Environmental and Social Impact Assessment, Non-Technical Summary

Dan E Well (DE01 & DE02) Temporary Abandonment Project, Denmark

13 June 2023

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1. PRESENTATION OF THE PROJECT AND THE PROPONENT

TotalEnergies EP Danmark A/S (TEPDK) plans to temporarily abandon wells DE-01 and DE-02 due to technical safety concerns coming from the hazards identified during the initial risk assessment (TEPDK, 2023f). The Dan E (Dan “Echo”) platform is an unmanned, six slot wellhead platform that was in service from 1977 to 2018. The platform has been shut down since 2018 and has no power supply.

TEPDK, an affiliate company of TotalEnergies, has successfully explored, developed, and produced oil and gas in the Danish North Sea for more than 50 years, and is fully committed to developing the Danish North Sea resources. TEPDK provides 26,000 jobs directly and indirectly, contributes to state revenue, and provides energy security in Denmark today and will do so for decades to come.

In 2018, TEPDK acquired Maersk Oil, including the Sole Concession and the role as operator in the Danish Underground Consortium (DUC). The DUC is a joint venture involving TotalEnergies (43,2%), BlueNord (formerly Noreco) (36,8%) and Nordsøfonden (20%). The companies work together to produce oil and gas from the Sole Concession area in the Danish part of the North Sea. Today, DUC accounts for the largest share by far of Danish oil and gas production and owns key parts of the infrastructure for all activity in the Danish section of the North Sea. The DUC is responsible for 85% of the oil and 97% of the gas production in Denmark.

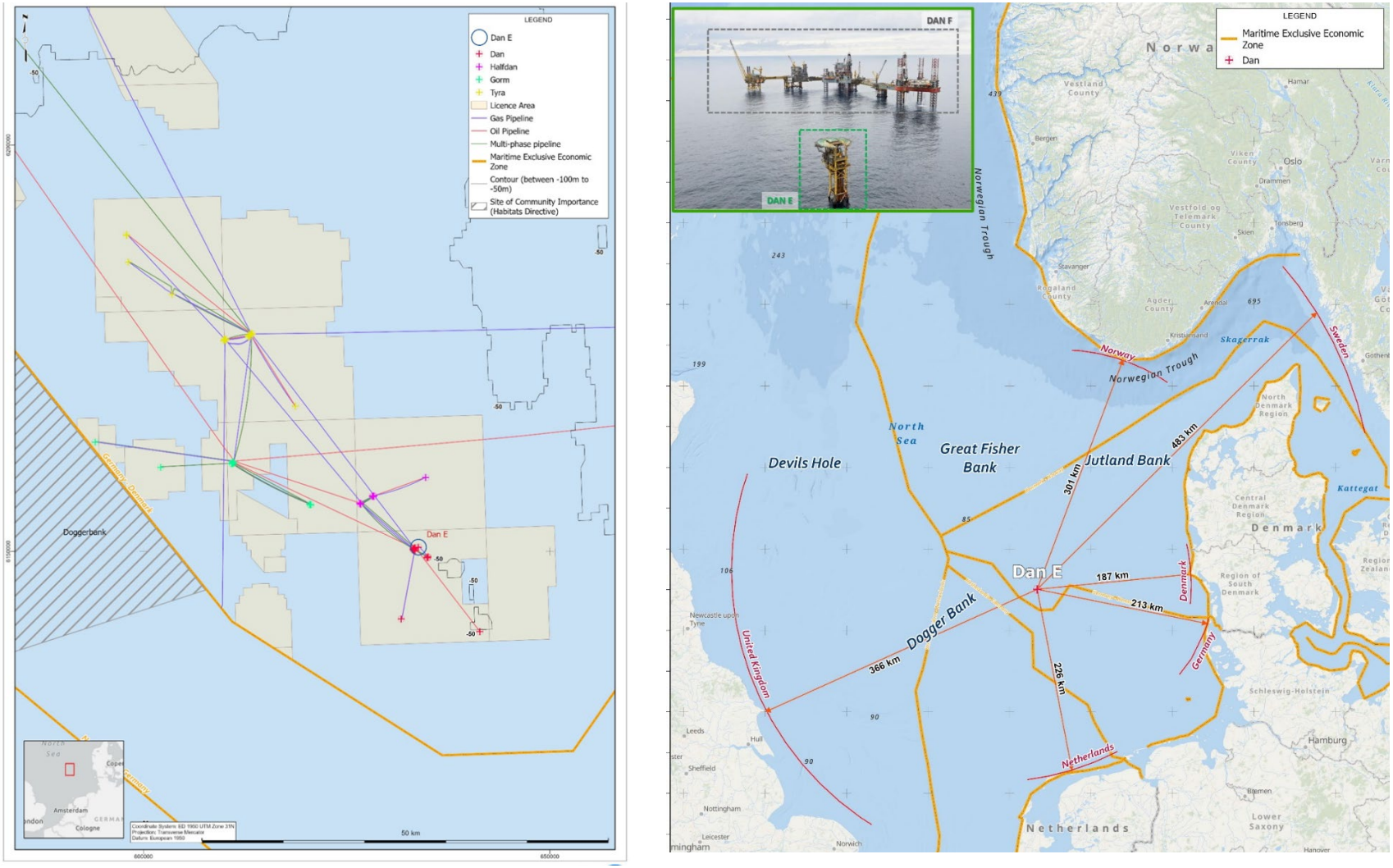
As Denmark’s leading oil and gas company, TEPDK operates 16 fields comprising 50 offshore installations and five main manned installations (hubs). It is a diverse and multinational team of more than 1,400 people, of which approximately 450 work offshore. TEPDK’s Esbjerg facilities control most of the operational activities in the Danish North Sea.

TEPDK prepared the Environmental and Social Impact Assessment (ESIA) report to assess the environmental and social impacts due to the temporary abandonment activities in line with Danish regulations. The project is hereinafter presented as DEWTA project (“*Dan E Well (DE01 & DE02) Temporary Abandonment Project*”). This document presents the Non-technical Summary (NTS) of the ESIA report (ERM, 2023a) prepared as part of the environmental approval process being undertaken for the proposed project activities.

Dan E is in the southern part of the Danish sector of the North Sea, approximately 210 km west of Esbjerg and 185 km from the Danish coastline. The DAN Field is in the Danish EEZ, approximately 20 km from Germany’s EEZ border (Figure 1.1). The existing components at the DAN Field comprise the Dan F facilities, Dan B, Dan E, Kraka and the decommissioned subsea wellhead Regnar. The production facilities are connected by subsea pipelines, through which oil, gas and water are transported. Dan E is a wellhead platform (Figure 1.1) and the location of the DEWTA project activities.

The proposed activities are to temporarily abandon 2 wells, named DE-01 and DE-02, at the Dan E platform. Wells will, at some unspecified future time, be permanently abandoned. The DEWTA project is expected to start in Q4 2023 and can be described in two phases: the first phase is the “Mobilization. In this phase the jack-up rig is mobilized and towed close to Dan E. Once in position the second phase “Well Temporary Abandonment” will start, where the rig is skidded over each well to temporarily abandon it. The estimated project duration is 99 days.

Figure 1.1 DAN License Area and Dan E Location



Source: ERM, 2023

The following scheme presents the key elements of the ESIA process and NTS.

The ESIA Process

- **Offshore exploration and production of oil and gas in Denmark** are activities requiring **DEA approval** through an ESIA. This requirement is set forth in the EIA Directive 2011/92/EU which is implemented in Danish legislation through the 'Subsoil Act', the 'Environmental Impact Assessment (EIA) Act' and the 'Ordinance on the administration of international nature protection areas and the protection of certain species by feasibility studies, exploration and extraction of hydrocarbons, storage in the subsoil, pipelines, etc. offshore'.

