Environmental and Social Impact Assessment

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

13 June 2023

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

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Acronyms and Abbreviations

Name	Description
µ	micron
µm	micro metre
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AoI	Area of Influence
API	American Petroleum Institute
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
Ba	Barium
BaSO4	Barium Sulphate (Barite)
BAT	Best Available Technique
bbl	Barrel
BEK	Bekendtgørelse (Executive Order)
BEP	Best Environmental Practice
BOCP	Blowout Contingency Plan
BOP	Blowout Preventer
BRL	Background Reference Level
BWM	Ballast Water Management
Cd	Cadmium
CH4	Methane
CHASE+	Chemical Status Assessment Tool
CITES	The Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animal
CO	Carbon Monoxide
CO2	Carbon Dioxide
COLREGS	IMO's International Regulations for Preventing Collisions at Sea
COVID-19	Coronavirus Disease of 2019
Cr	Chromium
CR	Critically Endangered
Cu	Copper
D(n)	MSFD Descriptor (n)
Dan E	Dan Echo Platform
dB	Decibel
DBF	Dogger Bank Front
DEA	Danish Energy Agency (Energistyrelsen)
DEFRA	Department for Environment, Food and Rural Affairs
DEPA	Danish Environmental Protection Agency (Miljøstyrelsen)
DEWTA	Dan E Well (DE01 & DE02) Temporary Abandonment Project

Name	Description
DHARP	Danish Health Authority (Sundhedsstyrelsen, Strålebeskyttelse (SIS))
DHI	Danish Hydraulic Institute
DIN	Dissolved Inorganic Nitrogen
DIP	Dissolved Inorganic Phosphorous
DKK	Danish Krone
DM	Dry Matter
DMA	Danish Maritime Authority (Søfartsstyrelsen)
DUC	Danish Underground Consortium
DW	Dry Weight
DWEA	Danish Working Environment Authority (Arbejdstilsynet)
E&P	Exploration and Production
EBS	Environmental Baseline Study
EC	European Commission
ECA	Emission Control Area
ECOMAR	Development and Testing of a Data-Driven Framework for Ecosystem-Based Marine Spatial Planning
EDGAR	European Database for Global Atmospheric Research
EEA	European Environment Agency
EEC	Economic European Community
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIF	Environmental Impact Factor
EMoS	Environmental Monitoring Study
EMP	Environmental Management Plan
EN	Endangered
EnS	Environmental Status
eq	Equivalent
ERL	Effect Range Low
ERM	Environmental Resource Management
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
Espoo Convention	Convention on Environmental Impact Assessment in a Transboundary Context
etc	Et Cetera
EU	European Union
EU ETS	European Emission Trading Scheme
FOMS	Field Operations Management System
GDP	Gross Domestic Product
GES	Good Environmental Status
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GS	General Specifications
H2S	Hydrogen Sulphide
HAT	Highest Astronomical Tide
HELCOM	Helsinki Commission (The Baltic Marine Environment Protection Commission)
Hg	Mercury
HOCNF	Harmonized Offshore Chemical Notification Format

Name	Description
HSE	Health, Safety and Environment
HSE-MS	Health, Safety and Environment Management Systems
HSEQ	Health, Safety, Environment and Quality
HSSE	Health, Safety, Security and Environment
IA	Impact Assessment
IAPP	International Air Pollution Prevention
IBA	Important Bird and Biodiversity Area
IBTS	International Bottom Trawl Survey
ICES	International Council for the Exploration of the Sea
IFC	International Finance Corporation
IMO	International Maritime Organisation
IOGP	International Association of Oil and Gas Producers
IPCC	Intergovernmental Panel on Climate Change
IPIECA	Originally International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owners Pollution Federation Limited
IUCN	International Union for Conservation of Nature
IZI	Individual Zone for Isolation
JNCC	Joint Nature Conservation Committee
KBA	Key Biodiversity Area
km	Kilometre
kton CO2eq/	Kilotonnes of Carbon Dioxide Equivalent
l	litres
LAT	Lowest Astronomical Tide
LBK	Lovbekendtgørelse (Consolidation Act)
LC	Least Concern
LF	Low Frequency
LOI	Loss on Ignition
LOV	Lov (Law)
LSE	Likely Significant Effect
LSO	Logistics and Services Operations
m	meter
m2	square meter
MARPOL	International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environment Protection Committee
mg	milligrams
mg/kg DM	Milligram per Kilogram of Dry Matter
MGO	Marine Gas Oil
mm	millimeter
MMO	Marine Mammal Observer
MMSR	Marine Mammal Sighting Reporting program
MPA	Marine Protected Areas
MSFD	Marine Strategy Framework Directive
MSL	Mean Sea Level
MSP	Marine Spatial Planning
mT	Metric Tonnes

Name	Description
Mt CO2/yr	Million Tonnes of CO2 per Year
Mt CO2eq/yr	Million Tonnes of CO2 Equivalent per Year
MW	Megawatt
N	North
NAO	North Atlantic Oscillation
NGO	Non-Governmental Organization
Ni	Nickel
NOAA	National Oceanic and Atmospheric Administration
NORCE	Norwegian Research Centre
NORM	Naturally Occurring Radioactive Material
NOVANA	(Danish) National Monitoring Program for Water Environment and Nature
NOx	Nitrogen Oxides
NPD	Alkylated Aromatic Hydrocarbon - Naphthalene, Dibenzothiophene, Phenanthrene
NT	Near Threatened
OBM	Oil Based Mud
OECD	Organisation for Economic Co-operation and Development
OSP	Operation Safety Procedure
OSPAR	Oslo Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic)
OSRL	Oil Spill Response Ltd
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PBDE	Polybrominated Diphenyl Ether
PBL	Netherlands Environmental Assessment Agency
PCB	Polychlorinated Biphenyls
PDCA	"Plan-Do-Check-Act"
PEC	Predicted Environmental Concentration
PFOS	Perfluorooctane Sulfonate
pH	Potential of Hydrogen
PLONOR	Poses Little or No Risk
PM	Particulate Matter
pMfh	per million flight hours
PNEC	Predicted No Effect Concentration
ppb	parts per billion
ppg	Pounds Per Gallon
ppm	parts per million
PR	Product Registry
PSV	Platform Supply Vessel
PTS	Permanent Threshold Shift
PWC	Perforate, Wash, Cement Method
RBA	Risk Based Analysis
Rev	Revision
SAC	Special Area of Conservation
SBS	Social Baseline Study
SBV	Standby Vessel
SCANS	Small Cetaceans Abundance in the North Sea

