constructed in a similar fashion:

- A large-diameter surface conductor pipe is installed to isolate the shallow seabed sediments down to a vertical depth of 60 to 90m below the seabed.
- Rotary drilling is then used to deepen the well toward the reservoir using a series of ever-declining well diameters, with each successive well lined and isolated from the previous section using cement. The pressure integrity of lined and cemented section of the well is confirmed before drilling the next section.
- Finally, the section within the deposit is opened and the well is drilled to its final depth. For the selected development concept, this will entail drilling horizontally for distances of 1,5 to 2,0 km within the deposit for each well. Flow from the deposit is prevented at this stage by using drilling fluid ("mud") that is of sufficient density to counter-act the reservoir pressure. Additional measures are implemented at surface using a so-called "blowout preventer" ("BOP") to stop any accidental flow that might occur while drilling.
- After drilling, a steel liner equipped with a series of valves and a number of isolation devices ("packers") is installed into the reservoir section; the isolation devices, made of rubber, are expanded to seal off intervals of the reservoir (typically 250m long) from each other and from the inside of the pipe. A long production string is then inserted into the well, which will carry fluids from the reservoir fluid to surface and a series of valves is installed on the wellhead at surface (the so-called "Christmas tree") to control flow into and out of the well. The well has now been completed.
- Before it can be produced, the valves along the well need to be sequentially opened and hydrochloric acid pumped into each zone within the deposit to improve the connection of the deposit with the well; this connection is normally obstructed by impermeable solids left behind by the drilling fluid and the acid creates flow paths around the damaging material and into the deposit.

- After all of the zones have been acidized, the well is opened to flow and, after clean-up of the spent acid and other technical water (completion brine and mud filtrate), the well is turned over to the production operations team for its intended use (either as a producer or an injector).

The important technology used in the well designs is as follows:

- The steel pipes for each section of the well have a wall thickness that ensures that the pipes will neither collapse due to formation stresses nor burst due to the stresses imposed while drilling, completing and stimulating the well.
- All pipes that may be exposed to the reservoir fluids from the deposit will be made of corrosion-resistant steel and will have gas-tight metal-to-metal steel connections.
- The quality of the cement placed behind each section of pipe will be evaluated according to Polish regulations to ensure appropriate isolation seals are in place.
- All elastomers that may be exposed to the stimulation fluid or the produced reservoir fluid will be of resistant to attack or degradation by those fluids
- All production and injection tubing strings (the uncemented pipes that bring fluid from the deposit to the surface or take injected fluids from the surface to the deposit) will be hydraulically isolated from the cemented casing string by means of a production packer.
- The wells will be fitted with surface-controlled sub-surface safety valves designed to automatically shut the well if there is sudden loss of control at surface. This minimizes flow from the well (whether producer or injector) if a surface line or a valve on the wellhead is suddenly damaged.
- Wellhead pressure and temperature will be constantly monitored for all wells; bottomhole pressure and temperature monitoring devices may also be installed.
- Production (or injection) tubing in all wells will be periodically monitored for corrosion.
- Provision will be made for injection of corrosion or wax inhibitor in all wells. If necessary, wells may also have installed systems for prevention of salt deposition during production.
- All well head equipment will be certified for use at 10.000 psi minimum pressure.

The important technology used in construction of the wells is as follows:

- Mud systems are designed appropriate to the interval being drilled. Near the surface, freshwater chemical-free systems will be used if drilling through shallow aquifers. At depth, heavy salt-saturated fluids will be used to prevent borehole enlargement while drilling through salt strata and to provide pressure over-balance and prevent flow from permeable zones.
- Drilling mud for entering the deposit will contain H_2S scavenger to ensure safety for drilling rig crew.
- Drilling mud is constantly monitored for density and hydrocarbon content and the levels of the drilling mud in the storage tanks is constantly monitored to detect any losses or gains which might lead to loss of well control.
- A blow-out preventer ("BOP") is installed on the wellhead when drilling the deeper sections of the well. This BOP is capable of completely closing the well and even shearing the drilling pipes if necessary to prevent uncontrolled flow to surface. The proper function of the BOP is tested at regular intervals per Polish mining regulations.
- H_2S detection is present throughout the operating area and all crew are trained in evacuation and rescue skills appropriate to their function in the crew.
- An oil spill response program, developed together with local authorities, will be in utilized for all drilling activities in the unlikely event of such an occurrence.

Conductor Pipe Placement

The thirty conductor pipes for the planned and potential wells will all be installed during island construction and before drilling rig arrival. This activity is discussed separately because it involves pile driving, which is likely to create the most ambient noise of any island activity. The conductors must be driven, instead of drilled and cemented, because they are very closely spaced and the sediment through which they will be driven is uncemented and prone to washout or cave-in when using rotary drilling methods.

The 30 piles will be driven into position after the island has been substantially constructed and before the cellar for the wells is completed. Driving these conductors is likely to require less than one day to complete per well and will be conducted during daytime only to comply with prevailing nighttime noise regulations. From an underwater noise standpoint, pile driving in the middle of the island, roughly 40m distant from the sea is expected to create noise levels that are well within regulated limits. In this way, drilling from an island is hugely beneficial compared to drilling from a wellhead platform.

Noise levels will be monitored during operations and, if necessary, mitigative measures such as bubble netting will be implemented as necessary.

Drilling Facilities Technology

One of the devices to be installed on the caisson-retained island will be a drilling rig and associated equipment to be used for well construction and maintenance. The 650 tonne skid-mounted drilling rig will be powered by AC motors and will be made according to the latest safety and environmental standards. The rig and associated equipment will be equipped with a dedicated electricity generation system powered by diesel engines.

Typical equipment will include: a mast with a top drive, a drilling hoist, a drilling shaft with a pipe ramp equipped with automatic feeders of drill line elements and casing pipes, a mud circuit with a system of preparation and purification of the mud, control systems, anti-eruption protection, air and plumbing system, all powered by the electrical system.

Modern safety support systems include both automation of drilling processes as well as warning and response systems in emergency situations.

3.5. Oil and gas production-related technology

Design objectives:

1. Basic philosophy is for "No accidents, no harm to people, and no damage to the environment".
2. Ensure that all surface production equipment is fit for purpose, making especial note of the sour nature of the reservoir fluids and the high salinity of the formation water present in the deposit
3. Pre-package all equipment in modular units that can be assembled onsite with a view to minimizing the time and effort required onsite to complete the construction
4. Ensure that the equipment contained in each module is installed in such a way that it can be easily and safely maintained or repaired
5. Ensure that the facility contains sufficient shut-down devices and controls to automate isolation of damaged or leaking equipment and limit possible size of gas, water, or oil leaks to manageable volumes
6. Minimize surface noise of the facility
7. Design the layout of all equipment with a view to eventual installation of additional

facilities (for example, for waterflooding), as necessary
8. Ensure that onsite crude oil storage is sufficient to permit continuous operations in the event of periodic harbour access restrictions for tanker barges (e.g. during storms)

Production facility technology:

1. Facilities to use proven technology for the separation of hydrocarbons and water. Protoype or first-off systems will not be used.
2. Materials for vessels and piping will be chosen based on their service. In particular, materials used for vessels, compressors and and pipes transporting hydrocarbons will be suitable for H_2S and CO_2 conditions as noted in the well fluids analysis.
3. The turbines used for power generation will be fitted with SoLoNOx^{tm} (DLE) technology for reduced NOx and CO emissions.
4. Use of automated systems will be maximized to reduce the exposure of personnel to potential hazardous environments. Process sensing (pressure, temperature, level, etc.) will be remote reading in the control room where practical.
5. Heat tracing of vessels and piping, where appropriate, for cold weather operations.

Oil Storage and tanker-barge transfer technology:

1. Storage tanks are located in a double-hulled barge in the harbor to reduce the transit tanker logistics and possible leak paths.
2. Dual mode inert gas and vapor recovery system to cover the product in the tanks with inert gas to make the tank atmosphere too lean for combustion.
3. Remote radar gauging of all tanks.
4. An advanced foam firefighting system with a fixed CO2 for all spaces and foam coverage of cargo piping manifold area.
5. Heated tanks to maintain product temperature during the winter.

Process Design – Oil and Gas

1. Initial oil production volume: 4770 m^3/d (4100 t/d).
2. Desulphurisation of the extracted gas to use it to produce process heat and electricity. The acid gas obtained in the desulphurisation process will then be mixed with the remaining gas, and the resulting mixture will be compressed using compressors adapted to handle sulphurised gas and reinjected into the reservior.
3. Purification of extracted reservoir water and its reinjection in the marginal parts of the reservoir using dedicated water injection wells.

Based on the petrophysical data obtained so far from the 3D seismic interpretation and the Wolin East-1 well, as well as on the properties of the reservoir fluids determined in the laboratory, simulations of the planned gas injection scheme indicate that the Wolin Wschód oil field should be able to maintain the initial level (plateau) of oil production for a period of 3 years before the average deposit pressure falls below the initial oil saturation pressure, and for 6 years before free gas production begins to increase and affect oil production efficiency.

During this initial operating period, the dynamic characteristics of the deposit will be evaluated and analyses will be carried out to determine whether the use of a full pressure support system to improve the depletion rate of the deposit and increase industrial resources is justified. It is intended that this work will be completed early enough to implement a full reservoir pressure maintenance system before the formation of secondary gas caps begins to play an important role, i.e. within 6 years of the start of operation.

All well production will be directed to three-phase separators where oil, gas and water are separated. A separate test separator will also be utilised to analyse production rates from individual wells as desired. The separated oil will then pass through a treater and a stabilizing tower where it is further processed to remove remaining gases and water. The processed oil will then flow to a sales storage tank where it will be retained until being pumped to the transit tanker. Oil volumes will be measured through a custody tranfer meter before being sent to the tanker.

Solution gas collected from each of the separation steps will be collected together with any vapors taken from the oil storage tank will be further treated as follows:

- part of the gas (approx. 14%) will be dried and directed to the amine installation to remove CO_2 and H_2S. The desulphurised gas obtained will be used in turbine generators to produce power and thermal energy for the process facility, and in particular to power the compressors injecting the gas back into the field.
- The sour gas separated from the fuel gas stream will be mixed with the rest of the companion gas and then compressed and injected into the reservoir through dedicated gas injection wells.
- All gas volumes, whether injected or used for fuel, will be measured.
- Condensate will precipitate from the natural gas when it is being compressed. This fluid will be stabilized and sent for export together with the crude oil.

Reservoir Water Treatment System

All water collected from the separators and other process equipment will first be directed to the oil skimmer, where the initial separation of trace amounts of oil from the water is planned, and then pumped to the induced gas flotation unit (IGF), where the oil content in the water will be reduced to the specified limits required for its re-injection into the field. A filter may be required should the re-injection specification not be achieved in the IGF. The oil separated in the oil skimmer and IGF will be discharged into an oil tank from which it will be recycled back to the inlet separators. The water from the skim tank and IGFwill go into a buffer tank, where chemicals will be added to it if necessary, and then it will be pumped into dedicated wells for injecting water into the reservoir.

The production process will be supervised from a control room equipped with a computerized technological supervision system, used to control and record the parameters necessary for the proper and safe operation of hydrocarbons. Automated systems will be used to monitor process conditions and safety devices will alarm and implement shutdown of equipment should the need arise. The process conditions (telemetry) will also be sent to an onshore situation room where management personnel can view and advise offshore operations staff.

At the frequency specified by the Mining Plant Operations Manager (KRZG), individual production well performance measurements will be carried out. To do this, the reservoir fluids will be directed to the test separator through the appropriate valve system on the inlet manifold as noted above.

Flaring system

During plant start-up, annual maintenance and occasional process disruptions, small amounts of gas may need to be burned (flared) on a flare. The flare will be located off the island at a distance and elevation that will not impose heat radiation above prescribed limits to either the island. The flare system will be automatic with a small, constantly lit pilot, that ensures all gasses are burned completely.

4. POSSIBLE VARIANTS OF THE DEVELOPMENT OF THE DEPOSITS

Several possible variants for the development were considered before arriving at the concept described in Section 1. These variants included the following main options:

A. Shore-based drilling and fluid processing
B. Offshore platform-based drilling and fluid processing
C. Drilling wells and processing reservoir fluids using an artificial island with the reception of crude oil by transport barges via a single buoy mooring and transshipment buoy (Single Buoy Mooring - SBM, or Catenary Anchor Leg Mooring Buoy - CALM).

This section of the memorandum describes each of these options and the reason that these alternatives were rejected.

4.1. Possible variants of the development of the deposits

Option A: shore-based drilling and fluid processing facilities:

Development and production of the Wolin Wschód deposit from a shore-based facility would be attractive from a capital cost perspective and would carry certain environmental advantages (namely, minimizing the risk of an oil spill in the sea).