- The **purpose of the ESIA report** is to ensure that the environment is given full and proper consideration in the decision-making process with respect to potential activities having possible negative and positive consequences on the environment. The ESIA report is used to **predict, identify, assess, avoid, minimize, restore, and offset all the possible impacts** of the planned activities and accidental events, so that environmental considerations can inform and be integrated into project decisions. It helps to select the best practicable location, layout, design, phasing, technologies, and products, to manage the impacts from activities and anticipate environmental restoration and offsetting, when needed.

- The ESIA report draws on primary **baseline data** and data obtained from **secondary sources,** and provides recommendations (captured in an **Environmental and Social Management Plan and Commitments Register**) on **measures to mitigate impacts** identified to be potentially significant to sensitive receptors in the area and to **reduce environmental impacts and manage associated risks**.

The Non-Technical Summary (NTS)

- A **non-technical summary (NTS)** is a concise document that describes the EIA process and its findings in a manner that is easily understood by the general public.

- The NTS **improves public access to environmental information** in compliance with the **EIA Directive.**

- It provides a **description of the project**, a description of the **measures** envisaged in to **avoid, reduce and remedy** significant **adverse effects**, the **data** required to **identify and assess** the main **effects** which the project may have on the environment and an **outline of the main project alternatives.**

The DEWTA project ESIA concludes that significant direct, indirect or cumulative adverse environmental and social impacts are unlikely because of the localised and temporary nature of potential impacts due to the project activities, the outcomes of the oil spill modelling for unplanned accidental events, and the relatively large distances between the project area and the land and sea borders of neighbouring countries. The ESIA also assessed there to be no significant impacts on the descriptors of the European Union Marine Strategy Framework Directive, on Natura 2000 sites and their designated features (habitats and species) or on other natural protected areas. Furthermore, no transboundary environmental impacts due to the project's planned and unplanned activities are expected.

2. PROJECT DESCRIPTION

2.1 Summary of Project Activities

The temporary abandonment main activities are:

- well cleaning (flushing), where seawater (with additives to inhibit corrosion) will be used to clean the wells;
- removal of the existing casing (milling), where the inner string will be removed from both wells; and
- well plugging, where 3 cement plugs are placed in the well to isolate the reservoir fluids (water, gas, oil) from the surface.

The main environmental impacts from the project activities are due to emissions and discharges during mobilization and the temporary abandonment process (e.g. water-based mud (WBM) and chemicals used for casing removal, use of seawater to flush the well and used cement from plugging the wells). All chemicals expected to be used for the project activities are classified as “green” or “yellow” by OSPAR. These chemicals can be discharged to the sea with a permit that TEPDK has in place and which is renewed each year with a dedicated application to the competent authorities.

The following section presents a more detailed description of the DEWTA Project activities.

Mobilization of the Jack-Up Rig

- The wells DE-01 and DE-02 will be temporary abandoned with a jack-up rig (photograph on the right). A typical jack-up rig consists of a buoyant steel hull with three lattice legs along which the hull can be 'jacked' up and down.
- Once the rig is in position, it will be positioned over each well. The temporary abandonment of one well is expected to last 45 days. The total estimated project period is 99 days.

Well Flushing

- Inhibited seawater (seawater containing oxygen, H_2S scavengers and corrosion inhibitors) will be used to flush / bull head contents into the reservoir. Once the well contents have been bullheaded into the reservoir, clean inhibited seawater will be circulated in the well.
- Approximately 1,800 bbl may be used to flush each well, i.e., up to approximately 3,600 bbl of inhibited seawater will be discharged.
- Any water returns in the closed system will be sampled using a centrifugal tester and any fluid with a hydrocarbon concentration above 30 mg/l will be contained and returned to shore for treatment and disposal. Any fluids with a hydrocarbon concentration below 30 mg/l will be discharged according to applicable regulations.

Casing Milling

- Milling is the cutting or removal of material from equipment or tools located in the well bore (the existing wells). For the temporary abandonment of DE-01 and DE-02, the casing in each well will be milled before setting the cement plugs.
- Approximately 2,100 mT of water-based mud (WBM) will be used during the operations for the two wells.
- The milled solids (swarf, small bits of material from the existing equipment or tools) will be removed from the WBM and retained and returned to shore for processing and disposal, i.e., WBMs and swarf will not be discharged. About 10% of WBM, as a conservative case scenario (210 mT), is considered to be discharged into the sea. The discharged WBM will not contain any swarfs or oil.

Well Plugging - Cement Plugs

- Approximately 130.4 mT of cement slurry and cement spacer may be used during the plugging of each well.
- Before cementing activities occur, the cement volume likely to be required for each unique well is calculated based on the well dimensions.
- The specific cement volume is then mixed from raw ingredients on the rig, all of which would be on the approved list of chemicals for TEPDK´s drilling and wells activities, in line with the OSPAR convention.
- All cement mixed is planned to be pumped and the design of the well is planned to accommodate this. However, based on TEPDK's experience, less than 20% of used cement (49.7 mT) may be discharged to the environment at the sea surface due to any excess cement that remains inside the surface lines and needs to be removed before it becomes solid and damages the equipment or any excess cement in the well that comes out as part of normal circulation.
- Unmixed raw ingredients, not used during the well activities, are retained on the rig and are returned to shore. TEPDK does not and has never intended to 'dump' unused cement as part of the proposed project. Dumping is not in line with TEPDK and TotalEnergies' internal procedures and policies.

2.2 Summary of Discharges and Emissions

Expected planned emissions and discharges from the DEWTA project include:

- Generation of underwater noise, emissions to air and liquid discharges (e.g. drainage, bilge, sewage) from the jack-up rig and project vessels;
- Discharge of inhibited seawater (seawater containing oxygen and H_2S scavengers, and corrosion inhibitors) from the well flushing during temporary abandonment activities;
- Discharge of used cement (Class G cement with additives) from the well plugging during temporary abandonment activities;
- Waste from casing removal and milling activities. WBM and swarf from milling will be retained and returned to shore for processing and disposal, i.e., WBMs and swarf will not be discharged under normal operations. However, discharge into the environment of about 10% of WBM is considered as a conservative case scenario.

The principal emissions to air from all phases of the DEWTA project will be exhaust emissions from power generation on the jack-up rig. Support vessels and helicopters will be also used to support logistics and material supply. Diesel oil or marine gas oil (MGO) will be used as fuel for all vessels and the jack-up rig causing primarily carbon dioxide (CO_2), sulphur oxides (SO_x), nitrogen oxides (NO_x) and carbon monoxide (CO) emissions. Smaller quantities of non-methane volatile organic compounds (VOCs), methane (CH_4) and particulate matter (PM_{10} / $PM_{2.5}$) will also be released. These emissions are released during the normal operation of a marine vessel and have the potential to cause a short-term, localized increase in pollutant concentrations. They also contribute to regional and global atmospheric pollution. All project vessel emissions will comply with requirements in the revised MARPOL Annex VI Prevention of Air Pollution from Ships, requiring that the global sulphur limit will be reduced from 3.5% to 0.5%, effective from 1 January 2020. The limits applicable in the North Sea Emission Control Area (ECA) for SOx and particulate matter is reduced to 0.10%, from 1 January 2015.

In 2022, TEPDK undertook a Green House Gas (GHG) emission calculation for similar activities and timeframes as those of the DEWTA project. An overall GHG emission value of 6 kt CO_2eq (kilo tons of carbon dioxide equivalent) was estimated considering the emissions from routine activities as part of drilling operations for 3.5 months, such as the mobilization and operation of a jack-up rig and support/supply vessels and helicopters, and the power generation on the jack-up rig (TEPDK, 2022).

Based on this calculation and its similarity with the DEWTA project, GHG emissions for the two DEWTA project phases are estimated to be approximately 6 kt CO_2eq. TEPDK also calculated the GHG emissions at the DAN field facilities for 2022. Drilling and related logistics activities accounted for approximately 8.5 kt CO_2eq (TEPDK, 2023). TEPDK carried out 118 days[1] of work overs[2] at the DAN E field. Danish CO_2 total emissions in 2020 accounted for 45.83 Mt CO_2eq. (EEA, 2022). Emissions from the DEWTA project activities are estimated to represent approximately 0.01% of annual emissions for Denmark in 2020.