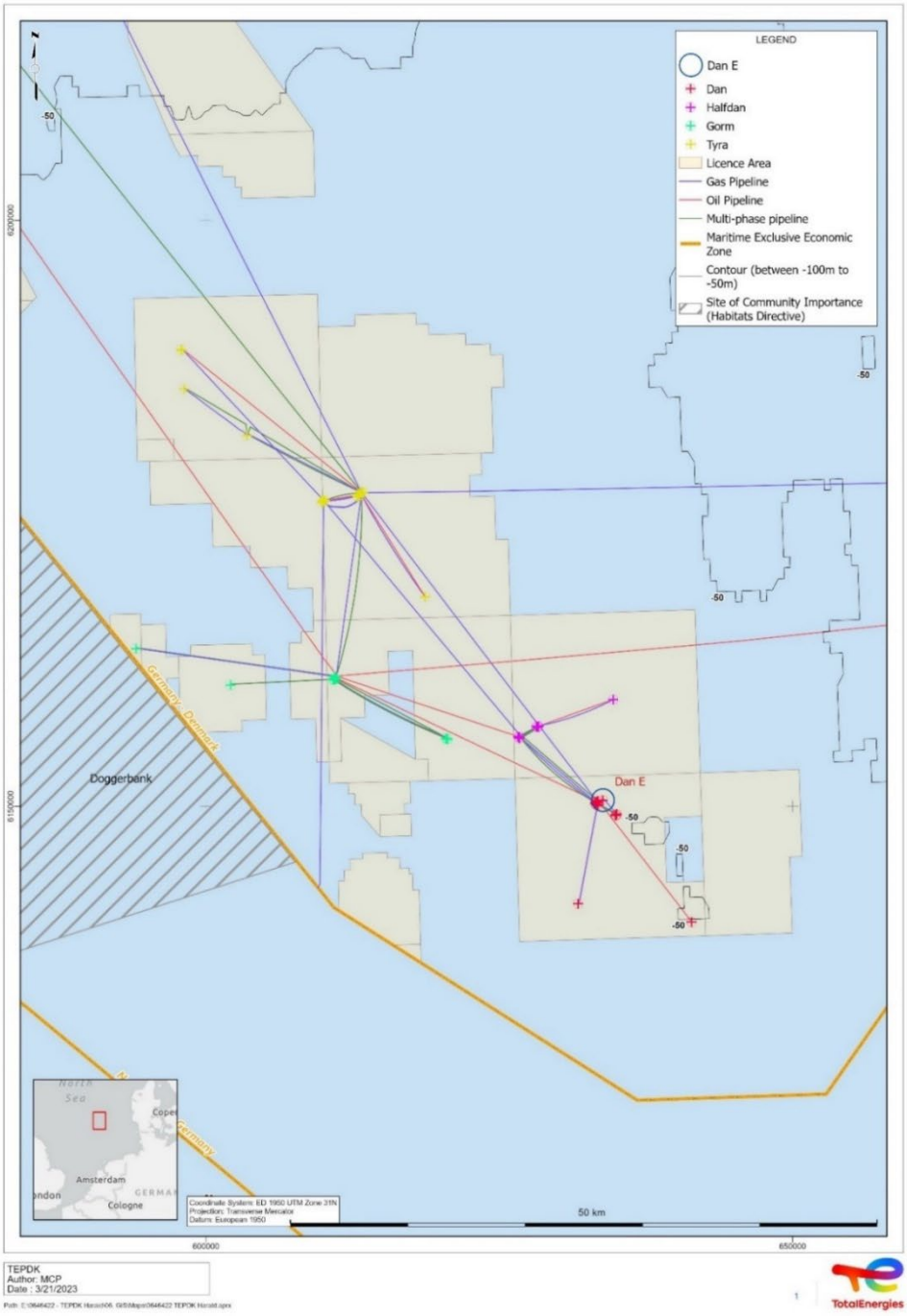
Name	Description
SCI	Site of Community Importance
SEA	Strategic Environmental Assessment
SECA	Sulphur Emissions Control Area
SEL	Sound Exposure Level
SHEQ	Safety Health Environment & Quality
SIA	Social Impact Assessment
SIS	Strålebeskyttelse (Radiation Protection)
SOLAS	Safety of Life at Sea
SOPEP	Ship Oil Pollution Emergency Plan
SOx	Sulphur Oxides
Sp	Species
SPA	Special Protected Area
STP	Sewage Treatment Plant
SVO / PVA	Særlig verdifulle og sårbare områder / Particularly Valuable and Vulnerable Areas (PVA)
tCO2	Tonnes CO2
TEPDK	TotalEnergies EP Danmark A/S
THC	Total Hydrocarbon
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorus
TVD	True Vertical Depth
UK	United Kingdom
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
US$	United States Dollar
VMS	Vessel Monitoring System
VOC	Volatile Organic Compounds
VU	Vulnerable
WBM	Water Based Mud
WEA	Working Environment Authority
WIMS	Well Integrity Management Systems
WMO	World Meteorological Organization
Zn	Zinc

1. INTRODUCTION

1.1 Presentation of the Project

TotalEnergies EP Danmark A/S (TEDPK) operates oil and gas infrastructure on behalf of the Danish Underground Consortium (DUC) in the North Sea, approximately 185 kilometres (km) from the western coast of Denmark. This includes production at the GORM, HARALD, TYRA, DAN and HALFDAN Fields. The DAN Field is located in the south-western part of the Danish North Sea, approximately 210 km west of Esbjerg (see Figure 1.1). The water depth at the DAN Field ranges from approximately 41 to 44 m.

Figure 1.1 DAN Licence Location



Source: ERM, 2023

The existing components at the DAN Field comprise the Dan F facilities, Dan B, Dan E, Kraka and the decommissioned subsea wellhead Regnar. Dan F consists of seven platforms connected by bridges and is the primary processing platform for the entire oil production from the DAN Field. Dan B includes a processing and accommodation platform, two wellhead platforms, and a flare platform.

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. The Dan E wells (DE-01, DE-02, DE-03, DE-04, DE-05 & DE-06) were originally oil producers; four were converted to water injection wells in 1996, and two wells (DE-03 and DE-04) were temporarily abandoned in 2013.

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). This ESIA report has been prepared to assess the environmental and social impacts due to the temporary abandonment activities. The project is hereinafter presented as DEWTA project ("*Dan E Well Temporary Abandonment Project*").

1.2 Purpose of this Report

Denmark has a legislative requirement for an Environmental and Social Impact Assessment (ESIA) report to be undertaken for projects of this type, and for the findings of the ESIA report to be submitted to the Danish Energy Agency (DEA).

The ESIA report follows the requirements of the Environmental Impact Assessment (EIA) Directive (2011/92/EU as amended by 2014/52/EU), as described in the EU EIA Directive 2014/52/EU. It has been prepared to assess the environmental and social impacts related to the activities at Dan E for the temporary abandonment of wells DE-01 and DE-02 (DEWTA project).

The purpose of the ESIA report is to ensure that the environment[1] 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 (IOGP, 1997). 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.

This ESIA report draws on primary baseline data and data obtained from secondary sources (refer to Chapter 4 Baseline Characteristics) and provides recommendations on measures to be applied to mitigate impacts identified to be potentially significant to sensitive receptors in the area (refer to Chapter 5 Impact Assessment and Mitigation). The assessment of potential transboundary effects, the assessment of potential impacts on Natura 2000 Site and on the Marine Strategy Framework Directive descriptor are presented in chapters from 6 to 8. An outline Environmental and Social Management Plan (ESMP) and Commitments Register have also been prepared based on the findings of this ESIA report and are provided in Chapter 9 Outline Environmental and Social Management Plan.