These advantages are both attractive, but the concept was ultimately rejected for the following reasons:

- Lack of available land space:

  the well pad would have to be located within 100 to 200m of the Świnoujście beach, somewhere east of the LNG facility because the wells drilling into the reservoir from such a long distance away approaches the technical limit for directional drilling and drilling from even further away is considered infeasible. The entire area that might be suitable is either too close to the LNG facility and the export gas line or is reserved for use by the planned port expansion project.

- Well placement technical risk:

  the wells would be very long directional wells, with total drilled depths in the range of 8 to 10 km. Accurate steering and placement of the wells within the reservoir would be difficult and there is a high risk that some of the wells would fail before reaching the deposit.

- Proximity to populated areas:

  besides the LNG facility and the pipeline, any shore based well pad would necessarily be very close to the beach, which is very popular with tourists, the rail line, and the planned future port expansion (assuming space could be found to accommodate the well pad and the port). If this were a Rotliegend development, with sweet fluid production, this might be acceptable but the Wolin Wschód development has high H_2S concentration (60 000 ppmv) in the solution gas and greater distance of separation from third-party activity is advised to minimize public exposure to any accidental gas release.

For these reasons, shore-based development of the deposit was not pursued.

Option B: Platform-based drilling and fluid processing:

Most deposits under the North Sea are developed using platforms instead of islands as a foundation for development; this is principally because water depth makes the use of islands impractical. In such fields, one platform is typically used to accommodate the wellheads and the drilling of all wells is performed using a jack-up MODU drilling unit, similar to the one used to drill Wolin East 1, which is placed above the wellhead platform when needed to drill and maintain the development wells. All wells are drilled from the single offshore location (as with the planned island option) and the produced fluid is sent via pipeline or connecting bridge to a neighbouring platform for processing. The processed fluid, in this case crude oil, is then normally exported to market via pipeline.

The platform-based concept has several drawbacks which make it less attractive than the planned concept. These drawbacks are summarized as follows:

- Every time a new well has be drilled or an existing well has to be re-entered, a jack-up rig must be hired and mobilized to the location. This is both expensive and inefficient: hiring a drilling rig and moving it into position from somewhere outside the Baltic takes time to arrange and is costly. Furthermore, this increases ship's traffic in the area, with attendant inconvenience and risks. Particularly for development of an oilfield, drilling of additional wells to improve recovery and periodic re-entry of wells for maintenance purposes is to be expected.
- Prevention of spills of produced fluids into the sea and control any such spill is much more difficult when operating a platform-based facility.
- MODU-based drilling operations create much more noise than island-based operations, particularly when driving surface conductor pipes.
- A pipeline to a shore-based tank farm would be required for the crude oil. Export from a platform-supported tank farm directly to an un-sheltered tanker barge seems more risky than export via an SBM (see Option C, below). While a shore-based tank farm might be desirable in any scenario, there is currently no obvious place that such a tank farm might be built in the current Świnoujście port area.

Option C: export from the island to SBM (CALM mooring and transfer buoy):

This option assumes island development, similar to the proposed concept, but instead of transferring the crude oil from the storage area to the tanker barge using fixed pipes at a dock within a sheltered harbour, the crude oil would be pumped via pipeline to a single-buoy mooring ("SBM" or "CALM buoy") to which the tanker barge connects using flexible pipe to accept the cargo. CALM buoys are commonly utilized throughout the world to load oil onto tankers, however normally in locations that are remote from land. Orlen's B8 deposit is developed using a CALM buoy for oil export, for example, however that facility is more than 50km from the coast.

The CALM buoy option carries the advantage that the artificial island footprint would be reduced to only about 4 ha. However, after discussion with the maritime directorate, it has been agreed that regular transfer of crude oil from an SBM to a tanker barge would carry unacceptable risk at this specific location; it would effectively constitute a ship-to-ship transfer of the oil.

For this reason, the SBM option has been rejected.

Fig. 13. Transport of crude oil using CALM buoys.

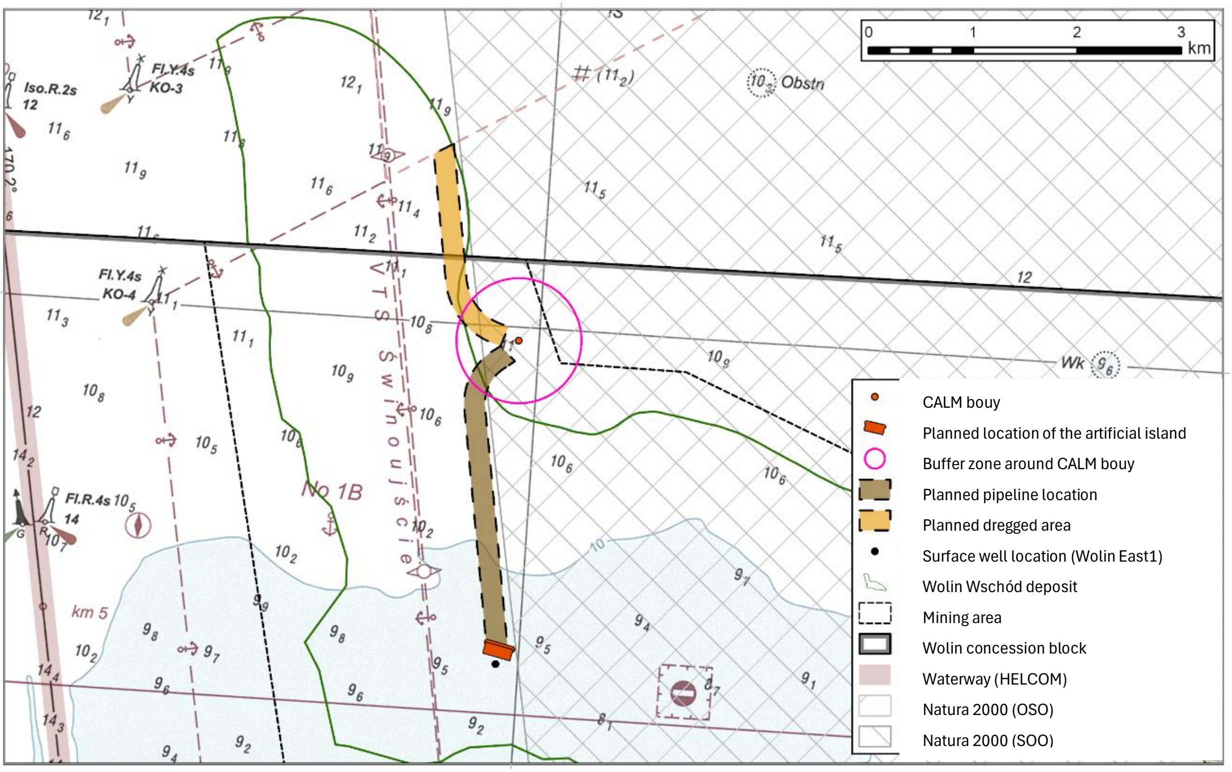


Fig. 14. Location of artificial island, CALM buoy, pipeline and the area that requires dredging of the sea floor.

4.4. Description of the expected effects on the environment in the event of no undertaking

In the process of exploration and appraisal of hydrocarbon deposits, the alternative variant to the optimal variant may only be the variant consisting in not undertaking the project, the so-called "zero" option. Analysing this option for a project of such a specific nature would mean considering the expediency of conducting exploration works for hydrocarbon deposits, which in the era of global energy deficit seems difficult to justify and inconsistent with one of the main objectives adopted by the Government of the Republic of Poland on 10 November 2009. Announcement of the Minister of Economy of 21 December 2009 on the national energy policy until 2030 (M.P. No. 2, item 11).

In the event of failure to undertake the implementation of mining works within the offshore area of the Wolin concession, there will be no impacts accompanying such works. In the area of the sea intended for drilling operations, the level of noise emissions and pollutants into the air will not change during the period of their implementation, and there will be no waste that will have to be transported to land and subjected to costly disposal. The surface of the seabed will also be intact. There will also be no spatial collisions with areas subject to legal protection, Natura 2000 areas. However, the possibility of extracting from new domestic deposits will be limited, which may translate into a decrease in the country's energy security. The described project consisting in the extraction of oil deposits in accordance with the Announcement of the Marshal of the Sejm of the Republic of Poland of 22 November 2019 on the announcement of the consolidated text of the Real Estate Management Act (i.e. Journal of Laws of 2024, item 1145) belongs to the public purpose investment, as it takes into account the public interest related to increasing access to energy resources, which is important from the point of view of the national fuel balance. At the same time, it is one of the main objectives of the ″Energy Policy of Polish until 2030" adopted by the Government of the Republic of Poland to ensure the country's energy security. The inability to exploit hydrocarbon deposits will deprive them of the possibility of diversifying the sources of energy supplies.

5. ANTICIPATED AMOUNT OF WATER, RAW MATERIALS, MATERIALS, FUELS AND ENERGY USED

Construction stage

At the construction stage, construction machinery and equipment as well as vessels will work in the area of the investment. The consumption of fuel burned in the engines of construction machinery and means of transport is difficult to determine at this stage. However, these quantities are not significant from the point of view of environmental impact.

Drilling Stage

The technology used during drilling assumes controlled and rational water consumption. For the preparation of drilling mud, very economical water management is carried out, the consumption of which is metered. The type of mud for a given drilling is selected depending on the geological and technical conditions, and the parameters of a particular mud must meet the requirements of the drilling technology. The practice of drilling with a closed circuit of the drilling mud means that only the regulation of the solid phase content in the mud is required during the drilling of the well (at a given interval). This significantly reduces the amount of water consumed during drilling. The estimated average water consumption during the implementation is estimated at the level of approx. 3-5 m3/day.

The table below shows the average daily consumption of diesel and lubricating oils during the construction of one borehole.

Table 1. Estimated average daily fuel consumption during the implementation of the project

ENERGY CARRIER	INTERNAL COMBUSTION ENGINE DRILLING RIG
Diesel	6000 kg
Hydraulic oil	18 l
Engine oil	40 l
Gear oil	20 l
Lubricants	2 kg.
Estimated electricity demand	1.2 MW/h

Production stage

The types and quantities of raw materials and energy that will be consumed during the year in the installation are presented in the table below.

Table 2. Types and quantities of raw materials and energy

Lp.	Material	Unit	Value
1.	Electricity	MWh/year	30 075
2.	Process heat in steam	Mg1)/year	322 324
3.	Water	m3/year	59 905
4.	Natural gas for own needs	Nm3/year	32 073 685
5.	Monoethylene glycol (MEG)	Mg/year	40
6.	Methyldeiethanolamine (MDEA)	Mg/year	51

6. SOLUTIONS THAT PROTECT THE ENVIRONMENT

During the works carried out in the area of the deposit so far, there have been no accidents posing a threat to the environment. In accordance with the solutions adopted so far, all works will be coordinated with the Maritime Office and the Harbourmaster's Office in order to minimize the risk of sea collisions. During the execution of construction works, the contractor will provide, install and operate all temporary safety devices, such as: navigation lighting, warning signs and signal buoys, etc., thus ensuring the safety of navigation and the works performed. The contractor will ensure constant visibility conditions, day and night, of the signs and warning lights, for which it is indispensable for safety reasons. During the construction, the investment area will be protected against possible pollution by petroleum derivatives (sorbents, floating dams). During the construction, machinery and equipment as well as technically efficient vehicles will be used. Places for refueling and possible repairs will be kept in prepared places with protections.

During the execution of all works, at every stage of the construction of the structure, health and safety regulations will be strictly observed, especially during the water transport of equipment and people, works that pose a risk of drowning of the worker, works carried out from water or under water, works carried out during the assembly and disassembly of heavy prefabricated elements.

In particular, the following actions will be applied:

- Intensified hydrotechnical works (erection of offshore structures) in the sea basin are planned to begin in the period from mid-September to mid-January, i.e. outside the period important for marine mammals.
- Gradual start-up of devices ("*soft start*" procedure).
- The use of modern, properly soundproofed and technically efficient equipment and the least acoustically burdensome technologies for conducting construction works with the use of devices reducing the impact noise propagating under water.
- Controlling the potential occurrence of marine mammals in the vicinity of the island, in case of their detection, their safety should be controlled, and in the event of danger, react and contact nature conservation services.
- From underwater noise management – installation of noise monitoring systems and, if required, devices limiting the spread of noise, such as underwater bubble curtains or the use of silent technologies in construction works.

During the development and exploitation phase, the following actions are envisaged to mitigate the main potential environmental and safety risks (listed according to the degree of risk to the environment and personnel).