The main source of underwater noise associated with the project is from the jack-up rig and project vessels. The DEWTA project does not involve the use of high intensity and impulsive underwater noise sources.

A summary of the discharges to sea during DEWTA project activities is described in Table 2.1. MARPOL is the International Convention for the Prevention of Pollution from Ships: all vessels and the jack-up rig used for the DEWTA project will comply with the international requirements stated in the MARPOL annexes for the prevention of air pollution from ships (Annex IV) and MARPOL 73/78 on waste management, oil contaminated water discharges (e.g., bilge water), and grey and black wastewater discharges.

Table 2.1 Discharges to Sea during Project Activities

Source	Treatment	Volume (Mobilization Phase)	Volume (Well Temporary Abandonment Phase)	Limit	Standard
Inhibited seawater	No treatment required.	Not planned.	Up to 3 mT (100% of chemicals used for inhibited seawater)	N/A	DEPA permit
Used cement	The cement is diluted, or additives are added to prevent hardening of the cement.	Not planned.	Up to 49.7 mT (less than 20% of chemicals used for cementing)	N/A	DEPA permit
Water Based Mud (WBM)	Milled solids (swarf) will be removed from the WBM.	Not planned	Discharge not planned and only as a conservative case scenario of up to 210 mT (10% of chemicals used for WBM)	N/A	DEPA permit
Black water (sewage)	Treat with approved marine sanitation unit. Maceration and chlorination.	~18,000 l (Estimated 100 l/ person / day)	~965.000 l (Estimated 100 l/ person / day)	■ Achieves no floating solids ■ No discoloration of surrounding water ■ <1 mg/l chlorine concentration	MARPOL Annex IV
Grey water	Remove floating solids	~39,600 l (Estimated 220 l/ person / day)	~2,161,000 l (Estimated 220 l/ person / day)	■ No visible floating solids or discoloration of surrounding water	MARPOL Annex IV

[1] wells_february_2022_january_2023.xlsx (live.com)

[2] Workovers are a type of well intervention involving maintenance, repairs or modifications on an existing well to improve its production or operational performance.

Source	Treatment	Volume (Mobilization Phase)	Volume (Well Temporary Abandonment Phase)	Limit	Standard
Bilge water	Oil-water separation	Volume not available*	Volume Not available*	■ 15 mg/l of oil	MARPOL 73/78 Annex I
Storage displacement water (ballast water)	Oil-water separation	Volume not available*	Volume not available*	■ 15 mg/l of oil ■ Ballast exchange at least 200 nautical miles from the nearest land in >200 m deep water	MARPOL 73/78 Annex I BWM Convention
Deck drainage	Oil-water separation	Volume not available**	Volume not available**	■ No free oil (Free oil is characterized by droplet sizes greater than 150 µ ■ 15 mg/l of oil instantaneous reading oil water threshold	MARPOL 73/78 Annex I

Note:
* the volume depends on vessel specifications and working conditions
** the volume depends on vessel specifications, working and metocean conditions

2.3 Project Alternatives

The “No-Go” (or “zero alternative”) is a projection of the anticipated future development without project realisation and describes the potential result if nothing is undertaken. Future production from the Dan E platform is unlikely; all wells have been shut in since 2018. The wells are deteriorating; therefore they are unlikely to be used for reinjection. Furthermore, the platform itself is in a dilapidated condition and is currently being maintained to enable the temporary abandonment scope of work to be executed. Future development of Dan E is unlikely with the current condition of the platform and wells. Safety requirements and the outcomes of TEPDK risk assessment show that a “No-Go” alternative is unfeasible.

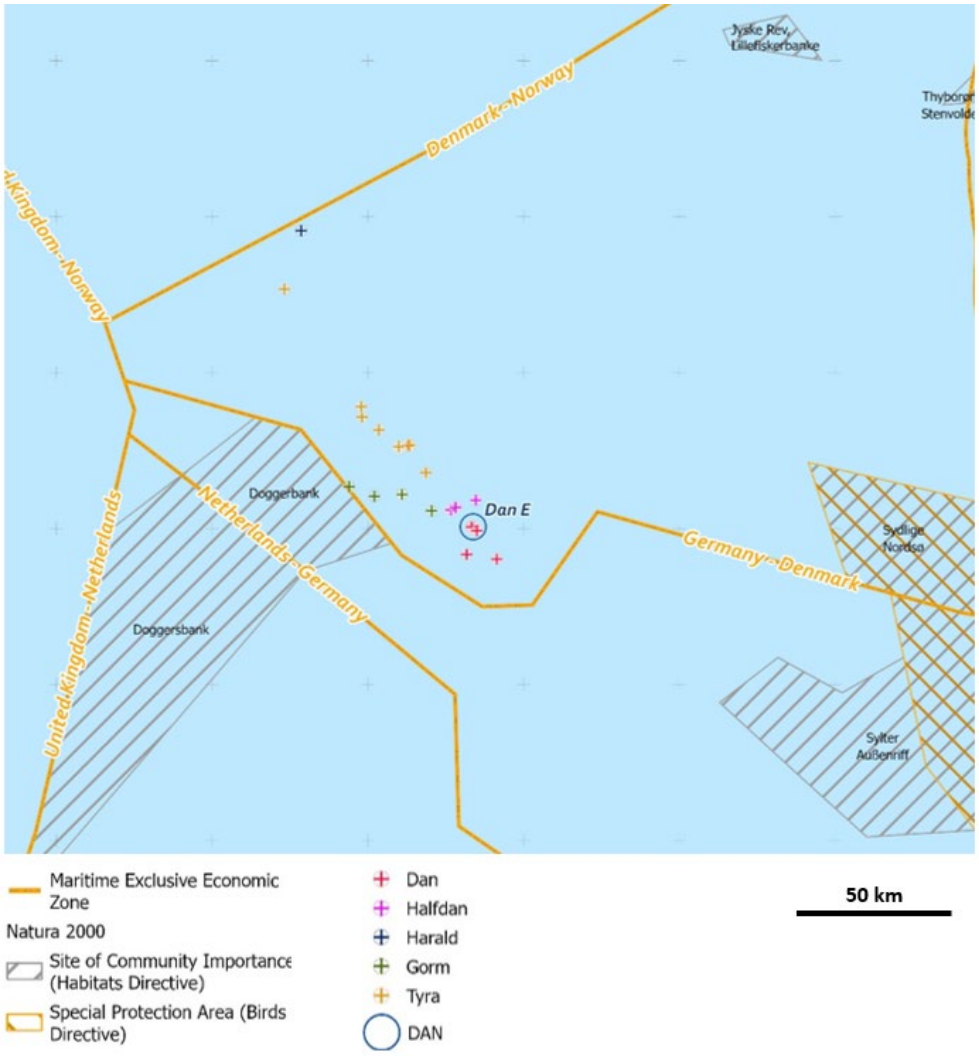
Alternatively to milling, the Perforate, Wash and Cement (PWC) technology might be used. The PWC technology is an efficient method that could be used as a contingency case in situations where the wellbore barrier needs to be placed across a section of uncemented casing. PWC involves a perforation gun run to the barrier depth (of approximately 3,400 ft true vertical depth in this case) where there is no cement or poor cement behind casing. When performing PWC, a minor amount of additional cement is required than an internal plug as the outer annular also needs to be cemented, usually equating up to 10 mT more cement than a standard cement job. The additional discharge of cementing chemicals for the PWC technology is 1.7 mT (51.4 mT) in comparison to cementing for casing milling (49.7 mT). Associated potential environmental impacts are similar to those associated with the milling technique.