The purpose of the outline ESMP and Commitments Register is to summarise the commitments made by TEPDK (and its Contractors) to implement all the measures identified during the design, planning, and implementation of the proposed project, to reduce environmental and social impacts and manage associated risks.

As detailed in Chapters from 5 to 8 and briefly summarized in the conclusion section (Chapter 10), the main findings of the ESIA are as follows:

[1] The term 'Environment' here is used in this context as a collective term that includes environment and social and community health.

- Impacts from planned activities: The ESIA identified the following potentially significant impacts resulting from planned activities: Green House Gas (GHG) emissions during the mobilization and temporary abandonment phases, discharges of inhibited seawater/WBM and used cement during the temporary abandonment phases. The impacts from these planned events are evaluated as Negligible considering the embedded project control measures and the additional mitigation measure where needed;
- Risks and impacts from unplanned events: Impacts due to unplanned events are considered As Low As Reasonably Practicable (ALARP) and are evaluated as Medium for 'Hydrocarbon/Chemicals Spills (Minor/Tier 1) and Low for 'Diesel Spills (Tier 2) from Vessel Collisions / Vessel to Vessel and Helicopter to Platform', 'Loss of containment as a consequence of dropped objects' and 'Hydrocarbon Spills (Major/Tier 3): Well Blowout'. For the blow out event, TEPDK contracted Oil Spill Response Ltd (OSRL) to conduct an oil spill modelling for a similar project. Impacts are discussed in full detail in Section 5.6.3.3. The modelled scenarios show that the seawater column impacts above the OSPAR threshold of 70 ppb was not reached. The hydrocarbon concentrations were below 25 ppb (threshold for the most sensitive marine life) within the Natura 2000/OSPAR MPA Doggerbank, or any other affected area. Results for shoreline impact above the threshold of 0.1 l/m^2 are expected with a probability of 55% in Denmark, 73% in Norway and 48% in Sweden. All the shoreline impacts would be related to light oiling, except for a small area in the northern tip of Denmark with moderate oiling.
- Cumulative impacts: The DEWTA project and its impacts will not spatially or temporally overlap with any offshore projects (oil and gas, renewables or other) in the area. The DEWTA project activities are planned in Q4 2023 (lasting approximately 99 days) and TEPDK is considering using only one jack-up rig for all its DUC operations, thus not involving simultaneous activities with its other development projects. No significant cumulative impacts are expected to occur as part of the DEWTA project;
- Transboundary impacts: it is unlikely that there will be significant adverse transboundary environmental impacts due to planned activities for the project, given the localised and temporary nature of the environmental impacts associated with the proposed activities of the DEWTA project, and the distances between the DEWTA project area and the land and sea borders of neighbouring countries;
- Impacts on Natura 2000 Sites and other protected areas: Section 7 addresses the potential impacts during both the planned mobilization and temporary abandonment activities and unplanned events phases of the DEWTA Project on Natura 2000 sites found in Germany at 26.9 km to the west and 99 km to the south east, Netherlands 56 km to the south west and in Denmark (from 109 km to 175 km to the north east and south east). The screening assessment is based on the main ESIA evaluations and the unlikely blowout scenario during well temporary abandonment as summarized in the previous sections. The assessment has demonstrated that the DEWTA project will not result in any likely significant effects on habitats and species populations including Habitat Directive Annex IV species (all species of cetaceans including harbour porpoise) for which Natura 2000-sites have been designated, no full appropriate assessment is therefore needed;
- Impacts on the Marine Strategy Framework Directive (MSFD): the 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 MSFD as defined by the Danish Marine Strategy II (Danish Ministry of Environment, 2019). As summarized in Section 8 the DEWTA project's environmental impacts will not hinder the achievement of good environmental status for the relevant descriptors.

1.3 Presentation of the Project Proponent - TotalEnergies EP Danmark A/S (TEPDK) and Danish Underground Consortium (DUC)

TEPDK has successfully explored, developed, and produced oil and gas in the Danish North Sea for more than 50 years, and is fully committed to the development of the Danish North Sea. TEPDK

provides 26,000 jobs directly and indirectly, contributes to state revenue, ensures 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 DUC. The DUC partnership changed in 2019. First, TEPDK expanded its presence through the closure of the acquisition of Chevron's 12% share, and second, Shell sold its upstream assets in Denmark to BlueNord ASA (formerly Noreco). The DUC is a joint venture involving TotalEnergies (43,2%), BlueNord ASA (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, the DUC accounts for most 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, a significant contribution to society. When the DUC was formed in 1962 to explore the Danish North Sea, there was no great expectation that Denmark would become an oil-producing country. However, by 1972, the DAN Field came on stream and sparked global interest.

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 and it also has a registered office in Copenhagen.

1.4 Report Structure

The structure of this ESIA report follows the requirements of Danish legislation on Environmental Impact Assessment (see Section 2.2.1).

This impact assessment (IA) method is also in accordance with TotalEnergies' General Specification for E&P EIA including internationally accepted assessment criteria TotalEnergies, 2019, GS EP ENV 120. The contents are summarized in Table 1.1.

Table 1.1 ESIA Report Structure

Section	Chapter Title	Content
1	Introduction	This chapter presents the scope of the ESIA report for the DEWTA project, offshore Denmark in the North Sea. It also provides details on the project background, the project owners and the ESIA report structure.
2	Policy, Legal and Administrative Framework	This chapter provides an overview of the applicable regulatory framework for the project. It includes relevant Danish environmental legislation, international conventions, industry policies and standards that the project will comply with.
3	Project description	This chapter presents the project motivation, and a description of the project activities and its geographical and temporal context. It includes a site description, an overview of the project design and details of project inputs and outputs.
4	Baseline Characteristics	This chapter presents the baseline characteristics of the existing biophysical and socio-economic conditions in the project area and the project's area of influence (AoI). The baseline serves as the reference point against which changes can be predicted and monitored in the future.

Section	Chapter Title	Content
5	Impact Assessment and Mitigation	This chapter provides the method used to assess the potential environmental and social impacts of the project. This chapter also presents the results of the scoping assessment of the potentially significant impacts of the project activities on the main environmental and social aspects of the project area and the project AoI. This chapter also documents the project's predicted positive and negative impacts and outlines the general and specific mitigation measures to reduce, remove or avoid negative impacts on environmental and social receptors and outlines the residual impacts (post mitigation). The chapter presents: • Cumulative impacts (Section 6); • Impacts from Unplanned/accidental events (Section 5.6); • Summary of Impact Significance (Section 5.7).
6	Transboundary Effects	This chapter presents the assessment of potential transboundary effects
7	Natura 2000 Assessment	This chapter presents the outcomes the potential effects on Natura 2000 sites
8	Marine Strategy Framework Directive	This chapter presents the assessment of potential impacts on the Marine Strategy Framework Directive descriptors and on the NOVANA Program.
9	Outline Environmental and Social Management Plan (ESMP)	This chapter presents the outline ESMP and Commitments Register for the project. It summarizes the avoidance, minimization and mitigation measures that are required to manage the 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 planning, mobilization and plugging phases.
10	Conclusions	This chapter concludes the ESIA and briefly summarizes the proposed project and its potential impacts from planned activities, from unplanned/accidental events. It also summarizes the potential cumulative and transboundary impacts and impacts on the Natura 2000 sites.
11	References	The References presents a list of references and bibliographic sources used for this report.
Appendices		
Appendix A	Legislative Framework	It presents a summary of the legislative framework relevant for the DEWTA project and TEPDK activities in the region

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

2.1 Introduction

This chapter provides an overview of the applicable regulatory framework for the project. It includes relevant Danish environmental legislation, international conventions, industry policies and standards including the TotalEnergies Standards the project will comply with.