- **Uncontrolled Oil and Gas Eruption with Hydrogen Sulfide from a Well -** The potential environmental damage and safety risk to personnel on the island associated with such an event require comprehensive equipment solutions, dedicated operational procedures, and specialized personnel training throughout the project lifecycle. As mentioned above, during the drilling of the Wolin East-1 exploration well, this risk was eliminated through careful, detailed planning and rigorous supervision of the procedures used during the operational work. For future operations, the following preventive actions are envisaged in order to mitigate the described risk:
  - installation of H_2S detection systems and fire protection systems throughout the drilling area and at the production plant on the island, along with training of all personnel in responding to H_2S hazards.
  - selection of appropriate materials for wells and production installations with appropriate pressure class and resistance to acid gas,
  - selection of mud systems suitable to prevent uncontrolled inflow from the deposit during drilling and minimize the risk of mud losses; management of the specific gravity of the mud during drilling in order to maintain its parameters within the assumed design range,
  - selection of appropriate eruption prevention devices and ensuring their regular maintenance and proper operation during drilling,
  - control of the speed of pulling out the drill line (tripping), geophysical probes and other measuring tools from the well at the open deposit horizon,
  - installation of fixed packers and surface-activated subsurface safety valves in the columns of the production pipes, in order to ensure that there is no uncontrolled outflow from the well in the event of valve failure on the operating head (Christmas tree) or in the choke assembly line,
  - use of an island platform for drilling wells instead of an elevated jacket truss structure with a deck (topsides) to eliminate the risk of damage to wells in the event of an uncontrolled collision with local movement of marine vessels,

  - regular inspections of mining pipe columns and pipelines during operation to identify corrosion and weakening of pipes at an early stage,
  - developing an oil spill contingency plan in cooperation with local authorities and search and rescue services (SAR), in order to minimize the negative effects of a possible spill.

  In the very unlikely event of a simultaneous failure of the drilling mud system and the eruption prevention during the drilling of one of the production wells, the maximum uncontrolled oil outflow was estimated at 3300 tons/day, with the most unfavorable assumption that at the time of the system failure, the entire planned length of the well would have already been drilled.

- **Large oil spill during tanker loading:** there is a potential risk of oil spill when loading oil tankers and when transporting cargo to the receiving facility. Such a leak can occur during the transfer of liquid to the vessel or as a result of a leak in the ship itself, especially in the event of a collision. In order to reduce this risk as much as possible, the following design solutions and systems will be used in the project:
  - all tankers will be double hulled,
  - Loading pipelines and buoys will be equipped with leak detection systems and automatic valves to shut off the flow.
  - Deployment of a floating boom across the harbor mouth during tanker loading operations so that any possible spill would be contained and mitigated within the harbor confines.
  - the risk of collision (ship-tanker, ship-island) will be reduced by controlling the movement of ships by the Harbourmaster's Office,
  - Regular operating and maintenance procedures for equipment will ensure that all preventive measures are kept in readiness.
  - The possibility of such an event will be included in the oil spill response plan, developed in cooperation with the relevant authorities and search and rescue services (SAR).

- **Acid gas leakage**: In addition to the eruption scenario of a wellborehole outflow, an acid gas leak can occur as a result of a failure of piping or valves in a processing plant. During the design and operation phase of these installations, the same precautions are applied as those listed in the event of an uncontrolled eruptive flow. In this case, the use of automated shut-off systems for both the wells and to isolate the leaking equipment is the main preventive measure to be employed. Regular inspection and maintenance is also a key mitigative measure. Gas detection devices will also be used to monitor for leakage within the process area. All systems will report back to the main control room.

Fire Detection: Heat detection devices (infra-red) will be used throught the facility for detection of fire, or of "hot spots" that may result in a fire. Bearings of rotating equipment will have heat and vibration sensors that will alert to the control room of any impending issues.

- **Minor oil or chemical spill in the process area:** In this case, oil or chemical spills are limited to the island area and remain only on the island's surface. Mitigation of the risk of such leaks is carried out by:
  - specialized equipment for stopping leaks and for safe handling and handling of materials in the process area,

- bunding around locations where frequent liquid transfers are made so that any spillage can be contained,
- drip trays under process equipment to capture any leaks, drips or spills during routine maintenance operations,
- control procedures and processes to prevent and ensure that leaks are reported and that all leaks are promptly rectified when they occur.

- **Loading and unloading of supply units:** From time to time, especially during drilling, chemicals, drilling mud or other hydrocarbon fluids (e.g. diesel) will be transported from the supply units to the island. Reducing the risk of leaks and their consequences will be carried out by:
  - use of specialized equipment to stop spills and handle materials in the area of the supply port and throughout the island,
  - procedures and control processes to prevent and ensure that leaks are reported and that all leaks are promptly rectified when they occur.
  - Include possible scenarios in the oil spill response plan.

- **Reducing the risk of excessive ship traffic and collisions:** especially during island construction and drilling operations, ship traffic to and around the island will be relatively intense. Prevention of excessive traffic of vessels and the risk of collision will be carried out by:
  - coordination and communication with maritime authorities and the harbourmaster's office in the field of control of the movement of vessels,
  - round-the-clock monitoring of the movement of ships around the island and the use of VHF radio communication and other communication channels,
  - the establishment of a no-sailing zone around the island;
  - establishing procedures and processes for managing ship traffic in cooperation with maritime authorities.

- **Underwater noise during the construction of the island (driving conductors):** no conductors are required for the construction of the island itself, however, in the drilling zone, inside the island, a total of thirty steel conductors with a diameter of approx. 600 mm will be driven in order to isolate unstable layers. The use of an island instead of a drilling template together with a jacket truss structure and a head platform for drilling operations will significantly reduce the noise associated with such operations. Underwater noise will be monitored during the conductor driving operation to ensure compliance with all regulations; If necessary, additional noise reduction measures may be implemented.

- **Garbage, waste and other marine pollution:**
  - All of the main equipment (the drilling ring and the processing facility) will be transported to the island in pre-fabricated modules. This will minimize the amount of fabrication work that needs to be done onsite, which will greatly minimize the generation of waste.
  - reducing the negative impact of all generated garbage and waste by segregating them into appropriate containers and handing them over for disposal or management on land by authorized entities,
  - reducing the amount of waste generated and preventing its release into the marine environment through the use of appropriate procedures and practices.

- **Flare stack emissions and fire risk:**

- Risk mitigation through analyses of thermal radiation and emissions from the torch to determine its optimal location
- Risk reduction by positioning the torch according to the results of the analyses, at an appropriate distance from the island and on the leeward side in relation to the prevailing wind direction, but in such a location that the process facility and drilling area are not affected by incidental flaring irrespective of the direction of the wind.

7. TYPES AND EXPECTED QUANTITIES OF SUBSTANCES OR ENERGY RELEASED INTO THE ENVIRONMENT USING ENVIRONMENTALLY FRIENDLY SOLUTIONS

For this project, there are 4 principal areas of operation for which emissions must be managed:

- **Island construction (and eventual reclamation)**, for which noise / light emissions, and bottom sediment disturbance / suspended solids plumes are the key issues to be managed
- **Drilling operations,** for which liquid / solids waste, GHG emissions from power generation, and noise / light emissions are key issues to be managed,
- **Production facilities operations (including accommodations)**, for which GHG emissions from power generation and occasional gas flaring, liquid and solid waste, and noise/light emissions are the key issues to be managed.
- **Harbour facilities operations,** for which noise energy (from ships' engines) and light emissions are the key issues to be managed.

7.1. Noise

Noise emissions for all aspects of this operation can be expected to be minimal and within the Polish regulations. The main mitigation measures to be employed in this regard are as follows:

- **Construction:** two principal noise sources may be expected during construction: frequent arrival/departure of vessels (propeller/engine noise) and piledriving of the conductors for the wells. Piledriving will be limited to daytime hours only, so the main impact of both vessel traffic and piledriving will be underwater noise. Because the piledriving will be conducted from the middle of the artificial island, CEP anticipates no difficulty keeping underwater noise levels below regulated levels during this limited-duration activity. Ship traffic to and from the island is a larger issue that will be present throughout the life of the field, however the number if daily vessel movements to and from the island (as discussed elsewhere in this report) is minimal compared to the total daily ship traffic in and out of Świnoujście harbour.
- **Drilling Operations:** during normal drilling operations, noise levels are maintained well within Polish regulations. Noise in this operation is principally caused by the power generation unit, however the generators will be housed in sound-proofed structures, so noise levels will be significantly reduced.
- **Production Operations**: as with the drilling operations, the main source of steady background noise is the power generation unit, which will also be housed

in sound-proof structures. An additional source of noise, less difficult control, is the occasional use of the flare stack. Upset conditions may occur day or night and the noise above-water noise that may result from flaring gas at the anticipated production rates (400 thousand Nm^3/d) may exceed Polish guidelines for very brief intervals (normally not exceeding 5 minutes) while shut-down systems are activated. For planned shut-downs and process de-pressuring, such use of the flare stack would be limited to daytime hours.

- **Harbour Operations:** As during construction operations, underwater noise from periodic arrival and departure of vessels is the main issue.

The expected values of noise intensity emitted into the environment (in the air) by modern drilling rigs of this type are within the range of 80 dB and refer to the area limited by the structure of the island.

7.2. Light emission

The installation on the island will be fully illuminated during the project (24/7), from construction to abandonment, to ensure sufficient ambient lighting conditions, and to allow all operations to be carried out in full safety. During drilling operations, there will be more light on the western end of the island than when the rig is idol. The entire hydrotechnical structure will be equipped with external navigation lights to warn other marine users of its presence in order to avoid a possible collision. The accompanying ships also have their own ambient and navigational lighting, albeit with less luminescence. While this constitutes a specific light exposure for the immediate vicinity and may have some impact on local marine species and birds, the "light pollution" will be temporary (for the duration of the operation) and is not considered a significant threat to the environment.

On the other hand, the lack of adequate (and legally required) lighting poses a very real and serious threat to:

- Safety of people working and living on the island,
- The safety of other maritime users, especially within a busy port area,
- environment, as this would increase the likelihood of collisions and the associated potential leaks.

7.3. Emissions to air

Air emissions come from several sources:

- equipment used during island construction, which is mostly exhaust from vessels
- emissions during drilling, which is almost entirely the exhaust from the generators
- emissions during production, which is mostly the exhaust from the generators together with the exhaust from the service vessels and tanker barges, and with occasional, rare emissions from the flare stack.

Total emissions have not yet been estimated for the project, pending further detailed planned, however the largest single emissions source is the power generation for the production facility and this can be estimated with some precision. Forecast gas production when producing 4100 t/d of crude oil is approximately 400 thousand Nm^3/d, of which 14% will be used to fuel the generators. This 42 thousand Nm^3/d fuel gas stream is expected to yield annual emissions totaling 36 kT CO_{2equiv}, of which 90% is CO_2 and the remainder is NO_x

and fugitive methane. Essentially no SO_x is expected to be emitted, since all of the H_2S will be removed from the fuel gas and re-injected into the depost.

After 5 years of production, if full pressure maintenance is not implemented and partial pressure maintenance continues, then gas production will rise along with recompression needs and this will cause a corresponding increase in fuel gas demand and emissions. If this scenario emerges, CEP will evaluate the benefit of installing a CO_2 extraction unit on the generator exhaust unit to capture the CO_2 and add it to the re-injection gas stream.

At the stage of performing works related to the construction and decommissioning of the island, the emission of exhaust fumes generated during the operation of equipment and ships will be accompanied. It was assumed that at most 2 construction machines equipped with diesel engines would work on the island at ts he same time. It was assumed that the fuel consumption at full power of each machine is 20 dm3/h. Assuming a diesel density of 0.84 kg/dm3, we get 16.8 kg/h. It has also been assumed that the effective operating time of the engines of all operating machines is 50%, so the average fuel consumption of one machine will be about 8 kg/h. The average hourly emission of pollutants for a single machine is calculated as the product of average fuel consumption and pollution indicators. The table below shows the level of emissions of harmful substances emitted during the operation of construction machinery on the drilling site.

Table 3. Overview of emissions from heavy construction machinery

Name of the substance	Emission of a single construction machine [kg / h]	Emissions of all used construction machinery [kg/h]
Nitrogen oxides (all fractions)	0,3904	0,7808
Nitrogen dioxide	0,0544	0,1088
Total particulate matter	0,0184	0,0368
Carbon monoxide	0,1264	0,2528
NMVOC	0,0566	0,1132
Benzene	0,00004	0,00008

The emission indicator values for heavy construction machinery were adopted according to the "EMEP/CORINAIR Emission Inventory Guidebook - 2007, Technical report No 16/2007, Annex No. B810".

At the stage of drilling works, the emission of dust and gases into the atmospheric air will be accompanied by the sources of which will be unorganized and organized emissions. Emissions of gaseous pollutants and dust accompanying this stage of the task of developing the Wolin deposit will be temporary, and the range of their impact will be limited to the place of work and the immediate surroundings.

Disorganized Broadcast:

- ✓ emission from the combustion of reservoir gas (the so-called "candle") - related to conducting activities aimed at testing the reservoir.