3. BASELINE CHARACTERISTICS: DESCRIPTION OF THE EXISTING ENVIRONMENT

3.1 The Physical and Biological Environment

Dan E is in the south of the Danish North Sea with coasts more than 185 km from the wellhead platform. There are no protected or internationally recognized areas within the DEWTA project area. The closest Natura 2000 conversation site is 26.9 km to the west of the DEWTA project area, in the German EEZ (Figure 3.1). This area is named Doggerbank SAC (site code DE1003301).

Figure 3.1 Natura 2000 Conservation Sites Near the DEWTA Project Area



Source: EEA, 2023. Prepared by ERM, 2023.

The natural environment associated with the DEWTA project area is representative of the North Sea system. The Danish region of the North Sea is generally characterized by a mixture of fine-grain sediment types (<2 mm in diameter, Ø grain size) consisting of sand, muddy sand and fine mud in offshore areas, with smaller patches of coarse and larger grained sediment deposits (>2 mm - 4 mm Ø) in the northern and eastern regions of the Danish Exclusive Economic Zone (EEZ). The DAN Field area is characterized by sand and fine muds.

The water depth in the DAN Field is about 45 m. It is highly unlikely that macrophytes (macroalgae and higher plants) grow due to a lack of light at this depth. The benthic fauna consists of epifauna and infauna (i.e., organisms living on or in the seabed, respectively) such as crustaceans, molluscs, annelids, echinoderms. Figure 4.20 shows the benthic fauna assemblages in the North Sea and across the DEWTA project area based on Künitzer et al. (1992). Benthic fauna assemblages are classified using the TWINSPAN classification (I-II-III-IV). The DEWTA project area is surrounded by class IIa, defined as “muddy fine sand” and whose indicator species are bivalve *Nucula nitidosa* and crustaceans *Callianassa subterranea* and *Eudorella truncatula*.

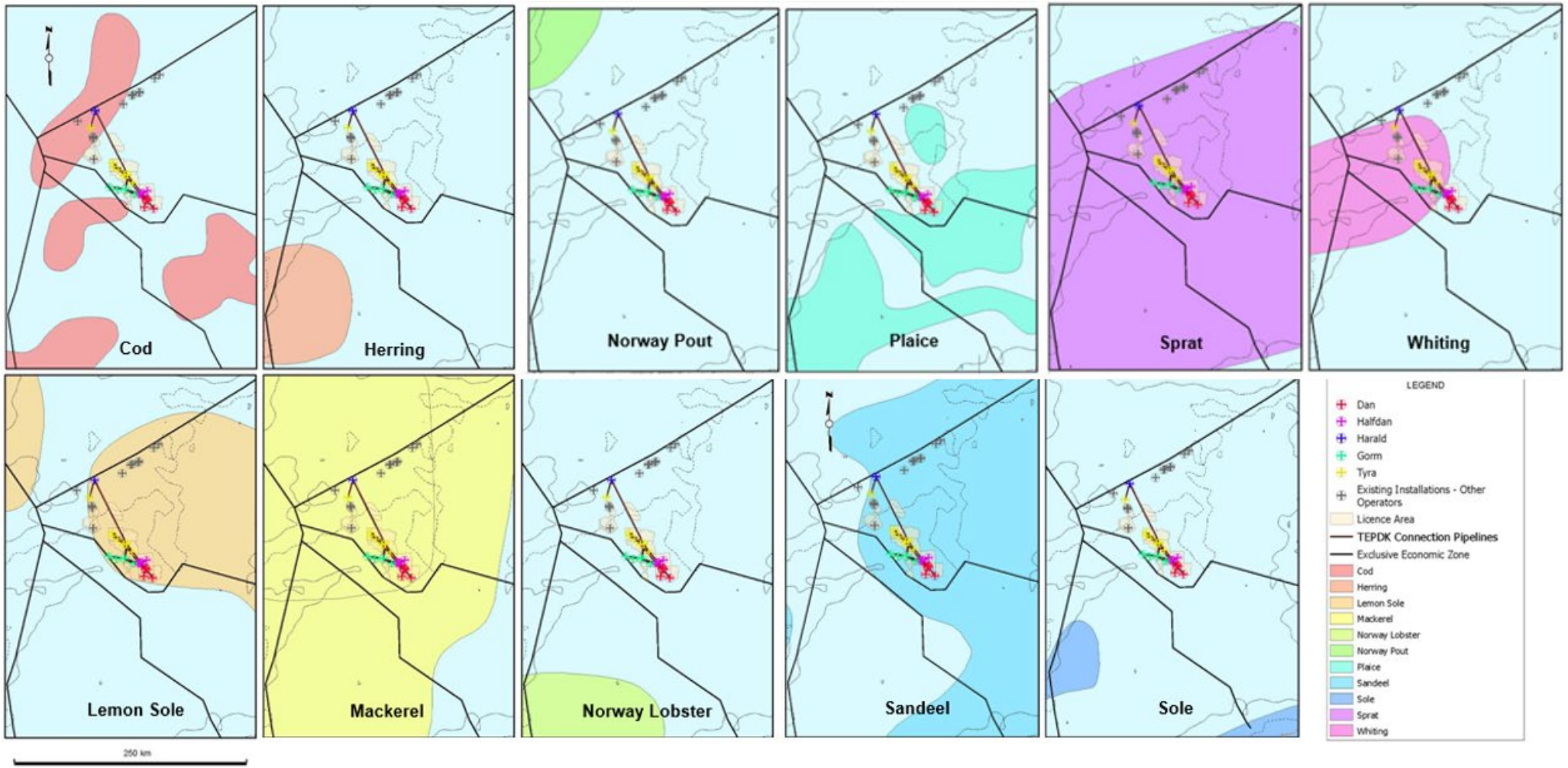
No benthic species on the IUCN Red List of Threatened Species (IUCN Red List) have been identified near the DEWTA project area. The DEWTA project area is in the Central North Sea, where the dominant surface circulation is eastward, and the undercurrent flows in a south-westerly direction.

Air quality in the North Sea has improved considerably since the introduction of a limit on SO_2 emissions from vessels in the North and Baltic Sea, and English Channel. Air quality in the DEWTA project area is not influenced by any onshore stationary anthropogenic sources of airborne pollution, as the DEWTA project area is approximately 210 km west of Esbjerg. Marine traffic and the existing offshore oil and gas activities provide point sources of atmospheric pollution in the North Sea.

In the DEWTA project area, pinniped species include the grey seal and harbour seal. The resident cetacean species present in the DEWTA project area are minke whale, harbour porpoise and white-beaked dolphin, which are typical species of the North Sea. Less common species include short-beaked common dolphin, Atlantic white-sided dolphin, long-finned pilot whale, orca and Risso’s dolphin (Waggitt et al., 2019). According to Waggitt et al. (2019), the harbour porpoise and white-beaked dolphin show the highest population density in the central and southern North Sea compared to other marine mammals, which inhabit waters further north past Northern Scotland and the Atlantic.

The North Sea, including the DEWTA project area, has areas important for the life cycle of important commercial fish species. Fish species of commercial significance that spawn at or close to the DEWTA project area include lemon sole, mackerel, plaice, sandeel, sprat, and whiting (Figure 3.2).

Figure 3.2 Spawning Grounds for Key Commercial Fish Species



Source: Worsøe et al., 2002. Prepared by ERM, 2023.

There are currently seven locations in Denmark that are on UNESCO's World Heritage List. The Wadden Sea Natural Park is the only coastal cultural heritage site of significance in West Jutland. The Wadden Sea is the world's largest unbroken intertidal sand and mud flats, encompassing a multitude of transitional zones between the land, sea, and freshwater environments. The park contains dunes, tides, marshlands, mudflats, nature and game reserves, and a unique wildlife. In addition to being a UNESCO World Heritage site, this is Denmark's largest national park and one of the world's most important wetlands.

The coastlines of the North Sea are a habitat for seabirds that inhabit estuaries, rocky coasts and cliffs. The waters of the North Sea are used for feeding by coastal birds and winter migratory species from the north and east. Only two species are listed as of concern under IUCN designation near the project activities; the northern fulmar (endangered), and the black-legged kittiwake (vulnerable).