Denmark is part of the European Union (EU) and has its own national legislation, which will apply to this project. The application for environmental approval that the project requires must be submitted to the Energistyrelsen (the Danish Energy Agency (DEA)), which manages the applications and issues the approval on behalf of the Danish State. There is cooperation amongst the DEA and may include the following agencies:

- Miljøstyrelsen (Danish Environmental Protection Agency (DEPA));
- Søfartsstyrelsen (Danish Maritime Authority (DMA));
- Kulturstyrelsen (The Danish Agency for Culture);
- Naturstyrelsen (Danish Nature Agency);
- Erhvervsstyrelsen (Danish Business Authority); and
- Arbejdstilsynet (Danish Working Environment Authority (DWEA)).

The surveillance of Danish waters and of civilian shipping, sovereignty enforcement, pollution prevention, environmental surveillance, ice-breaking, etcetera (etc.) are the responsibility of Forsvarsministeriet (Ministry of Defence). Den Maritime Havarikommission, the Danish Maritime Accident Investigation Board, has responsibilities for accidents within Danish waters.

The Danish Health Authority, Radiation Protection (DHARP) or Sundhedsstyrelsen, Strålebeskyttelse (SIS) is responsible for radiation management. The Danish Business Authority manages all Danish accounts in the EU ETS Registry.

2.2 EU and National Environmental Legislation

2.2.1 Environmental Impact Assessment

2.2.1.1 National Legislation

Offshore exploration and production of oil and gas in Denmark are activities requiring DEA approval. This requirement is set forth in the Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment and in the EIA Directive 2011/92/EU ('Assessment of the Effects of Certain Public and Private Projects on the Environment' and the last 2014 amendment with Directive 2014/52/EU). The EIA Directive is implemented in Danish legislation through the:

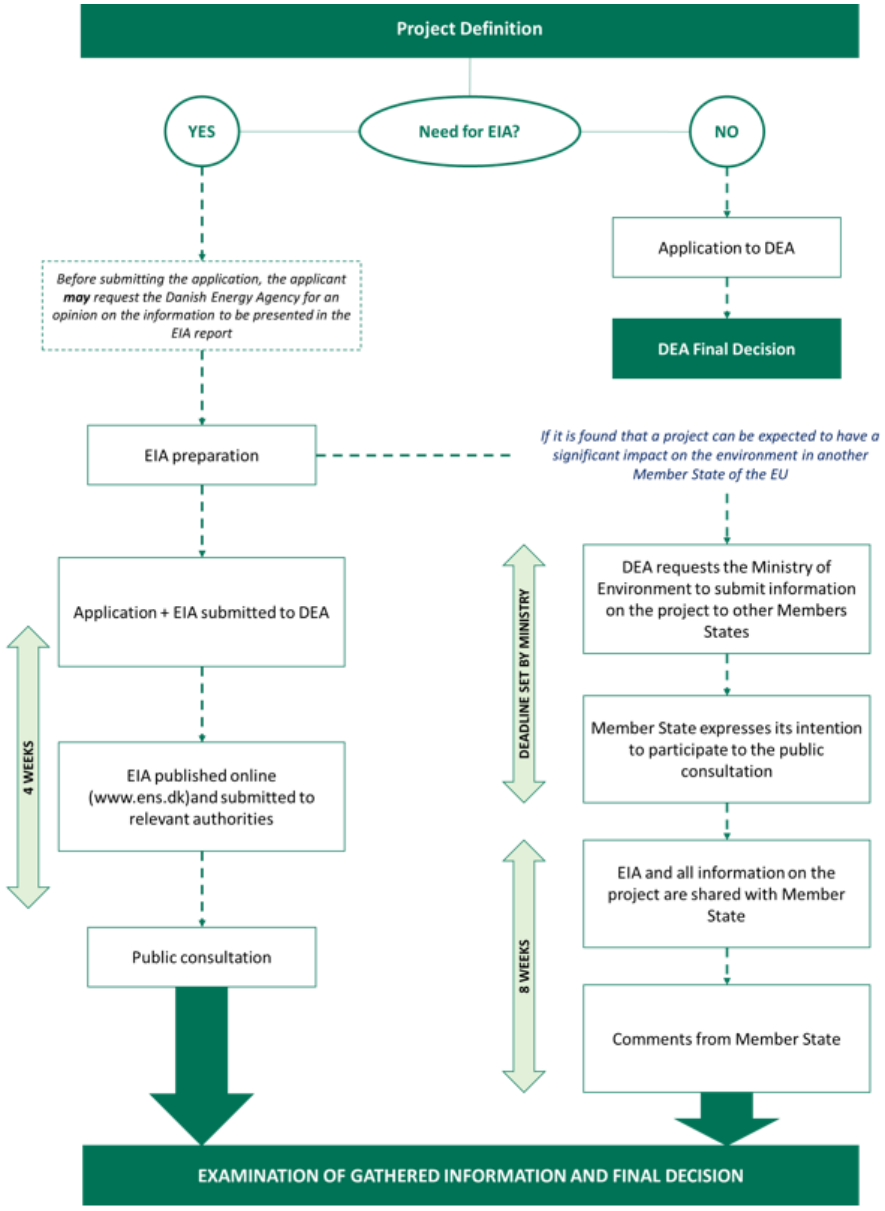
- Subsoil Act (Consolidation Act no. 1533 of 16/12/2019);
- The Act on Environmental Impact Assessment of Plans and Programs and on Specific Projects-The 'EIA Act' (Consolidation Act no. 4 of 03/01/2023); and
- Ordinance on the administration of international nature protection areas and the protection of certain species by feasibility studies, exploration and extraction of hydrocarbons, storage in the subsoil, pipelines, etc. offshore (Offshore Impact Assessment Order BEK no. 1050 of 27/06/2022). This ordinance contains provisions implementing parts of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Bird Protection Directive).

This ESIA is prepared to meet the requirements of the applicable legislation, as summarised in Annex A.

Specifically, for oil and gas projects, when a company applies to the DEA for approval of a production plan for oil and gas fields or the installation of pipelines, the application must be accompanied by an EIA report and an account of the measures taken to reduce identified impacts.

The ESIA process is summarised in Figure 2.1.

Figure 2.1 Danish EIA Process



Source: ERM (2022)

The ESIA report and its non-technical summary (NTS) for the project will be made available for public consultation on the DEA's webpage. The deadline for making comments or raising objections to the application and ESIA report is after at least 8 weeks, in accordance with the Consolidation Act no. 4 of 03/01/2023. After the DEA has made its decision whether to approve the project, the DEA must publish the decision in the same places where information concerning the application and ESIA report was published. The approval decision may be appealed to the Danish Energy Board of Appeal within

4 weeks from the issuance of the approval. TEPDK may not act on the approval before the complaints period has finished.