Flare, it is an installation used for the periodic discharge of natural gas accompanying crude oil, burned at its outlet with free access to air. Excess gas accompanying the process of testing the deposit and special procedures aimed at making the discovered oil field available, as well as discharges occurring during emergency or planned shutdown of individual elements of technological installations, is directed to the flare. The purpose of burning gas on a flare is to avoid the direct introduction of natural gas components into the atmosphere, the main component of which – methane, is a gas that is much more conducive to the formation of the greenhouse effect than the carbon dioxide contained in the exhaust gas. Burning natural gas on a flare is a way to prevent methane emissions into the air in about 98% (due to adverse weather phenomena and flame decay). Flare emission is an unorganised emission that is not subject to the obligation to obtain a sector permit or to notify the installation. Burning gas on a flare is permissible in accordance with the Regulation of the Minister of Economy of 25.04.2014. *on detailed requirements for the operation of mining plants extracting minerals through boreholes (Journal of Laws of 2014, item 812).* It is not possible to precisely measure the amount and composition of exhaust gases in the torch that are a mixture with air. The introduction of gases and dust therefore takes place without the intermediation of technical means intended for this purpose, directly in the air, in an unorganized manner.

Organized broadcasting.

It should be assumed that during drilling operations on the island, the sources of organized emissions will be production generators and diesel tanks. Five power generators with a capacity of about 1500 kVA each are used to power the drilling rig, where three work continuously, supplying electricity to the individual components of the drilling rig while two act as a backup. A process boiler with a capacity of approximately 350 kW is also used during the winter. The generator sets will meet current exhaust emission standards.

7.4. Sewage and waste

The island will be a place of permanent work and housing for the crew consisting of about 90-110 people. Freshwater is usually used for municipal purposes, which can be supplied from an external source, i.e. from a feeding vessel and/or by devices mounted on the island, which can convert seawater into fresh water through processes such as reverse osmosis or rapid evaporation.

The resulting sanitary wastewater will be of domestic origin, according to European standard data, an average of 250 liters (0.25 m3) per person is produced per day. Sanitary wastewater is treated in a certified biological wastewater treatment plant. The sludge from the wastewater treatment plant will be transported to the shore for disposal. Food waste that cannot be shredded will be frozen, stored and also sent to the counter for disposal.

At the same time, municipal waste, such as food residues, various types of packaging, garbage, etc., is generated and will be collected on an ongoing basis in containers intended for this purpose. The estimated amount of this type of waste during the project implementation period will be approximately 300 m3/year.

During the operation of the drilling rig, oily water and used oils and lubricants will also be produced. Oily water is mainly bilge and rainwater, as well as dirty water generated in the process of washing and maintaining individual components. Their number will be about 0.8 - 1.0 m3/day. After pre-treatment, they will be collected in a sealed tank, and then transported ashore by a service vessel and handed over to the appropriate sewage collection facilities in the port.

Sewage disposal from the island area

The drainage will include sewage from rainfall and runoff from gutters, washing of decks and work areas. Direct drainage from the island to the sea is limited to clean areas only, mainly through open gaps. The drilling rig is designed with embankments to divert oily wastewater to a closed water drainage system. Contaminated wastewater will be sent to shore for appropriate reprocessing and/or disposal.

In addition to the drainage system and embankment around some areas of the drilling rig, such as engine rooms and chemical warehouses, spill clean-up kits are deployed in strategic locations around the island to provide additional safeguards to prevent spills into the sea.

Waste collection, segregation, storage and disposal

All types of hazardous waste will be segregated on the drilling rig, including:

- Used oil substances (lubricants/engine oil, hydraulic oil and cooking oil), Oil-contaminated material (filters/rags/barrels),
- Solvents, adhesives, paints and chemicals,
- Used batteries,
- Fluorescent lamps,
- Extinguishing agents,
- Refrigerants,
- Absorbents, contaminated swarf and chips, contaminated pipe protectors,
- Aerosols,
- Empty containers that contained these materials.

Non-hazardous waste will be collected and stored on the oil rig. Recyclable materials will be separated, including:

- Packaging materials (wood, paper/foil),
- Scrap metal, wire, rope, pipes, wire, shavings, empty cans and drums that did not contain hazardous materials,
- Rubber pipe protectors,
- Office waste (paper/toner cartridges),
- Glass,
- Plastics.

The waste will be transported to the supply base, from where it will be handed over for appropriate disposal at a licensed waste disposal site. Detailed information on waste and methods of its disposal (including facilities) will be described in detail in the Waste Management Plan, which will be prepared by the investor. Solid waste that is transferred to land for disposal will be correctly identified and segregated, and all necessary documents will be developed. As part of this process, the identification of waste as hazardous or non-hazardous will be undertaken, among other things. Waste codes, including the EWC European Waste Catalogue code, will be assigned in accordance with international conventions. Throughout the duration of the project, records of waste will be kept, including type, code and volume/weight.

Estimated amounts of waste generated on the island on average over a <u>period of one month</u> are presented in the table below.

Table 4. Estimated amounts of waste generated during the month

Waste code	Type of waste	Amount of waste in Mg
07 02 80	Waste from the rubber industry and rubber production	0,20
07 02 13	Plastic waste	0,005
13 02 08*	Other engine, gear and lubricating oils	0,25
13 05 07*	Oily water from oil dewatering in separators	1,0
15 01 01	Paper and cardboard packaging	0,27
15 01 02	Plastic packaging	0,30
15 01 03	Wood packaging	0,3
15 01 10*	Packaging containing or contaminated with residues of hazardous substances	0,40

Waste code	Type of waste	Amount of waste in Mg
15 02 02*	Sorbents, filter materials (including oil filters not included in other groups), wiping cloths (e.g. rags, cloths) and protective clothing contaminated with hazardous substances (e.g. PCBs)	0,25
15 02 03	Sorbents, filter materials, wiping cloths (e.g. rags, cloths) and protective clothing other than those mentioned in 15 02 02	0,01
16 01 07*	Oil filters	0,01
16 01 19	Plastics	0.01
16 01 22	Air filter	0,01
16 06 01	Batteries and accumulators of lead acid	0,001
16 06 02	Nickel-cadmium batteries and accumulators	0,0001
16 07 99	Other wastes not mentioned	0,02
17 02 03	Plastics	0,004
17 04 07	Mixtures of metals	2,0
17 09 04	Miscellaneous waste from renovations other than those mentioned in 17 09 01, 17 09 03	0,03

** hazardous waste.*

In order to properly handle the generated waste (offshore waste management), especially appropriate protection against the possibility of its release into the aquatic environment, it will be temporarily stored on board in accordance with the procedures and the permit held as follows:

- household solid waste will be collected in plastic bags and stored in a container for the transport of waste,
- used oils and lubricants resulting from the operation of machinery and equipment will be collected in barrels adapted for this purpose and then transported to the land for disposal in transport containers,
- hazardous waste, e.g. waste batteries, will be segregated and stored in appropriate containers intended for transport and disposal,
- containers of paints, solvents and other chemicals will be stored in an appropriate warehouse and then periodically handed over in metal containers/bags for disposal to the mainland,
- large-size steel scrap, unused redundant casing pipes, drilling equipment will be successively transferred by crane to the supply ship and transferred to the CEP land base.

Drilling waste

The amount of drilling waste generated during drilling varies greatly, as it depends on the depth of the borehole, the type of rock formations being drilled and the drilling mud and water management regime. The drilling waste generated during drilling of the well consists of used mud and fine drill cuttings.

In accordance with the Regulation of the Minister of Climate of 2 January 2020. on the waste catalogue (Journal of Laws of 2020, item 10), drilling waste generated (being mining waste) from rotary and drilling mud drilling for oil and natural gas is classified in group 01 "Waste generated during exploration and extraction of minerals".

Drilling primarily generates waste coded 01 05 08 and 01 05 99. Additionally, acidizing and testing are expected to generate waste coded 01 05 05* and 01 05 06*.

All drilling waste will be transported ashore in sealed containers, where it will be handed over to an authorized entity.

Table 5. Table 5. Estimated amounts of waste generated during the drilling phase on average over one month.

Waste code	Type of waste	Amount of waste in Mg
01 05 05*	Drilling mud and drilling waste containing oil	150,0
01 05 06*	Drilling mud and drilling waste containing dangerous substances	150,0
01 05 08	Drilling muds containing chlorides and waste diffrenet than 01 05 05 i 01 05 06.	1200,0
01 05 99	Other waste	100,0

Drilingl mud

During drilling, a drilling mud is used, i.e. a liquid with appropriately selected physicochemical parameters (composition, viscosity and density). The drilling mud, in the process of drilling a well, performs a number of functions, such as lubricating and cooling the auger, suspending and transporting rock chips to the surface, and exerts the hydrostatic pressure necessary to control the pressure of the formation. Drilling fluids can be categorized based on their main component (in the continuous phase). This continuous phase can be water, oil, synthetic oil or gas. The resulting drilling fluids are called water-based mud (WBM), oil-based mud (OBM), synthetic base, or pseudo-oil base (SBM or POBM) and foam mud, respectively. Depending on the type of drilling fluid, the continuous phase can additionally contain dissolved organic and inorganic additives as well as finely divided solids of various types. The type of drilling mud to use generally depends on the conditions, both anticipated and those encountered in real time, for which each of these types of mud will have some advantages and disadvantages. Where technically possible, WBMs are currently most commonly used, although synthetic OBMs are also widely used in deeper well sections, especially in deviated wells or in difficult and unstable formations.

The drilling mud for drilling wells will be prepared based on the appropriate design. During drilling, a representative of the mud service (mud engineer) will be on the drilling platform responsible for preparing and maintaining the parameters of the mud during drilling and its ongoing treatment according to the well conditions. In order to protect the marine environment from contamination by drilling mud, the mud system works in a closed circuit, passing through, m.in, properly constructed separators separating rock fragments. The final drilling mud is stored in an airtight container until it is transported ashore for collection by authorized disposal units.

Cuttings

During the drilling process, cuttings will be created, which are carried by the drilling mud to the surface of the caisson-retained island, where the drilling mud will be separated, properly stored, and finally safely transported to land for disposal through a cleaning system. In terms of composition, cuttings are a waste rock found in the drilled formations of the well and crushed by the bit in the drilling process.

7.5. Transformations in bathymetry and bottom morphology

One of the factors resulting from the implementation of the works associated with the planned investment will be local impacts on the bottom morphology and bathymetry of this part of the sea basin.

The depth of a given body of water, as well as its variability dictated by the morphology of the seabed, has a direct impact on the salinity, illumination and temperature of the water, thereby determining the occurrence and ecology of biotic elements e.g., plankton, benthos or the group of nektonic organisms represented primarily by fish.

Legal conditions for the use of the seabed during the implementation of the planned investment related to the possibility of exploitation of natural resources are set out in the United Nations Convention on the Law of the Sea, drawn up in Montego Bay on 10 December 1982 (Journal of Laws 2002, No. 59 item 543) ("UNCLOS Convention"). It obliges States to consider the welfare of the marine environment when making decisions relating to the use of the sea, and this applies both to the Exclusive Economic Zone ("EEZ") (Article 58), but also to the continental shelf (Article 79) and the open sea (Articles 94 and 112) of UNCLOS.

Bathymetry reflects the configuration, i.e. the shape of the seabed landscape. Its form and spatial variation is an important factor, especially in the context of the living space of the flora and fauna in the sea, as well as the works resulting from the investment.

The marine landscape in this part of the basin is mainly the result of past geological processes and is also the result of dynamic transformations resulting from current processes determined by the parameters of the marine environment or various anthropogenic impacts occurring periodically.

7.6. Impacts on geology, surface sediments and pollution

The impact of the planned investment in terms of geology, surface sediments and pollution should be considered negligible. The geological formation of the earth's crust is the result of processes occurring over millions of years. The well to be drilled will only disturb the existing geological system in spots. The drilling, which will not exceed 3,000 m and will cover the upper layers of the Earth's mantle, will not change the existing geological structure, especially as the work will be performed only in the superficial layers of the lithosphere, estimated at 300-400 km.

During drilling, due to the artificial island, no substances will be released from the well or enter the marine environment.

Work related to the project will not significantly impact the appearance of seabed pollution.

The dredged material from the approach fairway, which is free of any anthropogenic pollution and meets the required conditions, will be used for incorporation into the island area, while the remaining material will be disposed of in accordance with applicable regulations.

7.7. Impact on seawater

The project's implementation will not have a significant impact on marine waters. Any sewage and oily water remaining from the treatment processes that do not meet discharge standards will be collected and transported to land for disposal.

7.8. Impact on hydrology and water quality

The planned project will not affect hydrology and water quality. The lack of impact on hydrology is because the hydrological regime of this part of the bay is shaped by several parameters that are not affected by the planned project. Storm surges or periodic changes in the water level in the bay are a result of factors in the basin result from climatic as well as geophysical factors.

Water quality may experience a slight, insignificant, short-term deterioration only during the initial works, caused by the lifting of sediments from the bottom that will infiltrate the water table. However, it should be borne in mind that this impact will be eliminated by tides caused by currents and the movement of water masses.

7.9. Impact on meteorological conditions

Meteorological conditions will not be affected in any way by the planned investment. These are primarily determined by climatic factors.