3.2 The Human Environment

3.2.1 The Oil and Gas and Renewables Industries

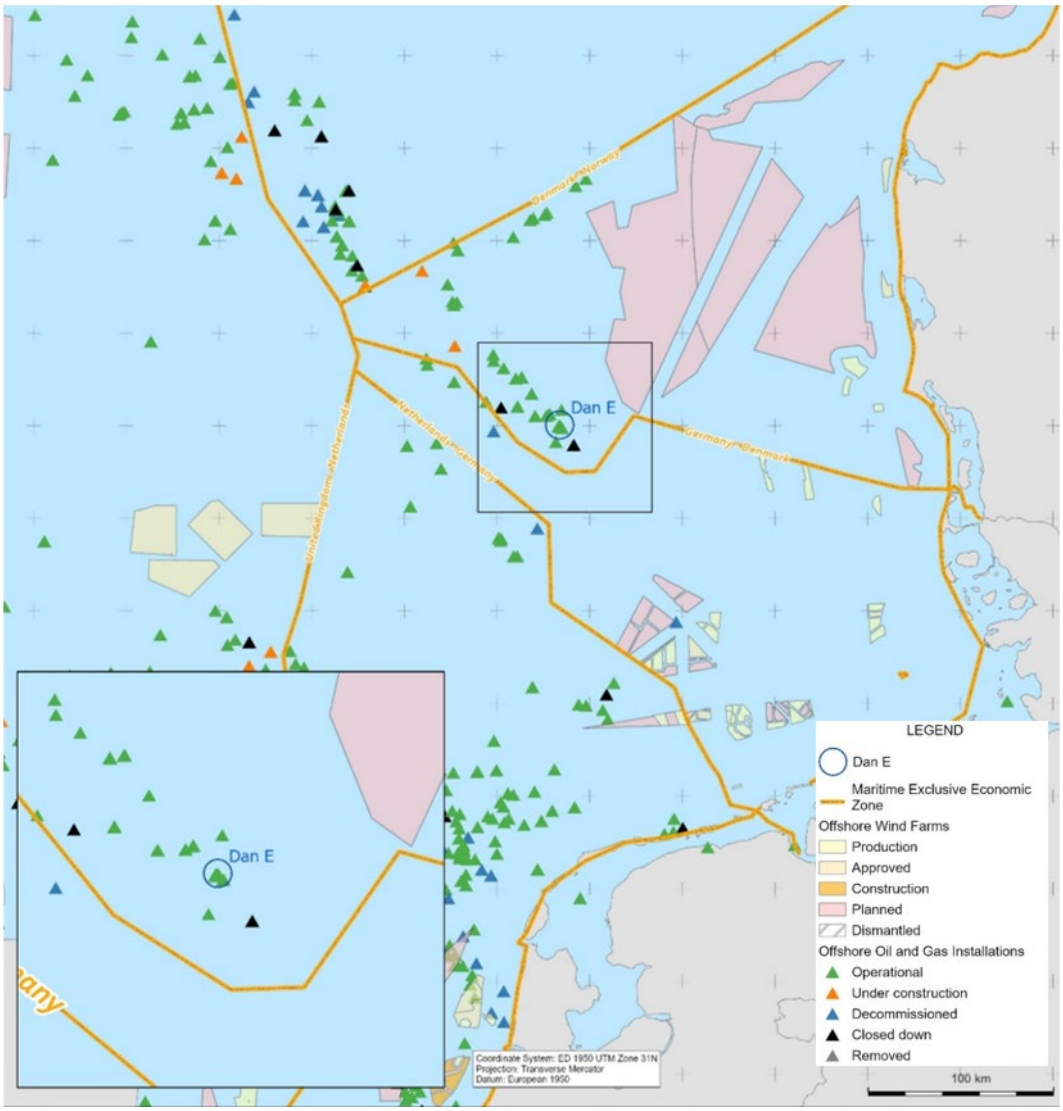
In 2017, the committee for the development of an oil and gas strategy for Denmark found that oil and gas production in the Danish part of the North Sea has been, and still is, one of the most essential financial contributors to Danish society. The production forecasts show that in the future, production in the Danish part of the North Sea has the potential to increase by 20 million m^3 which is equivalent to 70 billion Danish krone. The primary contributions are taxes and dues, trade balance and energy security, and indirect impacts such as employment in related industries.

Denmark makes use of marine spatial planning which organises the use of ocean space and interactions among human uses (i.e. fisheries, aquaculture, shipping, tourism, and energy production) with the marine environment. Primary maritime uses are for fisheries and aquaculture, submarine cables and pipelines, mineral extraction, oil and gas extraction, military activities, shipping, tourism, offshore renewable energy production and nature conservation. Denmark's marine waters encompass 105,000 km^2.

The largest employment sectors by November 2021 were the public sector, the trade and transport sector, and the industry and manufacturing, mining and quarrying sector – the latest including the oil and gas sector (Statistics Denmark, 2023). The oil and gas sector is a minor sector in terms of employment. Dansk Offshore (formerly Oil & Gas Denmark), the branch organisation for the Danish upstream gas and oil sector, estimated that there are currently 26,000 direct and indirect jobs in the industry, of which 10,000 are full time. This represents less than 1% of the total national employment, which accounts for around 3 million jobs (Sperling et al., 2021).

The DEWTA project area does not overlap with other offshore energy installations and license areas. There are no offshore wind farms within the DEWTA project area; the closest operational turbines are within the Sandbanks wind farm in the German North Sea at more than 100 km south-east of the Dan E platform (Figure 3.3).

Figure 3.3 Offshore Wind Farm and Oil and Gas Activities in the North Sea



Source: EMODnet, 2023. Prepared by ERM, 2023.

3.2.2 The Fishing and Shipping Industries

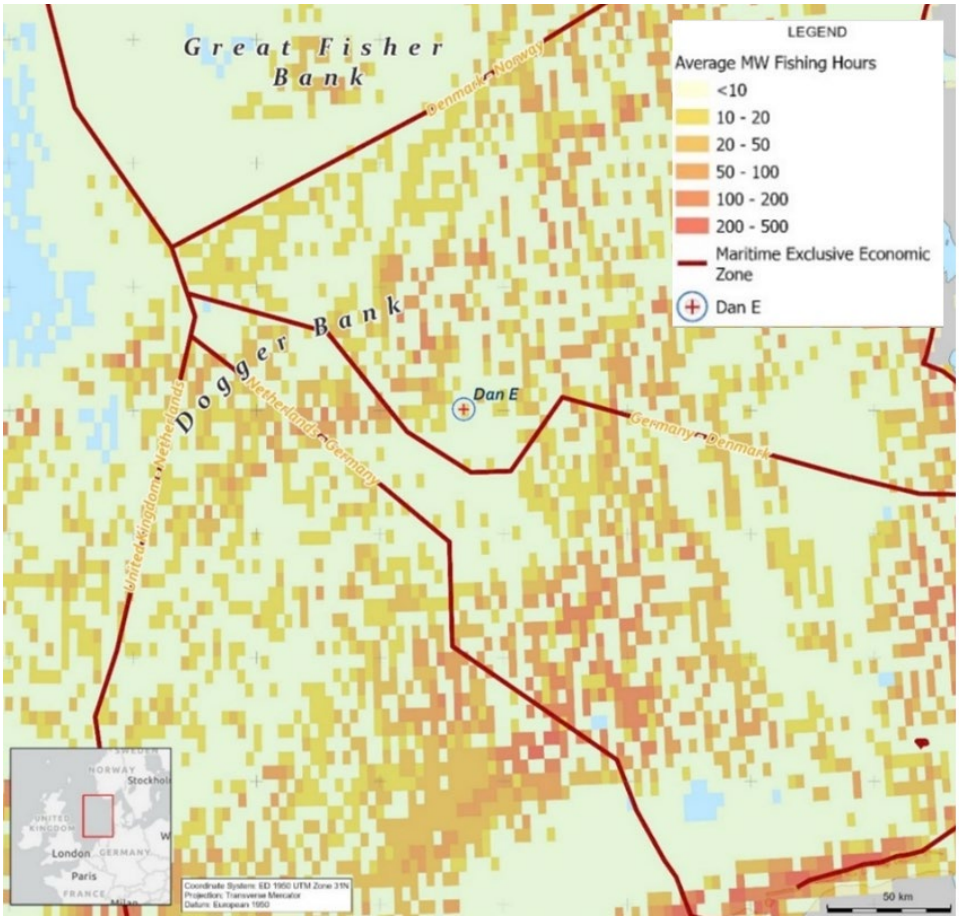
Fishing is an important industry in the North Sea according to ICES (2022c). Around 6,600 vessels from nine nations operate in the Greater North Sea, with the largest numbers coming from the UK, Norway, Denmark, the Netherlands and France. Total landings peaked in the early 1970s and have since declined. ICES (2022) reports that the Danish fleet in 2019 had 717 vessels operating in the Greater North Sea, representing around half of the entire Danish fleet (1,560 vessels). The size of the fleet has been generally decreasing over the last decade. The most dominant fleets are the demersal trawlers. The most important demersal fisheries target cod, plaice, saithe, northern shrimp and Nephrops using predominantly bottom trawls with some seine activity. The most important pelagic fisheries target herring and mackerel for human consumption, and sandeel, sprat, and Norway pout for reduction purposes (i.e. fish meal and oils).