With reference to the Natura 2000 network and applicable Danish legislation ("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 - Executive Order BEK no. 1050 of 27/06/2022"), Section 7 addresses the potential impacts from project activities on protected and recognized sites. The existing DAN facilities are not located within any Marine Protected Areas (MPAs), Nature Reserves, Natura 2000 sites, Important Bird Areas (IBAs) or Special Protection Areas (SPAs) of the North Sea. No significant impacts are expected due to the large distance from Dan E to any protected area.

2.2.1.2 International Conventions

Espoo Convention

The Convention on EIA in a Transboundary Context (Espoo Convention, 10 September 1997) sets out the obligations of parties to assess the environmental impact of certain activities at an early stage of planning. It also lays down the general obligation of states to notify and consult each other on all major projects under consideration that are likely to have a significant adverse environmental impact across boundaries. Therefore, its objective is to extend assessments across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts. The Espoo Convention was implemented in Denmark in 1999 through implementation of the EIA process and SEA Directives. Under the Espoo Convention, an EIA report must be prepared prior to authorising an activity listed in Appendix I of the Convention, when the activity might have a significant adverse transboundary impact.

In Denmark, DEPA, on behalf of the Ministry of Environment and Food, administers the Espoo Convention rules and is the responsible authority for the process of exchanging relevant information from the project owner to the potentially affected countries and possible comments from those countries in connection with the Espoo Consultation process.

Section 6 addresses the transboundary effects of planned activities and unplanned/accidental events. 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. 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.

Aarhus Convention

The Aarhus Convention "Convention On Access To Information, Public Participation In Decision-Making And Access To Justice In Environmental Matters (25 June 1998)" is about government accountability, transparency and responsiveness. The Aarhus Convention establishes several rights of the public (individuals and their associations) to the environment. The parties to the Convention are required to make the necessary provisions so that public authorities (at national, regional or local level) will contribute to these rights to become effective, including access to environmental information, public participation in environmental decision-making, and access to justice.

The Aarhus Convention is implemented by the EU through the Environmental Information Directive and the Public Participation Directive 2003/4/EC. Provisions for public participation in environmental decision-making are furthermore to be found in several other environmental directives, such as the SEA (Strategic Environmental Assessment) Directive, the Water Framework Directive, and the EIA Directive.

The Aarhus Convention was implemented in Danish law in 2000 on Amendments to Certain Environmental Acts, including amendments to the Continental Shelf Act. The Aarhus Convention is implemented in Denmark by the Subsoil Act amongst others.

Regulation (EC) N° 1367/2006 of the European Parliament and of the Council on the application of the provisions of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters to Community institutions and bodies (OJ L 264, 25.9.2006, p.13) entered into force on 28 September 2006 and into application on 17 July 2007.

The "Aarhus Regulation" covers not only the institutions, but also bodies, offices or agencies established by, or based on the EC Treaty. They now need to adapt their internal procedures and practice to the provisions of the Regulation. The Aarhus Regulation addresses the "three pillars" of the Aarhus Convention: access to information, public participation and access to justice in environmental matters, where those are of relevance to EU institutions and bodies and lays down related requirements.

Public participation in environmental decision-making for the DEWTA project will be empowered according to the provisions of the:

- **Act on Environmental Impact Assessment of Plans and Programs and on Specific projects – The EIA Act (Consolidation Act no. 4 of 03/01/2023); and**
- **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 (Executive Order BEK no. 1050 of 27/06/2022).**

2.2.2 Offshore Safety

2.2.2.1 Offshore Oil and Gas Safety Directive (2013/30/EU)

The Directive aims to ensure that the best safety practices are implemented across all active offshore regions in Europe. The 2013//30/EU directive will reduce as far as possible the occurrence of major accidents due to offshore oil and gas operations and to limit their consequences. The DWEA is responsible for implementing the Directive and has prepared Guideline 65.1.13-1 on Health and Safety Documents in connection with offshore oil and gas operations.

2.2.2.2 Offshore Safety Act (Consolidation Act no. 125 of 06/02/2018)

The Offshore Safety Act (Consolidation Act no. 125 of 06/02/2018[2]) requires response contingency plans for offshore platforms carrying out exploration, production and transport of petroleum hydrocarbons to prevent and mitigate pollution from major accidents. The required content of such plans is specified in the associated regulation on contingency plans in case of pollution of the marine environment from oil and gas pipelines and other platforms (Executive order no. 909 of 10/07/2015 because of protection of the marine environment act no. 1165 of 25/11/2019 § 34 a.).

The Executive Order of the Offshore Safety Act sets out regulations concerning the required emergency planning in case of sea pollution by oil and gas spill originating from offshore platforms. Emergency preparedness and contingency plans for pollution shall follow the guidelines defined in the order and DEPA may also set conditions for approval of the contingency plan. Additionally, the regulation ‘Notice of Emergency Preparedness in case of Pollution of the Sea from Certain Offshore Installations’ in Annex A (BEK no. 909 of 10/07/2015) also requires the DEWTA project to comply with the Emergency Preparedness Regulation by maintaining a contingency plan and in the event of pollution, combat the contamination of the sea.

[2] https://offshore.at.dk/en/regulations/the-offshore-safety-act/ ; https://offshore.at.dk/regler/bekendtgoerelser/

TEPDK will comply with the Emergency Preparedness Regulation in which the DEWTA project offshore installations must maintain a contingency plan, which, in the event of pollution of the sea from the facility, can combat the pollution.

2.2.3 Protection of the Environment

While the DEA is responsible for the EIA procedures, DEPA is responsible for supervising emissions and discharges to the marine environment. The main environmental regulatory framework for the offshore industry is the Act on Protection of the Marine Environment[3] [4]or "Marine Environment Act" as modified by the last LBK no. 1165 of 25/11/2019 "Executive Order on the Protection of the Marine Environment[5]" and the Environmental Protection Act (LBK no. 5 of 03/01/2023[6]).

2.2.3.1 Executive Order on the Protection of the Marine Environment (LBK no. 1165 of 25/11/2019)

The purpose of the Executive Order on the Protection of the Marine Environment is to prevent and limit pollution and other effects on nature and the environment, in particular the marine environment, from activities which may:

- Endanger human health;
- Damage natural and cultural resources in the ocean, including the seabed;
- Disrupt the rightful exploitation of the sea; and
- Decrease recreational activities and their value.

The Act will also ensure the maintenance of preparedness for action against pollution at sea, on coasts and in ports.

The law regulates Danish ships and ships located in Danish territorial waters, Danish aircraft and aircraft located in or over Danish territorial waters, Danish platforms and platforms located in Danish territorial waters or on the Danish continental shelf area, Danish pipelines for the transport of hydrocarbons and excipients and pipelines for the transport of hydrocarbons and excipients in Danish territorial waters or on the Danish continental shelf area, foreign ships that are in the exclusive economic zones, to the extent compatible with international law.