7.10. Impact on fauna and flora

Due to the complex and dynamically periodically changing pattern of ecological parameters of the biological environment in the zone of the planned investment, it is difficult to define the ultimate impacts on individual biological elements. The changes taking place in the biological environment will also largely result from impacts conditioned in the abiotic elements. Nevertheless, it is possible to outline the potential impacts that will occur during the preparation of the investment and its periodic operation.

7.10.1. Impact on phytoplankton formations

A characteristic feature of the phytoplankton of this part of the Pomeranian Bay is its dynamic changes both in time and space. They are a consequence of changing abiotic influences. These changes are the result of fluctuations in such parameters as salinity, water thermics, direction and intensity of sea currents, freshwater inflows, nutrient content and others.

Based on the range of impacts of the undertaking on abiotic parameters of the marine environment, as well as on account of the local impact of the sunken drilling installation, it should be clearly stated that the impacts on phytoplankton formations will be insignificant. The spot location of the drilling installation will not significantly change the pattern and intensity of sea currents, salinity or thermics of water and miogens. Some insignificant impacts are likely to occur during the initial phase, when the surface bottom formations are interfered with. Local contaminants, sediments and biogenes raised from the seabed may then appear in the water depths. As a result of these processes, the possibility of light penetration important for photosynthesis and phytoplankton growth may decrease periodically. Contaminants raised from the seabed as well as those caused by drilling operations may be a negative factor. However, these impacts will be short-lived in time and eliminated by moving water masses.

Based on the environmental analysis and the phytoplankton results obtained, the following conclusions can be made:

- the project will not cause significant impacts on plankton either during construction or operation;
- all identified possible impacts of the investment on plankton, during construction, operation and eventual decommissioning will be insignificant impacts;
- as the investment will not noticeably affect plankton, there will be no secondary impacts in the ecosystem of the analysed water body on other elements of the trophic chain, i.e. benthos, fish, birds, mammals;
- in the area of implementation of the planned investment, no activities or undertakings have been identified, either within or outside the investment, that could result in a significant cumulative impact on plankton;
- the investment will in no way alter the biodiversity of the marine ecosystem through impacts on plankton;
- the possibility of achieving the environmental objectives set for the marine waters of the Baltic Sea in terms of plankton will not be affected by the implementation of the proposed drilling platform foundation.

7.10.2. Impact on vascular vegetation formations

Due to the special conditions, mainly resulting from the increased salinity of the waters in the area of the planned project, as well as the considerable depth, the flora of vascular plants is completely limited. Significant salinity values of 7.5 to 8.0‰ cause plasmolysis in the cells, which leads to the disappearance of physiological processes. Another limiting factor for this group of plants is the considerable depth of the water body, reaching approximately 10m in this part of the water, which largely prevents the penetration of sunlight necessary for photosynthesis. Vascular plants only have chlorophyll pigments that efficiently absorb red radiation. They do not have the ability to absorb radiation in the long-wave spectrum (blue and green). They also do not show chromatic adaptability like some pleuropods. Parameters limiting the occurrence of vascular plants are also the sandy, unstable and rather barren substrate poor in mineral compounds. This set of ecological factors eliminates and prevents the occurrence of vascular plants in this part of the marine basin. Hence, it should be concluded that the implementation of the project will not have any significance for this group of plant organisms.

Thallophytes in the marine saltwater environment, are represented by the green algae *Chlorophyta*, the brown algae *Phaeophyta* and the red algae *Rhodophyta.* The occurrence of most of the pleurotid representatives of these three plant clusters is associated with highly saline marine ecosystems. Some of them, such as the species of the sea lettuce genus *Ulva* sp. div., *Cladophora* sp. div. or the few small-bodied taxa of the brown algae *Phaeophyta*, e.g. of the orders *Ectocarpales* and *Sphacelariales,* as well as the red algae *Rhodophyta,* may occasionally occur in habitat-rich parts of the seabed and various types of submerged installations. They most often inhabit the stable substrates of stones, wood and mollusc shells or develop as epiphytic forms on other macroalgae. The occurrence of these mollusc taxa is not favoured by the sandy, shifting substrate that is characteristic of the locational marine zone of the planned project. The rocky substrate, which is definitely absent here, inhabited by pleurotrophic algal species is an important ecological niche in the marine ecosystem. It is not only a place of development and growth for juvenile fish and other animal organisms, but also a spawning ground for some fish species.

Direct monitoring surveys carried out in the area in recent years have shown that there is a general lack of bottom formations that allow pleuropod algal formations to develop. This seabed formation almost completely limits the occurrence of pleuropods, giving it a homogeneous character. Therefore, also in this respect, the impact of the project on the pleuropod flora should be considered insignificant. The limited size of the affected area also supports the lack of significant impact. It will only locally change the character of the bottom, especially in the initial phase of the works. At the same time, the located installation will be colonised over time by sedentary forms of pleuropods, which will have a positive impact on certain abiotic and biotic parameters of the environment, such as:

- localised periodic increase in O_2 content in the aquatic environment;
- more favourable conditions for phytoplankton growth;
- an increase in the population of zooplankton species;
- local increase in biodiversity.

The analysis of the environment and the results obtained in terms of the formation of pleuropod plants indicate that:

- the investment will not cause significant negative impacts on benthic plant formations during both the construction and operational phases;
- The permanent structural elements of the investment will allow the development of sedentary forms of plant organisms on its infrastructure;
- all identified possible impacts of the investment on sedentary vegetation formations, both during its construction, operation and eventual decommissioning, will be

insignificant impacts;

- as the investment will not noticeably affect sedentary vegetation formations, there will be no secondary negative impacts in the ecosystem of the analysed water body on other elements of the trophic chain, i.e. benthos, fish, birds, mammals.
- no activities or undertakings have been identified in the area where the proposed investment is to be carried out, either within or outside the investment, that could have a significant cumulative impact on sedentary vegetation formations;
- the investment will not adversely affect the biodiversity of the marine ecosystem through impacts on sedentary vegetation formations; the possibility of achieving the environmental objectives set for the marine waters of the Baltic Sea in terms of sedentary vegetation formations will not be affected by the planned drilling platform foundation

7.10.3. Imapct on zooplankton formations

The formation of zooplankton, its qualitative and quantitative diversity depends primarily on the ecological parameters of the aquatic environment. The implementation of the planned project will not significantly affect the change of these parameters. The condition of the water environment in the area of the planned project is an effect of various factors of physical nature, among which the most significant are sea currents moving water masses. These impacts result not only in a change of salinity, but also water thermics, nutrient content and other parameters, which cause transformations in the entire biotic system of the ecosystem. Due to the limited extent of negative effects of the planned project, it should be considered that its impact on zooplankton will be insignificant.

7.10.4. Impact on meiobenthosis formations

Meiobenthos are benthic fauna inhabiting the superficial layers of the seabed. They represent organisms mainly from the lower systematic units of *invertebrate* animals *Invertebrata*.

The basic feature of environmental conditions determining the formation of meiofauna formations is the nature of the bottom sediments. They differentiate the conditions of existence of benthic fauna, which consequently determines the number of taxonomic units appearing on individual test sites as well as their abundance.

The components of the bottom sediments in the part of the Pomeranian Bay, where the project is planned to be located, include both mineral fractions formed from grains of sand, fine gravel and pebbles of various sizes, as well as occasionally silty-clay sediments mixed with fine sand and more or less abundant presence of detritus particles of various sizes. The heterogeneity of the sediment favours the appearance of spaces in the sandy substrate filled with the remains of plant material - phytodetritus, deposited on the bottom after periods of its more dynamic development. The strong enrichment of the sediment, especially of its lower parts, results in a change in its properties, and consequently the composition of the meiofauna. The processes of accumulation of organic material in sandy sediments result in the appearance of a very shallow layer of oxido-redox discontinuity, i.e. a layer deprived of oxygen, which significantly limits the existence of benthic fauna.

By its very nature, the project will exclude a certain area of the seabed that will become inaccessible to meiofauna. However, this will be a relatively small area where various infrastructure elements associated with the associated with the operation of technical facilities. The exclusion of this part of the ecosystem will be permanent. There are likely to be some non-beneficial impacts on bottom surfaces in the vicinity of the project infrastructure.

However, they will only have periodic impacts, especially during the first stages of the implemented works.

From the point of view of the functioning of the biotic elements of the entire ecosystem and its individual links, it should be considered that the impact of the project on meiofauna will be insignificant, especially as it will cover a very small area of the seabed.

7.10.5. Impact on fish

On the basis of the results of monitoring studies carried out in the area of the water of the project, it should be stated that this area is a place of occurrence of both typically marine and freshwater species. The periodic appearance of migratory species is a consequence of their biology related to reproduction. The species composition and frequency of occurrence of specimens of individual taxa during the study periods indicate that ichthyofauna occurring in the body of water is a random combination resulting from changing environmental conditions. At the same time, the dominance of undersized specimens in the fish stock population indicates that they appear in this part of the body of water due to favorable environmental conditions for development and growth, or they are not caught during the exploitation of the fishery due to the technical capabilities of the equipment used. The reservoir is a place of increased navigation, which indicates that these activities are not of significant importance and do not have a negative impact on fish formations. Therefore, it should be considered that the location of the island will also have no significance for this link in the trophic chain.

7.10.6. Marine mammals

The porpoise is a protected species, listed in Annexes II and IV of the Habitats Directive. This IA also addresses the requirements for the assessment of the ecological functions of species in Annex IV. This species is also protected under the Agreement on the Conservation of Small Cetaceans of the Baltic and North Sea (ASCOBANS), under the auspices of the Bonn Convention. This species is also protected by the HELCOM agreement under the Helsinki Convention and is listed in Appendix II of the Washington Convention (CITES). In Polish regulations, porpoises are listed in Annex I to the Regulation of the Minister of the Environment of 14 October 2014 on the protection of animal species (Journal of Laws, item 1348), as a species under strict protection and requiring active protection. It is also listed in the Polish Red Book of Animals. The porpoise is also the subject of protection of the Natura 2000 Ostoja area in the Pomeranian Bay PLH990002.

The common seal and the common seal are also protected species, listed in Annex II of the Habitats Directive. These species are also protected by the HELCOM agreement under the Helsinki Convention. As far as Polish regulations are concerned, both seal species are listed in Annex I to the Regulation of the Minister of the Environment of 14 October 2014 on the protection of animal species (Journal of Laws, item 1348) as strictly protected species.

The analysis of the environment, the results of the research obtained so far, as well as observations concerning marine mammals indicate that:

- the Pomeranian Bay basin in which the implementation of the project, a temporary place of occurrence of marine mammals, mainly seal species, will be located;
- Documented threats to this group of animals are primarily fishing gear (various types of nets) used by fishermen, as well as collisions with ships and underwater noise. It even poses a high potential threat to porpoises that have the ability to echolocate, identify location and thus avoid underwater obstacles;
- the project will not cause significant negative impacts on marine mammal populations

both at the construction and exploitation stages due to the limited impacts of the small area of impact and stationary operation and the pollution caused by underwater noise;

- all identified, possible impacts of the project on marine mammal populations, both during its implementation, exploitation and possible liquidation, will be of an insignificant nature;
- the project will not in any way negatively affect the biodiversity of this part of the marine ecosystem by affecting the populations of marine mammals, avifauna and ichthyofauna, scaring with noise with limited impact will cause temporary scaring off marine fauna, which will minimize potential collisions with the platform and the ongoing works;
- the implementation of the project, in the case of its maintenance-free operation, will not affect the possibility of achieving the environmental objectives set for the marine waters of the Baltic Sea in the context of marine mammal populations and water quality.

7.10.7. Birds

The Pomeranian Bay is one of the main wintering grounds for seabirds in the Baltic Sea. In addition to the four species listed in Annex I to the EU Birds Directive (black-necked grebe, red-necked grebe, horned grebe, lesser gull), the Pomeranian Bay is also used by 15 other bird species (> 250 thousand individuals) as an important wintering, moulting and resting place (> 1% of the departing population). The impact in the context of the occupation of the area should be considered negligible, because the body of water shown to be an important wintering place for birds during migration is very extensive, while the platform will occupy a small area in relation to the entire area and, which also needs to be emphasized, it is located outside Natura 2000 areas. The barrier effect for migratory birds will also be negligible, as the change of route related to bypassing the site will constitute only a small part of the entire migration route, so the additional energy costs will be very small. Of course, the Investor is aware that some species may occasionally collide with drilling rig elements, especially during difficult weather conditions. According to the data presented by the OSPAR Biodiversity Commission on the effects of drilling rig lighting on bird collisions in the North Sea region, which shows that most of the species affected are not seabirds, but migratory land birds. Reports state that 75% of the species shown are from the thrush family. The risk of collision of birds with drilling rig elements occurs in a discontinuous manner, i.e. with a high variability of intensity over time. It takes place during unfavorable weather conditions (fog, drizzle) and during the passage of a cold front causing birds to lower their flight ceiling and are more exposed to collisions and more strongly attracted by light. The same thing happens at night, especially with inadequately lit objects. In bad weather, brightly lit objects are a magnet that attracts birds, which circle in their vicinity in confusion, potentially hitting structural elements or each other. The main disruption of bird migration will occur when the structure of the island with the drilling rig appears on site. Once the drilling rig is located in place, birds will avoid it, However, in order to protect the environment in terms of migration and wintering of birds, the following ways are planned to minimize the above threat:

- The amount of lighting will be kept to a minimum, ensuring sufficient lighting for workers in the workplace and markings of the island and drilling rigs in terms of the safety of ship traffic
- UV wavelength lights will be used, which are less likely to attract birds and thus less likely to cause birds to collide;
- A so-called fog horn will be installed, emitting an audible signal during periods of poor visibility.