According to Eurofish (2021), the fishing industry plays significant role in the Danish economy. Fisheries constitute a very important economic activity in specific regions, e.g., in western and northern Jutland and on the island of Bornholm in the Baltic Sea.

EMODnet (2023) published datasets on fishing intensity in the EU waters. It was created in 2021 by the International Council for the Exploration of the Sea (ICES). Fisheries overview data concern the

spatial distribution of average annual fishing effort (mW fishing hours) by ecoregion and gear type (e.g., beam trawls, bottom otter trawls, bottom seines, dredges, pelagic trawls and seines and static gear, when available). Fishing effort data are only shown for vessels >12 m long having vessel monitoring systems (VMS). Fishing efforts near the DEWTA project area are less intense but are constant over the year (Figure 3.4).

Figure 3.4 Fishing Efforts in the North Sea (2021)



Source: EMODnet, 2023. Prepared by ERM, 2023

The North Sea is currently, and has been historically, a sea with intense use and activity. Traditionally mainly used for fishing and shipping, other sea-based activities have progressively increased such as offshore wind farms, aquaculture, marine protected areas and pipelines.

The ESIA presents vessel traffic maps for January and July 2022 from Automatic Identification System (AIS) data in density map format. The density has been calculated based on the number of signals per grid point and shows that coastal and port areas represent a much higher density of ships. The DEWTA project area shows a lower concentration in the winter than in the summer. The summer months are the busiest in all parts of the North Sea. Shipping activities occupy all areas of the North Sea, although the highest concentration of shipping activities is located along the coastal and central parts, which are trafficked by transit ships and supply vessels.

3.2.3 The Tourism Industry

No tourism takes place at the DEWTA project area. The nearest tourist sites are located along the Jutland coast and Esbjerg, more than 180 km away (Vadehavskysten, 2023; Visit Denmark, 2023).

4. IMPACT ASSESSMENT

4.1 Overview of the Method

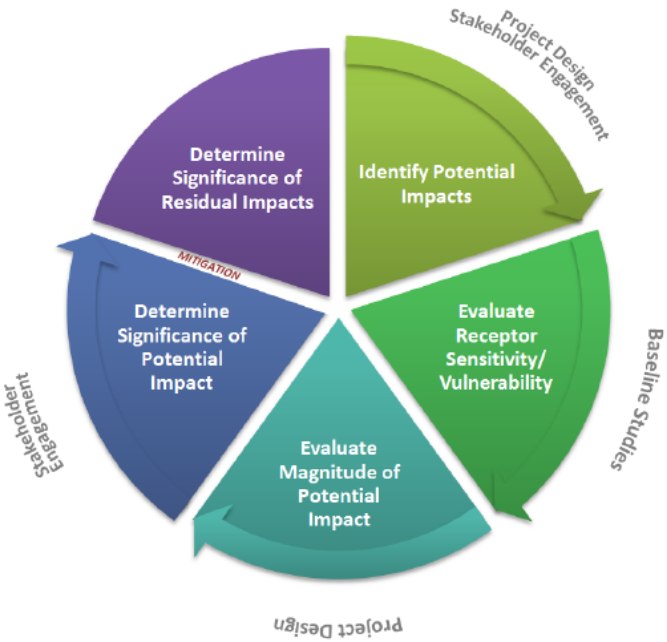
Figure 4.1 presents an overview of the impact assessment (IA) approach used in the ESIA. The ESIA identified and evaluated the potential impacts that the DEWTA project may have on the physical-biological and human environment and developed mitigation/ management measures that will be implemented to avoid, minimise or reduce negative impacts and enhance positive impacts. The main environmental impacts of the project activities can be divided into two categories: those associated with planned operations and those associated with unplanned events (e.g. oil spills). Each of the impacts associated with the two categories has been assessed according to a prescribed methodology as summarised in Figure 4.1.

Figure 4.1 Overview Impact Assessment (IA) Approach

Overview

The purpose of the impact assessment process is to identify any likely significant effects on receptors/resources as a result of impacts from a Project and develop appropriate mitigation measures to effectively manage these environmental and social effects. The process is iterative and can be summarised by the figure to the right.

The detailed impact assessment methodology that will be used complies with international best practice for impact assessment. The overarching principles of this methodology are illustrated here, but note that each ESIA topic area will have specific criteria for defining receptor sensitivity/vulnerability and impact magnitude.



Evaluation of Significance

The significance of the potential effect on receptors/resources is determined through the combined consideration of:

- **the sensitivity/vulnerability of the affected environment, and**
- **the magnitude of the potential impact.**

Note that the term **'magnitude'** is used as shorthand to encompass various possible dimensions of the predicted impact, such as:

- the nature of the change (what is affected and how);
- its size, scale or intensity;
- its geographical extent and distribution;
- its duration, frequency, reversibility ; and
- where relevant, the probability of the impact occurring as a result of accidental or unplanned events.

Magnitude of Impact	Sensitivity/Vulnerability/Importance of Receptor or Resource: Low	Medium	High
Negligible	Not Significant	Not Significant	Not Significant
Small	Not Significant	Minor	Moderate
Medium	Minor	Moderate	Major
Large	Moderate	Major	Major

There is no statutory or agreed definition of significance however, for the purposes of this assessment, the following practical definition is proposed:

An impact will be judged to be significant if, in isolation or in combination with other impacts, the effects will be a notable change from baseline conditions and may require mitigation to management environmental/social effects/risks.

Magnitude and vulnerability/sensitivity will be looked at in combination to evaluate whether an impact is significant and if so its degree of significance. The principle is illustrated here.

The impact assessment process evaluates both beneficial and adverse impacts, however the magnitude rating is only assigned for adverse impacts.

Residual Impacts/Effects

Is it still significant?

Once mitigation has been identified, a re-assessment of impacts to determine the magnitude and significance of any residual effects (after mitigation) will be undertaken.

The results will be represented in the final ESIA Report and with an explanation of how the impacts have been reduced to as low as reasonably practicable (ALARP) and why further mitigation of any remaining significant effects is not technically or financially feasible.

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Environmental and Social Impact Assessment Method

4.2 Assessment of Impacts from Planned Activities

This impact assessment has been conducted to meet TotalEnergies' guidelines for conducting ESIA processes and addresses the Environmental Assessment Regulations in Denmark and international good practice for ESIA reports, as described by the International Finance Corporation.