The executive order defines how dumping of substances or materials shall not take place, except for the dumping of absorbed seabed material. The minister shall grant a permit for and supervise the dumping of recorded seabed material, which shall be limited in time and specify the substances or materials covered by the permit.

The DEWTA project will discharge inhibited seawater (seawater containing oxygen and H_2S scavengers, and corrosion inhibitors) from the well flushing; limited quantities of used cement and, only in case of contingency, WBM. The present ESIA (see Section 3.3.8 and 3.3.9.3) provides information on the quality and quantity of materials and chemicals. TEPDK will update the annual use and discharge permit prior to the operations.

2.2.3.2 Environmental Protection Act (LBK no. 5 of 19/01/2023[7])

The purpose of the Environmental Protection Act is to contribute to safeguarding nature and the environment, thus enabling a sustainable social development in respect of human conditions of life

[3] https://www.retsinformation.dk/eli/lta/2013/963
[4] https://eng.mst.dk/trade/industry/offshore-activities/ ; https://mst.dk/erhverv/industri/olie-og-gasproduktion-i-nordsoeen-offshore/
[5] https://www.retsinformation.dk/eli/lta/2021/1165
[6] https://www.retsinformation.dk/eli/lta/2023/5
[7] https://www.retsinformation.dk/eli/lta/2022/100

and for the conservation of animal and plant life. This Act seeks to prevent and limit pollution and other effects on nature and the environment, from activities, which may; endanger human health, damage natural and cultural values on and in the sea, including the seabed, disrupt the rightful exploitation of the sea or decrease recreational values or activities. The objectives of this act are:

- To prevent and combat pollution of air, water, soil and subsoil, and nuisances caused by vibration and noise;
- To provide for regulations based on hygienic considerations which are significant to people and the environment;
- To reduce the use and wastage of raw materials and other resources;
- To promote the use of cleaner technology; and
- To promote recycling and reduce problems in connection with waste disposal.

The Act applies to:

- All activities which give off solid, liquid or gaseous substances, and release microorganisms, which are likely to cause environmental and/or health issues;
- Vibration and noise;
- Products or goods likely to cause pollution in connection with manufacture, storage, use, transport or disposal;
- Means of transport and other mobile facilities likely to cause pollution; and
- Animal husbandry, pests and other matters likely to cause problems of hygiene or significance nuisance to the surroundings.

This Act also applies to the activities involving hazardous processes and to the storage of substances with dangerous properties, in such a way that interruption of operation or accidents may cause an imminent risk of pollution, as specified in the section above. DEPA regulates the discharge of oil and chemicals into the sea from offshore activities.

The present ESIA for the proposed DEWTA project defines the environmental interactions and effects due to the temporary abandonment of DE-01 and DE-02 (Section 5). TEPDK will update the annual use and discharge permit prior to the operations.

2.2.3.3 Discharges to sea - Permits for discharge of offshore chemicals and oil in produced water (BEK no. 394 of 17/07/1984)[8]

Offshore operators are obliged to apply for permits to use and discharge chemicals and to discharge oil in produced water to the sea in Denmark. The discharge of substances and materials from a marine facility may only take place after DEPA has granted permission. The owner of the offshore installation will prepare an application based on the permissions.

The associated regulation on discharges to the sea of compounds and materials from certain marine facilities (BEK no. 394 of 17/07/1984 “Ordinance on the discharge into the sea of substances and materials from certain marine installation”) defines the information needed to obtain permission for discharges. The discharge permit regulates discharge of oil and chemicals to the sea and, among others, defines requirements for:

- Maximum oil concentration in discharged produced water;
- Limitations for total amount of oil to be discharged;

[8] https://www.retsinformation.dk/eli/lta/1984/394

- Monitoring program for oil concentration in discharge water;
- Continuous control of total oil discharge;
- Classification of offshore chemicals;
- Use and discharge of offshore chemicals depending on classification;
- Regularly reporting on discharge of oil and chemicals.

TEPDK will update the annual use and discharge permit prior to the operations consistent with the information presented in the present ESIA (see Section 3.3.8) and according to the requirements of the BEK no. 394 of 17/07/1984 "Ordinance on the discharge into the sea of substances and materials from certain marine installation".

2.2.3.4 Implementation of OSPAR's Offshore Chemical Discharge in Denmark

Hazardous substance and materials, including chemicals used in the offshore oil and gas industry are recorded and monitored through the Danish Product Registry (PR). This is a joint registry under the DWEA and DEPA (WEA, 2020). Approximately 38,000 chemicals are registered, of which 350 are actively used offshore.

All substances listed in the PR are given a PR number, and information such as composition and use are listed. Chemicals used in the offshore oil and gas industry are also covered by OSPAR guidelines, and, as such, additional information is required for registration in accordance with Annex 1 of OSPAR Recommendation 2010/3 on a Harmonised Offshore Chemical Notification Format (HOCNF) (as amended). The application must include the exact composition of the substance and its ecotoxicological properties according to OSPAR guidelines, and chemicals must be re-notified every three years. DEPA uses the information in the PR when an operator applies for a discharge permit for offshore chemicals.

DEPA follows the "colour classification" for rating chemicals made in OSPAR Recommendation 2019/04 on Harmonised Pre-screening Scheme for Offshore Chemicals. The Danish Ministry of Environment has, in some cases, grouped the classifications from OSPAR as Black, Red, Yellow and Green according to Appendix 1 of OSPAR Recommendation (2019/04). This system will be used as per DEPA requirements.

As a Danish operator, TEPDK follows the OSPAR colour classification and the system used by the Danish Ministry of Environment, even though Danish operators often have internally different colour classifications. The colour classification is described, as follows:

- **Black**: Chemicals containing one or more components registered in OSPAR's 'List of Chemicals for Priority Action', and their use is prohibited except in special circumstances;
- **Red**: Chemicals containing one or more components that, for example, accumulate in living organisms, are toxic, or slow to naturally degrade in the marine environment;
- **Yellow**: Yellow chemicals are inorganic chemicals with an aquatic toxicity greater than 1 milligram per litre (mg/l). Yellow chemicals can normally be discharged without specific conditions, although their use is monitored by DEPA; and
- **Green**: Chemical components that pose little or no risk to the environment according to OSPAR's PLONOR[9] classification.

The present ESIA Section 3.3.8 "Chemical Use and Discharge" defines TEPDK's Chemical Permitting Procedure. TEPDK currently anticipates that no chemicals classified as red will be used in the DEWTA project. However, should a specific circumstance arise which requires their use, TEPDK will submit the permit requests to DEPA. Applications for red chemicals that

[9] PLONOR: Poses Little or No Risk.

can be discharged to the environment require a thorough assessment considering all technical, health, safety and environmental (HSE) aspects.

TEPDK will update the annual use and discharge permit prior to the operations consistent with the information presented in this ESIA, according to OSPAR and BEK no. 394 of 17/07/1984 "Ordinance on the discharge into the sea of substances and materials from certain marine installation".