It should be assumed that the exploitation of the deposit will cause a temporary escape of birds from the area. During drilling, environmental hazards usually occur in a small area for a short period of time and generally on a small scale. The negative phenomena associated with drilling do not cause major ecological damage. Hazards are minimized by appropriate equipment, the use of special materials, certified equipment, the correct construction and armament of the outlet opening, and appropriate procedures when drilling reservoir rocks.

It should also be noted that the surface elements of the structure of the designed project will be a place of gathering for some species of birds.

7.11. Analysis of possible social conflicts related to the planned project

The implementation of new investments or undertakings may be a source of anxiety among the local community, and in extreme cases lead to conflicts between the investor and the local community. The investments violate the existing "status quo" and are at the same time an impulse for residents and local entrepreneurs to ask questions related to the impact of these investments on the environment, as well as on the functioning of their local community. In some situations, e.g. in the absence of proper communication on the part of the entity planning the implementation of the project and lack of dialogue with residents, entrepreneurs and other local authorities, social conflicts may occur.

Potential causes of conflicts during the implementation of the Wolin offshore project,

- fear of the unknown,
- negative experiences with existing and functioning investments in a given area and the resulting nuisances,
- conflict of interest of shipowners whose vessels sail in water areas in the vicinity of the planned project,
- conflict of interest of fishermen making catches in the area of impact of research and drilling,
- concerns of sea beach users,
- desire to obtain additional, personal benefits,
- disregarding the opinions and conclusions of local communities,
- the desire to preserve the marine environment in an unchanged state.

Most often, the causes of conflicts overlap, which leads to problems with identifying the real sources of conflict and makes it difficult to prevent potential conflicts as well as resolve those that have already arisen.

In the case of planned works, all natural and legal persons using local sea waters should be considered as a "third party", including, in particular, shipowners whose vessels sail in the water areas in the vicinity of the planned project and fishermen fishing in the area of impact of the works carried out in the area of the Wolin concession. In connection with the implementation of the planned project, it will be necessary to establish a temporary closed area for fishing around the oil platform. This is due to the need to ensure the safety of all installations. Apart from this limitation, during failure-free operation, there is no threat to the interest of "third parties". The likelihood of an emergency oil spill and the associated risk to the environment and third parties is very low. In an unfavourable situation, there may be a compulsion to change course, which is a natural matter in maritime practice, e.g. due to weather conditions.

At each stage of the implementation of the Wolin offshore project related to hydrocarbon deposits, CEP will try to respond to all the needs and expectations of the local community. investments.

The most important elements of the information campaign conducted in the area include: if necessary, the organization of information meetings before and during operational activities and the distribution of educational materials on the technology of the work carried out, safety and legal and environmental aspects of exploration and recognition of natural gas deposits.

An important element of the information campaign carried out by CEP will also be cooperation with local and regional media. In addition to communication activities carried out directly by designated representatives of CEP, activities in this area are also carried out by specialist companies performing subcontracted works on its behalf and companies with competences and knowledge in selected areas of exploration and production activities.

8. AREAS SUBJECT TO PROTECTION UNDER THE ACT OF 16 APRIL 2004 ON NATURE CONSERVATION AND ECOLOGICAL CORRIDORS WITHIN THE RANGE OF SIGNIFICANT IMPACT OF THE PROJECT

The planned project is located in a marine area outside Natura 2000 areas. In the immediate vicinity approx. 200 m to the east there are:

- Ostoja na Zatoce Pomorskej PLH 990002;
- Maritime Bay PLB 990003;
- Marine Protected Area HELCOM No. 170 Pomeranian Bay.

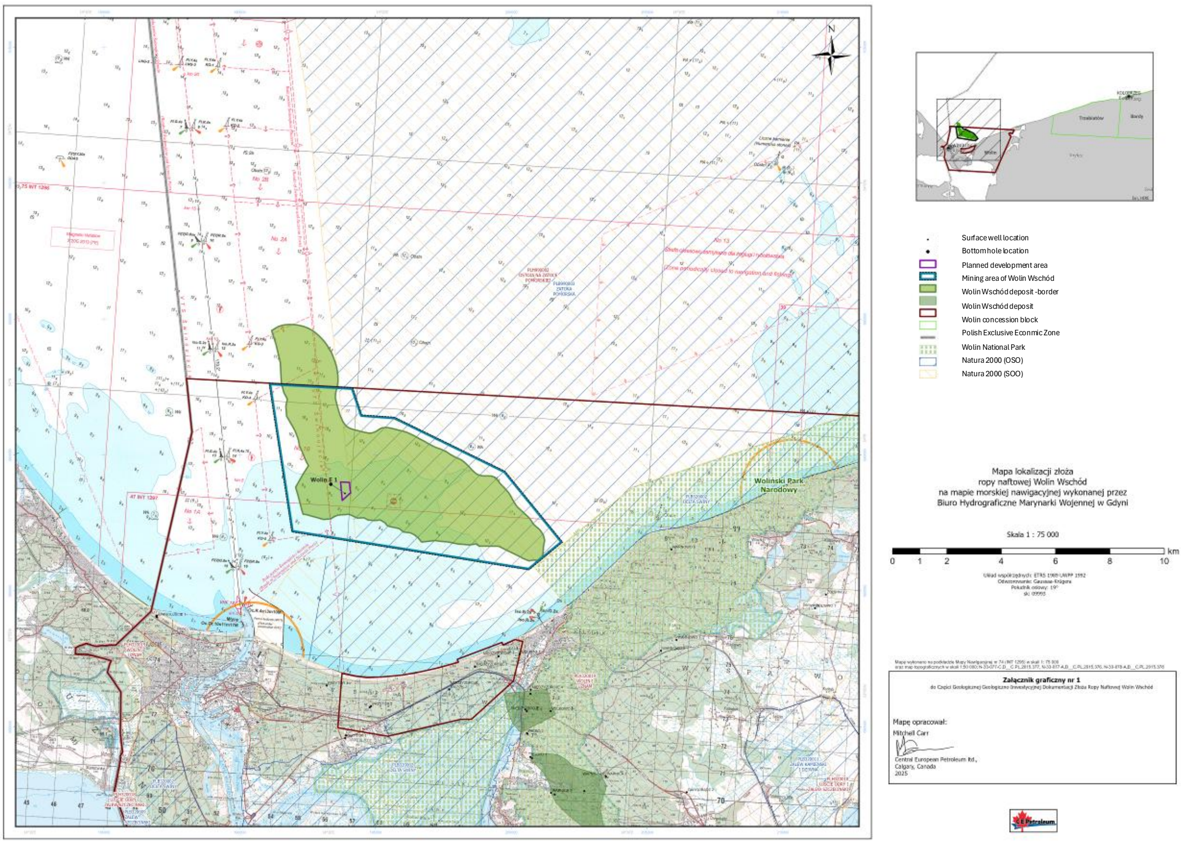


Fig. 15. Location of the project and Natura 2000.

<u>PLB990003 "Pomeranian Bay" </u>is a marine area, a special bird protection area with the area of 309 154.9 ha, established by the Regulation of the Minister of Environment of 11 January 2011 on special bird protection areas (Journal of Laws of 2011 No. 25, item 133 as amended). on special bird protection areas Natura 2000. No protection tasks plan has been established for the area.

According to the valid standard data form, the area includes the back delta of the Świna River, the upland part of the Wolin Island and the coastal zone of the Pomeranian Bay, in the north-west it includes a part of the Oderbank (pl. Ławica Odrzańska). The river delta, growing towards the Szczecin Lagoon, is formed by the natural and artificial arms of the Świna - including the islands located between them. More than 70% of the open area is occupied by brackish water, halophilous semi-reed communities and patches of *Phragmition*. An insignificant part of the area is occupied by arable fields. The forested area (several % of the land area) is occupied by alder swamp forest, coastal crowberry forests, mixed birch-oak forests and mixed beech-oak forests. The upland part of Wolin Island includes the Wolin end moraine range with its culmination on the Grzywacz hill. Its area is covered mainly by forests - pine forests, mixed beech-oak and pine-beech forests, Pomeranian beech forests and alder forests. Just over 3% of the area is covered by lakes, dominated by shallow glacial lakes. To the north, the land is bordered by cliffs and small sections of dunes as well as smaller agricultural and industrial areas. The waters of the Pomeranian Bay comprise a 1 NM (nautical mile) wide strip of coastal shallow sea water with depths of up to 10m. The bottom, thanks to its diversity (sandy, bouldery), is a very important breeding area for fish, a biotope for mussels and macroalgae. It is an important food base for migrating and wintering birds.
The area includes a bird sanctuary of European rank PL001. It hosts at least 38 bird species from the Annex I of the Council Directive 79/409/EEC, 27 bird species from the Polish Red Book (PCK). More than 160 species nest here, and the number of identified species exceeds 240. It is an important Aquatic Warbler refuge - 1-3% of the national population nests here (C1, C6). During the breeding season, over 1% of the national population of white-tailed eagles (C1, C6, PCK), and Gadwall nest here. The Ruff and the Dunlin breed here irregularly. Corn crake (C1) also breeds here. Outside the breeding season, the area has significant concentrations of wintering Common merganser (C3), Greylag goose (C7), Smew (C2).
The subjects of protection in this area are bird species from the Birds Directive, including in particular bird species associated with aquatic habitats such as: Razorbill, Black guillemot, Long-tailed duck, Black-throated loon, Red-throated loon, Velvet scoter, Common scoter, Red-breasted merganser, Horned grebe, Great crested grebe, Red-necked grebe. The main threats indicated in the standard data form are other human activities related to urbanisation, industry, etc.

PLH990002 "Ostoja na Zatoce Pomorskiej" is a marine area, an area of Community importance of 243058.55 ha in its entirety, established by Commission Decision dated 12 December 2008 adopting, pursuant to Council Directive 92/43/EEC, a second updated list of sites of Community importance for the Continental biogeographical region (notified under document C (2008) 8039)(2009/93/EC). No conservation plan has been established for the site.
According to the current standard data form, is a key area for the protection of habitat 1110 and an area of regular sightings of harbour porpoise, as well as an important area for the Baltic Twait shad population. In addition, it is also an important bird sanctuary of international rank E82. The Pomeranian Bay is a water body with a highly varied seabed, ranging from sandy shoals to extensive gravel pits and boulder fields. The central part of the Pomeranian Bay is occupied by a large upwelling called the Oderbank. In the north-west, the "Ostoja na Zatoce Pomorskiej" Natura 2000 site includes part of the Oderbank.
The object of protection in the refuge is the protected natural habitat from Annex I of the Habitats Directive with the code 1110 , i.e. submarine sandbanks, as well as animal species from Annex II of the Habitats Directive, including one of the ichthyofauna species - Twait shad and the marine mammal species porpoise, as well as the habitats of these species. No threats were presented in the standard data form in relation to this refuge.

The Director of the Maritime Office in Szczecin, in an announcement dated 04.05.2022, informed about the adoption of temporary conservation objectives for natural habitats and species and their habitats that are subject to protection in the Natura 2000 area "Ostoja na Zatoce Pomorskej" (PLH990002).

HELCOM Marine Protected Area

The boundaries of the HELCOM Marine Protected Area No. 170 Pomeranian Bay, coincide completely with the Natura 2000 site Zatoka Pomorska PLB990003 and partly with Ostoja na Zatoce Pomorskiej PLH990002. According to the information contained in the information sheet, the following bird species are present in the area:

- *Alca torda* Razorbill;
- *Clangula hyemalis* Long-tailed duck;
- *Melanitta nigra* Common scoter;
- *Melanitta fusca* Velvet scoter;
- *Cepphus grylle* Black guillemot;
- *Gavia arctica* Black-throated loon;
- *Gavia stellate* Red-throated loon;
- *Podiceps auritus* Horned grebe;
- *Podiceps cristatus* Great crested grebe;
- *Podiceps grisegena* Red-necked grebe;
- *Mergus serrator* Red-breasted merganser.

All of the above-mentioned species are subject to protection of the Natura 2000 Pomeranian Bay PLB990003 area.