The ESIA report has described the DEWTA project activities with the environment and social receptors, and assessed whether these interactions could lead to a significant impact considering scientific data, modelling data, current experience from TEPDK operations in the DAN Field and proposed mitigation.

The outcome of the assessment process has identified that planned activities will have Negligible impacts before and after mitigation. Table 4.1 summarizes the significance of impacts before and after mitigation measures are implemented for planned activities and relevant issues.

Table 4.1 Summary of Impact Assessment Significance Ratings for Planned Impacts

Receptor	Impact Mechanism	Phase	Impact Significance	Residual Impact Significance (Post Mitigation)
Climate Change	Emissions of Greenhouse Gases (GHG) due to ■ jack-up rig mobilization and demobilization with support vessels, ■ power generation on rig, ■ operation of support and supply vessels (excluding mobilisation as covered with rig) and ■ helicopter support during well temporary abandonment	Mobilization and Well Temporary Abandonment	Negligible	Negligible
Seawater Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Well Temporary Abandonment	Negligible	Negligible
Seabed, Sediment Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Well Temporary Abandonment	Negligible	Negligible

4.3 Unplanned Events

An unplanned event may include a hydrocarbon spill through accidental release during extraction, handling, and storage of crude or petroleum products. All unplanned events considered to have the potential to significantly impact the environment have been risk assessed based on the likelihood and severity, and the outcome of the risk assessment is summarized in Table 4.2. After the implementation of the control and mitigation measures, the unplanned/accidental events will have a Low or Medium risk, which is considered As Low As Reasonably Practicable (ALARP).

Table 4.2 Summary of Impact Assessment Significance Ratings for Unplanned Events

Impact Source	Impact Prior to Mitigation	Residual Impact Significance (Post Mitigation)
Hydrocarbon/Chemicals Spills (minor/Tier 1)	Medium Risk	ALARP
Diesel Spills (Tier 2) from Vessel Collisions / Vessel to Vessel and Helicopter to Platform	Low Risk	ALARP
Hydrocarbon Spills (Major/Tier 3): Well Blowout	Low Risk	ALARP
Loss of Containment due to Dropped Objects	Low Risk	ALARP

ALARP stands for As Low as Reasonably Practicable. TEPDK systematically identifies and assesses all risks to which people, the environment and assets are exposed, and implements measures to eliminate or reduce such risks to ALARP.

4.4 Cumulative Impacts

There are no seismic or drilling activities associated with the DEWTA project. The temporary abandonment activities at Dan E will occur mostly before and after other TEPDK activities planned in other fields. There is no actual overlap between TEPDK projects. Those projects, that are planned to happen during DEWTA, such as a seismic survey at a field at 33km distance are expected to have no significant cumulative impact due to the distance to the DEWTA project activities.

Potential overlapping with the DAN field associated underwater noise will be limited to the 99 days of project duration. Impacts on marine mammals, fish and plankton in relation to disturbances and noise from the DAN Field and other ship traffic is expected to be short term and intermittent and therefore considered as not significant.

Overall no significant cumulative impacts are therefore expected to occur as part of the DEWTA project and no cumulative impacts will adversely affect any Annex I habitats, Annex II and IV species, bird species identified under the EU Birds Directive and Natura 2000 sites, the closest of which is 26.9 km away, (i.e., Doggerbank (DE1003301) in Germany).

4.5 Transboundary Effects

Under the Espoo Convention, concerned parties are to be informed of potential transboundary adverse significant impacts and to be provided with possibilities for making comments or objections on the proposed activity. The DEWTA project is located relatively far from the maritime boundaries (EEZ) of Germany (20 km), the Netherlands (45 km), Norway (113 km) and the UK (115 km). The Swedish maritime borders are more than 400 km from the DEWTA project.

There are no relevant anticipated transboundary impacts from the DEWTA project activities given the localised and temporary nature of the project and the distances between the project area and the land and sea borders of neighbouring countries. The only potential transboundary impacts identified are to climate change; however, there will be no significant impact from the DEWTA project activities since emissions would be negligible and short-term and will not cause significant impacts at international borders.

No other significant and predictable transboundary impacts have been identified for the proposed activities. In addition, since there are no significant cumulative impacts, there are also no significant transboundary cumulative effects.

Impacts due to unplanned/accidental major events are evaluated to be of Low Risk (Level 2) due to the very unlikely likelihood of blowout occurrence and the moderate pollution with limited environmental consequences according to TEPDK's risk matrix.

4.6 Natura 2000 and Annex IV species Assessment

As part of the provisions of the Habitats Directive 92/43/EEC, a screening assessment (Stage 1) should be undertaken to determine whether the DEWTA project activities will have a Likely Significant Effect (LSE) on any Natura 2000 sites[3]. Under Danish national legislation, the ESIA also assessed potential impacts on Habitat Directive Annex IV species (all cetacean species in this case) potentially present in the DEWTA project area and adjacent areas.

The closest Natura 2000 site to the DEWTA project area (i.e. the Doggerbank SAC, DE1003301) is 26.9 km to the west, in the German EEZ, while the rest of the sites are more than 50 km away. Given these distances and the temporary and small scale of the DEWTA project, no LSE on the qualifying features of the Natura 2000 sites (habitat and species) are expected considering the planned project activities.

Regarding potential accidental events, as a worse case, a well blowout and subsequent spill could reach surrounding Natura 2000 sites, particularly the closest one, the Doggerbank SAC. Based on the modelled well blowout scenario conducted by OSRL (2022) for a well temporary abandonment project at the Dagmar platform (approximately 33 km to the northwest), with similar characteristics as the DEWTA project, only sheens and rainbow sheens (less than 5 µm thick) would be present in neighbouring surface waters. The probability of a well blowout is very unlikely, and the overall risk associated with this event is low and within the 'acceptable risk level' of TEPDK's Risk Matrix. TEPDK holds an Oil/Chemical Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016-E) developed for managing spills from all its offshore activities and designed to limit the consequence in case of a major spill. TEPDK also has a Blowout Contingency Plan (BOCP) (TEPDK-L2-PRO-WLS-0043-E).

The DEWTA project will not cause any Likely Significant Effect on habitats and species populations for which Natura 2000 sites have been designated and on Annex IV Species; therefore, for the DEWTA it is assessed that a full Appropriate Assessment (Stage 2) is deemed as not necessary.

4.7 Marine Strategy Framework Directive

The potential impacts of the DEWTA project on the environment at a population level have been summarized and further assessed for the overall impact in accordance with the 11 descriptors and the relevant environmental targets of the Marine Strategy Framework Directive (MSFD), as defined by the Danish Marine Strategy II (Danish Ministry of Environment, 2019). The MSFD outlines eleven descriptors (Table 4.3) used to assess the good environmental status of the marine environment.

Table 4.3 MSFD Descriptors

Descriptor (D)	Indicator		Descriptor (D)	Indicator
D1	Biodiversity is maintained		**D7**	Permanent alteration of hydrographical conditions does not adversely affect the ecosystem
D2	Non-indigenous species do not adversely alter the ecosystem		**D8**	Concentrations of contaminants give no effects
D3	The population of commercial fish species is healthy		**D9**	Contaminants in seafood are below safe levels
D4	Elements of food webs ensure long-term abundance and reproduction		**D10**	Marine litter does not cause harm
D5	Eutrophication is minimised		**D11**	Introduction of energy (including underwater noise) does not adversely affect the ecosystem

[3] European Commission (2018) guidance *Managing Natura 2000 provisions of Article 6 of the Habitats Directive 92/43/EEC* and the European Commission (2021) guidance *Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.*

D6	The sea floor integrity ensures functioning of the ecosystem	

In summary, the DEWTA project has no or negligible impact on the MSFD descriptors, their environmental targets and the relevant receptors. The Project's environmental impact will not hinder the achievement or the maintenance of good environmental status for all descriptors.