2.2.3.5 Regulation of non-indigenous species and management of ballast water and sediments from ship ballast tanks (BEK no. 733 of 19/05/2022)

The ordinance BEK no. 733 of 19/05/2022[10], pursuant to the provisions of the Act on the Protection of the Marine Environment, regulates the management of ballast water and sediments from ship ballast tanks. In addition, introduction of non-indigenous species through ballast water is regulated by the International Maritime Organization's (IMO) Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (known as the London Convention 1972) including the 1996 Protocol which became effective in 2006.

The present ESIA (Section 5) addresses the potential impacts related to non-indigenous species. All vessels and the jack-up rig used for the project will be compliant with the international and national legislation on the management of ballast water and sediments from ballast tanks to prevent the spread of invasive species by discharge of ballast water.

2.2.3.6 Marine Strategy Act (LBK no. 1161 of 25/11/2019)

The EU Marine Strategy Framework Directive (MSFD, 2008/56/EC) is implemented in Denmark through the Marine Strategy Act LBK no. 1161 of 25/11/2019[11], which aims to establish the framework for achieving or maintaining Good Environmental Status (GES) in marine ecosystems and enable sustainable use of marine resources. The Marine Strategy II is part of the implementation of the EU MSFD and the Danish Marine Strategy Act. The overall strategy covers the years 2018-2024 and it is developed by the Danish Agency of Water and Nature Management, now the Environmental Protection Agency, which is currently under the jurisdiction of the Ministry of Environment and Food. It encompasses Danish Sea zones such as waterbeds, seabed territories and exclusive economic areas. The Marine Strategy II comprises three parts, each part being revised every six years:

- Part 1: Good environmental status, initial analysis, environmental targets:
  - Aims to define good environmental status, provides an overview of the status in the sea and sets targets for achieving good environmental status, which is applied to eleven descriptors (described in the Marine Strategy Act Appendix 2): D1 Biodiversity, D2 Non-indigenous species, D3 Commercially exploited fish stocks, D4 Marine food webs, D5 Eutrophication, D6 Sea floor integrity, D7 hydrographical changes, D8 Contaminants, D9 Contaminants in seafood for human consumption, D10 Marine litter, D11 Underwater noise;
- Part 2: Monitoring program:
  - Assesses the state of the marine environment in relation to the environmental target set out in Part 1 of the Strategy. The monitoring program is mainly based on monitoring activities in the National Monitoring Program for Water Environment and Nature (NOVANA);
- Part 3: Program of measures:
  - Aims to contain concrete actions to achieve the set environmental targets and thus ensure a good marine environment in the future.

[10] https://www.retsinformation.dk/eli/lta/2022/733
[11] https://www.retsinformation.dk/eli/lta/2019/1161

The DEWTA project is within the Danish EEZ about 185 km from Danish coasts (Blåvandshuk Fyr[12]). The MSFD applies to the area of marine waters over which a member state exercises jurisdictional rights in accordance with the United Nations Convention of the Law of the Sea (UNCLOS). This includes deep-seawaters within European exclusive economic zone and includes, as defined by the MSFD, the seabed and subsoil under the water column.
The present ESIA (Section 8) addresses the potential impacts on the eleven descriptors.

2.2.3.7 Air Emissions and GHG

Ordinance on certain air pollutant emissions from combustion plants on platforms at sea (BEK no. 1449 of 20/12/2012)

Air emissions from offshore platforms are regulated in the regulation on certain air polluting emissions from combustion installations on offshore platforms (Executive order no. 1449 of 20/12/2012[13]).

The Executive Order covers combustion plants with a total rated thermal input of 50 MW or more located on platforms at sea. It also lays down requirements for the measurement of emissions of NOx from combustion plants with a rated thermal input greater than 30 MW (for engines and turbines) and 10 MW, located on platforms at sea, and which are not included in combustion plants with a total rated thermal input of 50 MW or more. The Ordinance excludes combustion plants used for cranes, emergency generators and fire water pumps, located on platforms at sea.

According to points 3 to 7 of the ordinance:

- Combustion plants covered by the ordinance shall be approved by DEPA through an application (as defined in Annex 1 to the ordinance) in which the combustion plant owner (the Company) defines: A. Information about the applicant and ownership; B. Information on the nature of the business; C. Establishment Information; D. Information on the location and operating time of the combustion plant; E. Drawings of the layout of the combustion plant; F. Description of the production of the combustion plant; G. Information on the selection of the best available techniques (BAT); H. Information on pollution and pollution control measures; I. Information on malfunctions and accidents; J. Non-Technical Summary;
- DEPA shall lay down in the approval conditions for the maximum emission of NOx to the air;
- The company carries out self-monitoring of combustion plants covered by section 1, paragraph 1, in accordance with the rules laid down in Annex 2 to the ordinance. DEPA may in the approval lay down additional conditions on the self-monitoring to be carried out;
- The company measures emissions from combustion plants, in accordance with the rules laid down in Annex 2 to the ordinance;
- DEPA supervises that the provisions of this Ordinance will be complied with.

Section 5.4.2.1 provides an estimate of the GHG emissions to the atmosphere arising from the project activities. Section 5 addresses the potential impacts related to air and GHG emissions.

All vessels and the jack-up rig used for the project will comply with the international requirements stated in the revised MARPOL Annex VI Prevention of Air Pollution from Ships.

European Union Emissions Trading Scheme (EU ETS)

Denmark has developed and adopted policies on climate change mitigation which are driven by compliance with international climate obligations set within the EU and UN, and by achievement of

[12] Lat: 55°33'41.06"N; Long 8° 4'18.36"E
[13] https://www.retsinformation.dk/eli/lta/2012/1449

specific national targets. The regulatory framework for the Danish climate related policies is laid out in the Danish climate law, such as the European Union Emissions Trading Scheme, the Climate Act, Denmark's Integrated National Energy and Climate Plan and the Energy Agreement (Annex A).

The EU ETS was launched in 2005 to combat climate change and is a major pillar of EU climate policy. Under the 'cap and trade' principle, a cap is set on the total amount of greenhouse gases that can be emitted by all participating installations. The cap is reduced over time so that total emissions fall. Within the cap, companies receive or buy emission allowances which they can trade with one another as needed. They can also buy limited amounts of international credits from emission-saving projects around the world. The limit on the total number of allowances available ensures that they have a value. After each year a company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed.

If a company reduces its emissions, it can keep the spare allowances to cover its future needs or else sell them to another company that is short of allowances. In Denmark, the Danish Business Authority manages all Danish accounts in the EU ETS Registry. The scheme covers offshore Installations for energy production exceeding 20 MW.

Section 5.4.2.1 provides an estimate of the GHG emissions to the atmosphere arising from the project activities and addresses the potential impacts due to air and GHG emissions.

2.2.4 Other Legislation, International Conventions and Project Implications

Table 2.1 presents a summary of other legislation and international conventions that are relevant to the DEWTA project. Annex A provides a full summary of the legislation summarized in Table 2.1.