With regard to animals other than birds, two species of fish and two species of marine mammals are present in the area:

- *Alosa fallax* Twait shad;
- *Halichoerus grypus G*rey seal;
- *Phocoena phocoena* Harbour porpoise (Baltic subpopulation).

The Twait shad *Alosa fallax* and the harbour porpoise *Phocoena phocoena* are protected in the Ostoja na Zatoce Pomorskiej PLH990002 Natura 2000 site. There is also one habitat type in the HELCOM area of the Pomeranian Bay that is Habitat type 1110 - Sandbanks permanently covered by shallow water. This habitat is the subject of protection in the Natura 2000 site Ostoja na Zatoce Pomorskiej PLH990002. As none of the alternatives under consideration conflict with or are in the vicinity of the natural habitat 1110 Oderbank, the investment will not affect the conservation status of this habitat. From the available wildlife data, the presence of Black guillemot *Cepphus grylle*, Twait shad *Alosa fallax* was not observed within the boundaries of the investment. Twait shad was found in 2017 in Świna.

One anthropogenic pressure was identified in the information card for the Pomeranian Bay HELCOM Area. This pressure is the introduction of litter (solid waste, including micro-waste). The intensity of this pressure was identified as medium in the card.

Existing anthropogenic pressures on birds, marine mammals and fish, including species of conservation concern in the aforementioned Natura 2000 sites are further described in the following sections.

Based on the assessments carried out, no significant impacts of the investment on the species present in the area and its values affecting the maintenance of the populations of these species in the area have been identified, provided that the construction and operation process is carried out in a correct and planned manner.

With respect to the identified pressure in the HELCOM area Pomeranian Bay in the form of introduction of waste into the environment, it is concluded that the implementation and operation of the investment will not result in the introduction of waste into the marine environment. All waste generated on vessels will be collected on vessels and periodically disposed of by transferring them ashore to appropriate waste collectors.

The area of the anticipated implementation of the project is beyond the reach of national ecological corridors. The closest structure of this type is the corridor called "Wolin Forests" (code KPn-32B) at a distance of about 2.0 km to the east (based on https://mapa.korytarze.pl/).

The Baltic Sea is an important area for seabirds, both during migration and wintering. According to observations carried out within the framework of GIOŚ bird monitoring (Meissner W., Chodkiewicz T., Kozakiewicz M. 2020. Monitoring of birds taking into account Natura 2000 special bird protection areas, 2018-2021. Stage 3. Part II. Monitoring of seabirds taking into account Natura 2000 special bird protection areas, years 2018-2021. report on field work and elaboration of the results obtained in the Monitoring of Wintering Seabirds in 2020. OTOP - for GIOŚ. Marki, Warsaw) in Polish sea areas, most seabirds congregate in three areas: the Pomeranian Bay, the Gulf of Gdańsk and the central part of the Slupsk Bank (pl. Ławica Słupska).

The Pomeranian Bay is considered one of the most important areas of waterbird concentration in the Baltic Sea. The shallow areas of the bay, such as the Oderbank and the estuarine area of the Świna River, which drains the organic matter- and nutrient-rich Odra into the bay, are among the main refuges for wintering birds in the southern Baltic Sea. The importance of this area increases during harsh winters, when bodies of water in the northern and eastern parts of the Baltic Sea freeze over. The resident birds then move to locations with more abundant food resources in the milder climate on the southern coast. In addition, the Pomeranian Bay lies on the route of the main avifauna migration routes from north-east to south-west. Therefore, due to the high natural importance of the Pomeranian Bay for migratory birds and wintering birds, the area was included in the Natura 2000 ecological network in the form of the "Pomeranian Bay" bird sanctuary PLB990003.

The area "Pomeranian Bay" PLB990003 extends from the western end of Lake Bukowo (Łazy), where it covers a 15 km wide strip of Baltic coastal waters to the Polish border, extending here to about 70 km. The central part of the Pomeranian Bay is occupied by a large upwelling called Oderbank.

Most of the area of the planned drill site is outside the boundaries of the "Pomeranian Bay" Natura 2000 site PLB990003. Only its north-eastern edge is within the boundaries of the area under consideration. Thus, it can be concluded that the investment site is outside the range of key areas as bird migration corridors, including the Oderbank.

A comprehensive study of the birds occurring in the Pomeranian Bay was carried out for the purpose of developing a protection plan for the aforementioned Natura 2000 site - commissioned by the Maritime Office in Szczecin. The results of the studies were included in the study entitled "Results of the Nature Inventory for the Special Protection Area of Birds Pomeranian Bay PLB990003 (Eco-Expert Sebastian Guentzel and Łukasz Ławicki Sp.j., Szczecin, 2012).

The results of the study confirmed that the Pomeranian Bay is an important site for migrating and wintering waterbirds. The most abundant group of birds are sea ducks: Long-tailed duck, Common scoter and Razorbill, which are observed throughout the study area, both in shallow coastal waters and in areas up to several tens of kilometres from the shore. High numbers are shown by swimming ducks of the genus *Anas*, which are mainly observed during active migration. Another group are *Fulicinae*, *Anatidae*, Common goldeneyes, Common merganser, Great crested grebe and cormorants. These species are mainly observed in shallow coastal waters. During the autumn migration period, *Charadria* Waders are highly abundant, mainly observed during active migration. Black-headed gull and little gull are also numerous during migration.

The area of the project, which is a drilling installation enabling the development of the field's exploitation resources, is located outside the Natura 2000 areas. At the border with the area of "Ostoja na Zatoce Pomorskej PLH 990002", "Zatoka Pomorska PLB 990003". Both areas are refuges in the sea waters of the Baltic Sea.

The "Refuge in the Pomeranian Bay" is classified as an area of Community importance pursuant to Decision 2010/44/EU of the European Commission of 22 December 2009 (Journal of the European Union LL 30/120 of 2 February 2010). L 43/63 of 13 February 2009). The refuge on the Pomeranian Bay is adjacent to the western part of the Polish coast. Its western border is a line drawn from Cape Arkona on the island of Rügen, the eastern border reaches the Gąska lighthouse. The area that is the location of the potential project is located outside the area of the refuge, on its western side.

It is forecast that due to the location of the project, during the operation, assuming undisturbed operation, there will be no impact on Natura 2000 areas. During normal operation of the oil rig, there will be no direct impacts that may affect protected areas. The potential impact may relate to the possible occurrence of a major failure. In practice, the occurrence of a serious drilling accident affecting the environment is considered unlikely, all impacts are only of a local nature.

Analyzing the presented environmental impacts, as well as the principles of preventing its pollution and acting in the event of an emergency, it should be stated that there will be no significant impacts on Natura 2000 sites. As a result of the environmental impact assessment of the planned project in the form of drilling boreholes for Natura 2000 areas, it was found that:

- the planned project will not result in a change in the indicators of the conservation status of habitats and species,
- the planned project will not affect the coherence and integrity of the Natura 2000 network,
- the planned project will not cause habitat conversions and will not cause permanent or periodic, direct or direct threats to priority habitats and species,
- in connection with the implementation of the planned project, no special actions and environmental compensation are required in order to protect the habitats and species found within the Natura 2000 sites.

9. RISK OF MAJOR ACCIDENT OR NATURAL AND CONSTRUCTION DISASTER AND CLIMATE CHANGE

The risk of a major accident or natural disaster due to the construction of the island is negligible. There was also no significant risk of a construction disaster related to the planned works. However, there is no need to create additional procedures to minimise the risk of personal injury and human loss and to deal with their occurrence, as these are defined by the applicable health and safety regulations. The designed structures will be implemented on the basis of commonly used, traditional methods in compliance with all applicable technical and construction standards and regulations, as well as occupational health and safety. The investor will ensure constant supervision of authorized inspectors and designers of all industries in order to eliminate the risk to the construction itself. During the construction phase, the risk of environmental pollution is low. The most serious consequences would be the leakage of petroleum substances, oils or coolants as a result of a collision on water or damage to construction equipment on land. In order to minimise the impact of such an event, access to neutralising agents such as sorption mats and dams, sorbents, leak protection sleeves for floating dams and the possibility of using a vessel to combat spills should be ensured. Any contamination should be handed over as waste to companies with appropriate permits.

The risk of extreme weather phenomena (storm, strong wind, heavy rainfall, storms) that may negatively affect the implementation of the project is low. In order to further reduce the effects of such phenomena, appropriate measures will be taken. The most important of these will be monitoring meteorological conditions and warning in advance of the occurrence of extreme phenomena. Prior to the occurrence of extreme weather phenomena that may negatively affect the works carried out, these works will be temporarily suspended, and their current condition, collected construction materials and construction machinery located on the site will be properly secured.

At the stage of exploitation of the deposit, the main environmental impact of the planned project related to the development of the Wolin field in the event of an accident is the release of crude oil into seawater. The large area around the island, the surrounding waters of the open sea are relatively insensitive to each of the above-mentioned types of hydrocarbon contamination. This can be concluded from numerous studies conducted around the world after emergencies that have occurred in the past. This is because crude oil is subject to:

- very strong dispersion in stormy conditions in a large volume of water,
- relatively fast movement over long distances on the sea surface,
- transformation caused by physical (dispersion, emulsification), chemical (e.g. photooxidation, dissolution) and biological (assimilation by microorganisms) processes.

In the case of the high seas, the interaction of these factors leads to the "absorption" of even very large amounts of hydrocarbons, without significant effects on birds and aquatic animals. When contamination reaches coastal waters, the scale of the threat increases. This is due to both the shallow sea depth of 10-12 m (and therefore small volumes of water) and the large, although periodically occurring, numbers of birds and fish.

In the event of catastrophic marine pollution, the following impacts should be taken into account:

- **Direct:** a limited number of birds in the immediate vicinity of the platform may be contaminated and killed. With regard to the demersal flora and fauna, which are extremely poor in this area, we can talk about negligible ecological losses. Limited losses are expected for fish. The reaction of fish to contamination of marine waters will be to migrate over a considerable distance.
- **Indirect:** depending on the direction of movement of the oil spill and the rate of its dispersion in the water table, significant contamination of the seashore may occur.
- **Short-term:** depending on the sea conditions (sea condition, wind strength, water and air temperature), the oil spill formed by the spill in question will remain on the surface of the water for several weeks. After this time, the environmental effects of the spill will be very much weakened, except in the coastal zone, as long as the spill reaches there.
- **Temporary - reversible:** practically all potential types of negative impacts on elements of the offshore environment will be temporary - reversible. Even if the coastline is contaminated, it is possible to recover from the pre-accident state, although this will be accompanied by significant financial outlays.
- **Permanent - irreversible:** hypothetically, permanent ecological effects may concern birds and, in some cases, fish (species that feed or breed in the coastal waters). In the most unfavourable case, i.e. when the spill reaches the seashore during the period when significant numbers of birds and/or fish are there, this will cause high mortality.

With regard to a specific fish population, there may be a permanent loss of taste and thus commercial value.

Nevertheless, given the possibility of a malfunction of marine mammal drilling rigs in the vicinity, one should be prepared for similar rescue operations as well as losses in populations related to oily animals and too late help. Nevertheless, in the event of an accident with the spillage of oilseeds, rescue units with appropriate procedures for the utilization and sorption of substances and nature conservation services dealing with the cleaning of marine animals from oils and their rehabilitation should be activated.

The island and the drilling rig will be fully equipped with appropriate equipment to prevent and remove the effects of oil spills.

In the conditions of the Baltic Sea, an oil spill of more than 5000 m3 could be considered catastrophic, as the probability of contamination of the coastline 6 km away from the oil platform would be very high. It should be mentioned that the scale of marine pollution due to this potential eruption would be much smaller than it would be in the event of a breakdown of a tanker carrying hydrocarbons. The traffic of tankers, especially transporting liquefied natural gas, in the Baltic Sea has been increasing significantly in recent years, posing a much greater threat to the cleanliness of the sea than in the case of the anticipated drilling and borehole testing technology.

It is not possible to accurately assess the size of the spill if technical intervention is necessary to stop the spill. Due to the ecological assessment of the effects of potential spillage, predictions about the extent of spillage are important. It depends mainly on:

- the amount of oil spilled,
- its behaviour in specific weather conditions (evaporation, emulsification, dispersion),
- hydrometeorological conditions (sea condition, wind strength, water and ambient temperature).

The extent of contamination is also affected by:

- high temperature of crude oil coming to the sea surface during the eruption (approx. 80 - 90 °C),
- a large percentage of light hydrocarbon fractions (which is characteristic of Cambrian oil varieties),
- increase in the area of the spillage due to oil spill,
- sea turbulence (waves).

These factors increase the evaporation of crude oil, and thus reduce its amount in water. In the conditions of the Baltic Sea, within the first 2÷3 days after the spill, the loss of oil mass in summer can reach about 25% (in winter about 15%).