The Dan E platform is approximately 29 km from the closest NOVANA program station (NOVANA is the National Programme for Monitoring the Aquatic Environment and Nature "*Det Nationale Program for Overvågning af Vandmiljøet og Naturen*" [4]). This station monitored soft-bottom fauna, hydrographic profile measurements, and nutrients and chlorophyll in water in 2017-2021. Water chemistry samples, including salinity, temperature, sight depth, chlorophyll and fluorescence, and soft-bottom fauna samples were taken in 2021(Hansen & Høgslund, 2021). The impact assessment showed that the DEWTA project activities have no significant or negligible impact on seawater quality and no significant or negligible impact on seafloor integrity. No or negligible impact of the DEWTA project activities on the NOVANA monitoring stations is likely based on the distance between the Dan E platform and the nearest monitoring station.

5. ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

The ESIA presents an outline Environmental and Social Management Plan (ESMP) that summarises the avoidance, minimisation and mitigation measures that are required to manage the DEWTA project's potential environmental and social impacts. These measures address the anticipated project-related impacts, including potential unplanned events, identified in Chapter 5 Impact Assessment and Mitigation, from the project's mobilisation and temporary abandonment activities.

The outline ESMP's overall objective is to provide a practical tool to summarize and list the minimisation and mitigation measures identified and committed to in the ESIA report.

TEPDK employees and all contractors and subcontractors throughout the supply chain for the DEWTA project activities will adhere to the applicable Danish regulatory framework presented in the ESIA and to the principles and standards set in the TEPDK Health, Safety and Environmental (HSE) Policy (TEPDK, 2023d).

The outline ESMP will be incorporated into the TEPDK Environmental Management System. TEPDK will also integrate the DEWTA project into existing plans. TEPDK has several management system plans that have already been created and are relevant to the DEWTA project. These plans that are currently being followed at other facilities, will be followed during DEWTA project development. The management systems detailed in the ESIA address different topics such as Stakeholder and Local Content, Operational Controls (including chemical and waste management), Emergency Preparedness & Response (Emergency Management Procedure, Oil/Chemical Spill Contingency Plan, Blowout Contingency Plan (BOCP)), Contractor Management, Air Emissions, Competency and Training, Audits and Non-compliances.

The DEWTA project's main control and mitigation measures are summarized in Table 5.1.

[4] https://novana.au.dk/

Table 5.1 Summary of the Control and Mitigation Measure Implemented by TEPDK for the DEWTA Project

Activity	Source of Impact	Control/ Mitigation Measures
Phase 1: Rig Mobilization Phase 2: Wells temporary abandonment	GHG emissions due to: ■ mobilization and demobilization, support vessels and jack-up rig ■ power generation on rig, ■ operation of support and supply vessels (excluding mobilisation as covered with rig) and ■ helicopter support for personnel transportation	■ Enforce all vessels of 400 gross tonnage and above involved in the project have a valid International Air Pollution Prevention (IAPP) certificate (MARPOL Annex VI/6); ■ Consider all aspects of mobilization, operation, demobilization, e.g. distance of mobilization, low consumption, environmental and safety performance; ■ Implement Manual for Emissions Monitoring CO_2, NO_X, VOC, SO_X, CH_4; ■ Implement TEPDK's General Emissions Monitoring Plan (TEPDK-L2-PRD-FO-0003-E) during all project activities; ■ Implement TEPDK's Logistics and Support to Operations Performance Measures procedure to optimize supply and support operations/ logistics to minimize operation time; ■ Monitor fuel type and usage of project vessels; ■ Adhere to emissions and discharge standards including applicable Denmark emission standards and MARPOL73/78 Annex I, IV, V and VI.
Phase 2: Wells temporary abandonment	■ Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	■ Implement TEPDK's Chemical Management Plan. Chemical products shall be carefully selected and used at the adequate minimum concentration; ■ Implement DEPA conditions stated in the general permit for use, discharge and other disposal of substances and materials, including oil and chemicals. ■ Prepare project specific Waste Management Plan to meet TEPDK standard TEPDK-L2-PRO-HSE-0026-E; ■ Follow OSPAR Recommendation 2019/04 on a harmonized pre-screening scheme for offshore chemicals. ■ Maximize re-use and re-cycle of used water-based muds for different wells; ■ Regularly maintain the on-board solids control system; ■ Minimize spent water-based mud discharge to sea.
Employment opportunities	■ Direct and indirect employment opportunities for the production phase and to supplying goods and services	■ Implement local content / In-country value development during planning.
Unplanned/Accidental Events	■ Hydrocarbon/Chemical spills (minor/Tier 1): e.g. hose failure during bunkering	■ Finalise HSE review prior to mobilization; ■ Plan for work execution during acceptable weather conditions, with clearly defined weather limits for vessel and helicopter operations; ■ Inform the Maritime and Ports Authority so that a Notice to Mariners is issued on project activities, location and schedule; ■ Establish a 500 m exclusion zone around the rig and support vessels during the project; ■ Equip vessels, used for surveys, with collision risk reducing devices (i.e. navigation lights, beacons, etc.); ■ Require that communication and navigation equipment on the DAN platforms and Dan E well temporary abandonment project vessels comply with requirements of the International Convention for the Safety of Life at Sea, 1974 (SOLAS)

Activity	Source of Impact	Control/ Mitigation Measures
		and vessel operations shall be in accordance with the IMO's International Regulations for Preventing Collisions at Sea 1972 (COLREGS); ■ Implement TEPDK Oil/Chemical Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016-E); ■ Adhere to SOLAS 73, and STCW 78 provisions, including those stated within 'The Manila Amendments (2010)'; ■ Confirm that the Ship Oil Pollution Emergency Plan (SOPEP) is in place for the rig and other vessels involved in the project activities.
	■ Hydrocarbon Spills (Tier 2): e.g. diesel spill from vessel collision to the jack-up rig or platforms and vessel to vessel / helicopter to platform	■ Confirm that the Shipboard Oil Pollution Emergency Plan is in place for the rig and all vessels involved in the activities; ■ Use and keep up to date the Project-Specific Rig Chemical Register; ■ Follow TEPDK's Oil/Chemical Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016-E); ■ Plan for work execution during optimal weather conditions, with clearly defined weather limits for vessel and helicopter operations; ■ Conduct routine maintenance to so that any leaks are managed in a timely manner.
	■ Hydrocarbon Spills (major/Tier 3): well blowout;	■ Implement TEPDK Blowout Contingency Plan (BOCP); ■ Confirm that a Well Integrity Management System (WIMS) is in place; ■ Implement TEPDK's Oil/Chemical Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016-E); ■ Confirm that a Blowout Preventer is in place; ■ Define the position of relief wells within 1 kilometre of the proposed well location; ■ Maintain stakeholder engagement which includes neighbouring countries and impacted communities so that impacts arising from oil spills are managed effectively; ■ Issue Notice to Mariners.
	■ Loss of Containment as a consequence of dropped objects	■ Frequently check that items and equipment are stored and secured safely on the rig and on board each vessel; ■ Control crane operations (Standard Operating Procedures and Permit to Work Systems); ■ Recover (where practicable) objects which are accidentally dropped into the sea.

Monitoring and auditing of the environmental impacts of the DEWTA project activities will increase the effectiveness of the approved ESMP. The project shall establish a schedule for Health, Safety, Security and Environment (HSSE) audits. Contractors shall be required to establish a similar schedule for its activities and those of subcontractors.

Parameters that shall be monitored include:

- Emissions and energy efficiency (including fuel consumption and GHG emissions);
- Discharges to the sea (including WBM discharged to the sea);
- Unplanned/accidental spills to the sea;
- Waste (hazardous and hazardous quantities);
- Annual Naturally Occurring Radioactive Material (NORM) material amounts; and
- Offshore marine receptors (including water quality, seabed (physical and biological); marine fauna).

TEPDK has documented processes for monitoring and for incident reporting. Compliance with these documents shall be maintained throughout the project's lifecycle. This includes but is not limited to identifying corrective actions in response to accidents or environmental or social non-compliances.

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