A favorable circumstance, from the point of view of the protection of the marine environment, is the dispersion of oil droplets deep into the water mass. Studies have shown that their size during migration into the water mass ranges from 10 to 1000 μm. The depth of migration reaches 80÷100 m. The movement of oil particles into the sea depends on the resultant buoyancy and the vertical turbulent diffusion component. This phenomenon may be accompanied by the so-called Stommel effect, which consists in the fact that oil particles endowed with buoyancy remain at a certain distance from the surface for an unlimited period of time.

The extent of contamination is also affected by the phenomenon of oil sinking and its emulsification. The sinking of oil particles occurs as a result of the evaporation of light hydrocarbon fractions. This changes the viscosity and density of crude oil. It is likely that after a few days of oil on the surface of the sea, its density will exceed the density of water and the particles will begin to sink. The emulsification of crude oil occurs as a result of mixing with water. The degree of mixing and the amount of emulsion resulting depend on the properties of the oil and the state of the sea.

The above considerations lead to conclusions about the extent of the spill. Crude oil moves on the surface of the sea at the resultant velocity for the speed of sea currents and the speed of the surface layer, forced by the action of the wind. Changes in wind direction, sea waves and the course of weathering changes in oil determine the shape of the spill. As a rule, it is a set of spots, separated from each other and having an irregular shape. They move on the surface of the sea mainly in the direction of the wind. Oil stains, with a thickness of a fraction of a millimeter, are usually several kilometers long and up to a kilometer wide.

In the case of a small spill, when the oil or condensate slick is thin, the main cause of bird death is gastrointestinal contamination, leading to acute enteritis and gastritis. The bird ingests the crude oil while grooming its soiled plumage. It can also be ingested with food, on which heavier fractions settle. This process takes several days or even weeks and usually leads to the death of the individual.

In light of the available literature, it can be assumed that only a large, accidental oil spill causes significant losses among birds. Observations made after such spills indicate that they do not necessarily result in significant losses to avifauna. Given the very low probability of an oil spill occurring during operation, it can be assumed that the risk to birds resulting from contact with hydrocarbons present in the marine environment in the area of the planned investment is negligible. In this case, in emergency situations, they may only be a source of local, short-term pollution that does not leave permanent traces in the marine environment. In the worst-case scenario, the contamination will not exceed several hundred meters from the site of the incident. If weather conditions favor the dispersion of reservoir fluids, condensates, or possibly crude oil into the environment (high ambient and water temperatures, exposure to sunlight, wind, and waves), the negative impacts will cease after a relatively short time (up to several days) and will not extend beyond the immediate vicinity of the incident site. In the vast majority of cases, a thin film, often micron thick, forms on the sea surface. This film will remain on the surface for no longer than several dozen hours. During this time, condensate or crude oil particles will evaporate and disperse into the water. The amounts of these substances mentioned are too small to contaminate fish or birds.

10. TRANSBOUNDARY ENVIRONMENTAL IMPACTS.

The obligation to consider the possibility of transboundary environmental impact of planned projects results from the Convention on Environmental Impact Assessment in a Transboundary Context, drawn up in Espoo on 25 February 1991 (Journal of Laws of 1999 No. 96, item 1110). From a legal point of view, the environmental impact assessment in a transboundary context is complementary and aims to determine the type of impacts that the proposed project will have, the location of the planned project in relation to areas under the jurisdiction of other States and the scale, intensity and duration of the impact, resulting in the possibility or absence of transboundary impacts. The subject of the assessment in this respect are only impacts of a significant nature. This is due to the fact that only some of the impacts caused by a given project can be of a cross-border nature.

In order to determine the potential cross-border impacts, an analysis of the impact of the project on various elements of the environment was carried out. The potential impacts and their effects are presented in the table below.

Table 6. Analysis of different types of impacts in terms of the possibility of cross-border impacts

Lp.	Analyzed Environment Element	Potential impact	Scope of cross-border impacts
1.	Bottom morphology and bathymetry	transformation of the seabed surface Sedimentation processes Presence of the installation	insignificant impacts of local scope.
2.	Hydrology and water quality	Generation of suspended sludge concentration an increase in pollutants and nutrients release of pollutants from the installation Presence of the installation change of water thermals and its parameters	minor or insignificant impacts.
3.	Geology and surface sediments	Physical disturbances of the seabed an increase in pollutants and nutrients sedimentation processes Presence of the installation release of pollutants from the installation	insignificant and purely local impacts.
4.	Climate and air quality	emissions into the atmosphere	insignificant and purely local impacts; impacts as a result of emissions during unplanned events
5.	Underwater acoustic climate	drilling and construction works	the impact of insignificant noise generated during drilling operations in the area of the artificial island;
6.	Plankton	concentration of suspended sludge Pollutants and nutrients	due to the local occurrence of insignificant impacts
7.	Bottom habitat formations, phytobentos and zoobenthos	Physical disturbances of the seabed concentration of suspended sludge sedimentation processes Presence of the installation	The identified disturbances are local in nature and the impact should be considered minor or insignificant and insignificant.
8.	Fish	Physical disturbances of the seabed suspension deposits sedimentation processes underwater noise	The identified disturbances are local in nature and the impact should be considered minor or insignificant and insignificant.
9.	Marine mammals	concentration of suspended sludge physical disturbances by the water underwater noise (drilling works carried out in the area of the dump, unplanned events)	identified disorders are of a local nature, therefore the effects should be considered minor or insignificant,
10.	Seabirds	physical disturbances by the water	Insignificant impact
11.	Natura 2000 sites	concentration of suspended sludge sedimentation processes underwater noise physical disturbances by the water Presence of the installation	Insignificant impact the project is located at a considerable distance from Natura 2000ł areas
12.	Marine Strategy Framework Directive (the whole sea area, environmental status based on 11 characteristics)	Physical disturbances of the seabed suspension deposits Pollutants and nutrients underwater noise non-native species Presence of the installation	The impact on Polish waters was assessed as minor or insignificant.

Lp.	Analyzed Environment Element	Potential impact	Scope of cross-border impacts
13.	Water Framework Directive (ecological status in zone 1 NM, chemical status in zone 12 NM)	suspension deposits Pollutants and nutrients release of pollutants by the installation	ecological or chemical status impacts of minor or insignificant
14.	Shipping and shipping routes	Safety Zone restriction zone (in the vicinity of the drilling installation)	the installation site area is located in the territorial sea zone of the Republic of Poland, outside shipping routes in the jurisdiction of other countries
15.	Commercial Fishing	Safety Zone Restricted Zone Presence of the installation Presence of ships	the installation area is located in the territorial sea zone of the Republic of Poland, and is also used for the purposes of maritime transport
16.	Archaeology (cultural heritage)	physical harm	the installation area is located in the territorial sea zone of the Republic of Poland, outside the body of water under the jurisdiction of other countries
17.	Resource extraction sites	Safety Zones Restricted Zone	there are no other places of extraction of raw materials located near the installation
18.	Military training grounds	Safety Zones	There are no military training grounds of other countries located near the installation
19.	Environmental monitoring stations and test zones	suspension deposits	There are no research sites of other countries located near the installation site.
20.	Tourism and recreation areas	Physical interference Safety Zone restriction zone in the vicinity of the project installation airborne noise	Due to their local occurrence and significant distance from tourist and recreational areas, the impacts are insignificant and insignificant

Impacts related to the implementation, operation and possible liquidation of the project should be considered in their entirety as not generating impacts that may be of a cross-border nature. This is due to both the scale of the project, the type of impacts resulting from its implementation, as well as the distance from areas under the jurisdiction of neighboring countries. The only parameter that can potentially have a cross-border impact is underwater noise, but for this reason, the construction of a caisson-retained island made of prefabricated elements delivered to the foundation site was adopted as an implementation option, which allowed to eliminate the impact in the field of impulse noise. Drilling on the island will significantly reduce the impact of underwater noise.

The analysis carried out in this study authorizes the following approach, that the range of impact is insignificant and is located in the immediate vicinity of the planned caisson-retained island. There are no hydrocarbon pollutants or waste in any form. The entire process of generating possible pollution and waste takes place in a closed system, is properly isolated from the environment and neutralized in a professional manner on land.

The only impact of a cross-border nature may be in the event of an emergency situation (a large oil spill). The extent of contamination will depend on water and air temperatures, prevailing weather conditions and sea conditions. In such an exceptional and unlikely situation, it is impossible to establish a rational limit of excessive impact. A spill with a volume of several thousand cubic meters can reach the seashore as well as at a distance of up to several kilometers into the sea. In this case, as the study has shown, the environment will only suffer in the immediate vicinity of the shore, where spilled oil or other condensates will accumulate.

If, on the other hand, the outflow of hydrocarbons or spilling occurs in stormy conditions and strong winds at a considerable distance from land, in the most favorable case the oil will dissipate completely. In such a case, the regeneration of the environment proceeds quickly. Bacteria that deal with the decomposition of petroleum compounds operate here, which are naturally able to dispose of small impurities with petroleum substances.

The solutions used in the construction of boreholes, both of a preventive and interventional nature, create a proven system of using multi-stage elements of eruption prevention of a technological nature (measurement procedures, monitoring of parameters, valves, preventers, etc.) and organizational and technical at the level of:

- enterprises (continuous surveillance vessel, own anti-oil equipment, rescue plan consistent with the national plan),
- country (agreements with supporting companies, mainly with the State Fire Service and the Maritime Search and Rescue Service with ships and rescue equipment),
- maritime procedures (support for the international rescue system based on the relevant legal bases and technologies available in the Baltic States).

In view of the above, the probability of a cross-border threat is low, as the described system creates the possibility of limiting contamination to the borders of Polish territorial waters.

11. PROJECTS BEING IMPLEMENTED AND IMPLEMENTED, LOCATED IN THE AREA WHERE THE PROJECT IS PLANNED TO BE IMPLEMENTED AND IN THE AREA OF IMPACT OF THE PROJECT OR WHOSE IMPACTS FALL WITHIN THE AREA OF IMPACT OF THE PLANNED PROJECT - TO THE EXTENT THAT THEIR IMPACTS MAY LEAD TO THE ACCUMULATION OF IMPACTS WITH THE PLANNED PROJECT

Due to the long distance, the cumulative impact with other port and industrial areas in Świnoujście will be insignificant. The impact of the planned hydrotechnical installation, in the event of overlap between the schedule of works and the period of construction of the Container Terminal, will be cumulative primarily with the impact related to the implementation of works in the marine environment. This impact will mainly concern the impact on the state of air pollution and acoustic impact. It is also possible to cumulate with works related to the construction of a new approach track to the Outer Port in Świnoujście, about 75 km long and 17 m deep. The main impacts will be related to the emission of pollutants into the air during the operation of dredgers and the spread of slurry.

At the stage of operation of the planned investment, the LNG Terminal, the Container Terminal and the approach track, the possibility of significant cumulative and cross-border impacts is also not anticipated. The planned new approach track to the Outer Port runs about 4 km to the west and north. Ship traffic only at the port entrance will be of the greatest importance for potential cumulative and cross-border impacts.

A separate issue is the indirect impact of the project, consisting in the movement of ships from and to the island on shipping routes. Currently, nearly 6500 ships call at the seaports in Szczecin and Świnoujście every year. The planned traffic of ships related to the exploitation of the deposit is about 2 vessels (smaller) per day (14 per week, 780 vessels per year). On the other hand, there are about 1900 to 2400 ships per day on the entire Baltic Sea (not including ferries, smaller fishing boats and recreational boats). In relation to this number, a few ships sailing from or to the installation will represent an increase in traffic volume in the Baltic Sea of about 0.3%. Based on the above data, it can be concluded that the exploitation of the deposit will not significantly change the traffic volume on the Baltic shipping routes and therefore will not cause cross-border impact related to ship traffic.

12. DEMOLITION WORKS CONCERNING PROJECTS THAT MAY HAVE A SIGNIFICANT IMPACT ON THE ENVIRONMENT

Drilling works will be carried out in the maritime area. Therefore, at this stage of drilling, it is not anticipated that it is necessary to carry out any demolition works, including, in particular, demolition works concerning projects that may have a significant impact on the environment, which would involve the generation of waste.

After the deposit is depleted, until the further exploitation of the deposit is no longer economically viable, it is expected that all facilities will be completely decommissioned. In the first place, all pipelines and other installations located outside the artificial island, such as emergency gas combustion installations with a transmission pipeline, will be dismantled and removed using tugs. Subsequently, the exploitation and injection wells will be permanently liquidated, and the drilling equipment with all the instrumentation will be dismantled and removed. The next step will be to dismantle and remove the main technological systems located on the platform using tugboats and sea cranes.

At the final stage, if no other possibility of commercial or non-commercial use of the island is identified, its physical liquidation will be carried out. At this stage, all the removed soil will be analysed for possible contaminants and then handed over for disposal or management in accordance with the applicable regulations. Resources left in the deposit after the end of exploitation will not require special protection.

After the end of operation and decommissioning of underwater and terrestrial production infrastructure, land reclamation will not be required due to operations in offshore areas. The area will be made available again for shipping and fishing.