Table 2.1 Summary of Other Legislative Requirements and Applicability

Id	Item	Summary	Relevance to the DEWTA project	Relevant Chapters/Sections in this Report
	EU Directives and National Legislation			
1.	Danish Fishery Act (LBK no. 17 of 04/01/2017, Ministry of Food, Agriculture and Fisheries)[14]	The Act sets regulations on fisheries management with the purpose of protecting living resources in marine and fresh-water and for protecting other marine animals and plants, to safeguard commercial fishing and related commercial activities. The impact a project will have on fishing grounds must be assessed and addressed, if relevant, according to the Act.	The project area is within the Central North Sea fishing area which extends over 280,000 km^2 from the western coast of Jutland to the eastern coast of the UK.	Chapter 5 Impact Assessment
2.	Law on Ionizing Radiation and Radiation Protection (LOV no. 23 of 15/01/2018, DHARP)[15]	The purpose of the Act is to minimize the population's exposure to anthropogenic and natural radiation and dispersal of radioactive material in the environment, to the extent it is realistically possible.	NORM generated by the DEWTA project will be collected and handled according to normal TEPDK procedures under the current permits and in compliance with Danish legislation.	Planned Emissions and Discharges, Waste Management (Section 3.6.7)
3.	Executive Order on Transboundary Shipments of Radioactive Waste and Spent Nuclear Fuel (BEK no. 672 of 01/07/2019, DHARP)[16]	This Executive Order describes the authorization and reporting procedures to be observed for transboundary shipments of radioactive waste and spent nuclear fuel if the activity and activity concentration of a consignment exceed the values in Annex 3 of Executive Order no. 670 of 01/07/2019[17] on Use of Radioactive Substances.	NORM generated by the DEWTA project will be collected and handled according to normal TEPDK procedures under the current permits and in compliance with Danish legislation.	Planned Emissions and Discharges, Waste Management (Section 3.6.7))
	International Conventions			

[14] https://www.retsinformation.dk/eli/lta/2017/17
[15] https://www.retsinformation.dk/eli/lta/2018/23
[16] https://www.retsinformation.dk/eli/lta/2019/672
[17] https://www.retsinformation.dk/eli/lta/2019/670

Id	Item	Summary	Relevance to the DEWTA project	Relevant Chapters/Sections in this Report
1.	United Nations Convention of the Law of the Sea (UNCLOS) (Montego Bay, 10 December 1982)	An international treaty concerned with the territorial seas and the contiguous zone, the continental shelf, the high seas, fishing and conservation of living resources on the high seas.	This convention establishes the rights of the coastal states, including navigation rights and the exploration for and exploitation of resources, such as oil and gas.	Chapter 4 Baseline: Navigation, Marine Spatial Planning
2.	International Maritime Organisation (IMO) Conventions	The UN specialised agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships.	The conventions include control and management of ballast water and sediments, harmful anti-fouling systems on ships, liability of oil pollution damage, oil preparedness, response and co-operation, pollution from ships and dumping of wastes and other matter.	Chapter 5 Impact Assessment: Oil Spills Air Quality and Emissions
3.	The MARPOL 73/78 Convention	The international convention for the Prevention of Pollution from Ships addresses pollution by oil, liquid substances, harmful substances, sewage, garbage, and air pollution.	MARPOL 73/78 contains several provisions relevant to the DEWTA project including requirements regarding waste management, oil contaminated water discharges (e.g., bilge water), and grey and black wastewater discharges.	Chapter 5 Impact Assessment: Discharges, Air Quality and Emissions
4.	The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) (Paris, 22 September 1992)	The convention focuses on prevention and control of pollution from different types of activities and has a focus on precaution through Best Available Technique (BAT), Best Environmental Practice (BEP) and clean technologies.	Strategies and recommendations relevant to the DEWTA project include the annual OSPAR report on discharges, spills and emissions from offshore oil and gas installations, management of produced water discharges, control system of discharged chemicals, list of substances/preparations used and discharged offshore, and disposal of disused offshore installations.	Chapter 5 Impact Assessment: Discharges, Air Quality and Emissions, Decommissioning, Waste
5.	Code of Practice on the International Transboundary Movement of Radioactive Waste (IAIA, 21 September 1990)	The Code establishes that every state should take the appropriate steps to ensure that radioactive waste within its territory, jurisdiction or control is safely managed and disposed of, to ensure protection of human health and the environment.	NORM generated by the DEWTA project will be collected and handled according to normal TEPDK procedures under the current permits and in compliance with Danish legislation.	Chapter 5 Impact Assessment: Waste and Naturally Occurring Radioactive Material (NORM), Code of Practice on the International Transboundary Movement of Radioactive Waste

Id	Item	Summary	Relevance to the DEWTA project	Relevant Chapters/Sections in this Report
6.	Basel Convention (22 March 1989)	To protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous and other wastes.	The Basel Convention is fully incorporated into Danish law. Wastes will be produced, collected, and handled within the DEWTA project according to normal TEPDK procedures under the current permits and in compliance with international and Danish legislation.	Chapter 5 Impact Assessment: Waste
7.	London Convention (1972) and Protocol (1996)	To promote the effective control of all sources of marine pollution and to take all practicable steps to prevent pollution of the sea by dumping wastes and other matter.	The London Convention and London Protocol are fully incorporated into Danish law. The project has precautions such as BAT, BEP and clean technology in place to prevent pollution.	Chapter 5 Impact Assessment: Discharges, Waste
8.	United Nations Framework Convention on Climate Change (UNFCCC) (Rio de Janero, 1992)	Under the convention, developed countries are required to take measures aimed at reducing emissions of GHG, particularly CO_2 and to assist developing countries.	The convention came into force in 1994 in Denmark. The project works with the UNFCCC and the annual OSPAR report to reduce, control and report GHG emissions, including CO_2.	Chapter 5 Impact Assessment: Air Quality and Emissions
9.	Convention on Biological Diversity (Montreal, 2022)	Convention to conserve biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits from the use of genetic resources.	The convention came into force in 1994 in Denmark. The project assesses potential impacts to biological receptors and to biodiversity.	Section 5 Impact Assessment: Impacts to biological receptors
10.	Ramsar Convention (1971)	An intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	Denmark currently has 43 designated sites as Wetlands of International Importance including along the west coast of Denmark. The closest to the DEWTA project is 'Vadehavet' approximately 182 km to the east on the Danish coast	Chapter 4 Baseline: Protected and Internationally Recognised Areas
11.	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS) (New York, 1992).	ASCOBANS was concluded under the auspices of the Convention on Migratory Species in 1991. It was incorporated into Danish law in 1994. The parties under this agreement will undertake to cooperate closely to achieve and maintain a favourable conservation status for small cetaceans.	SCANS surveys observed that between 1980 and 2018, cetacean species were found in the DEWTA project area such as minke whale, white-beaked dolphin, harbour porpoise, short-beaked dolphin, Atlantic white-sided dolphin and Risso's dolphin.	Chapter 4 Baseline: Marine Mammals Chapter 5 Impact Assessment

Id	Item	Summary	Relevance to the DEWTA project	Relevant Chapters/Sections in this Report
12.	World Heritage Convention – UNESCO World Heritage Site (Paris, 1972)	A World Heritage Site is an area with legal protection by an international convention administered by UNESCO. World Heritage Sites are designated for having cultural, historical, scientific or other form of significance.	The Wadden Sea on the Danish west coast is protected as a United Nations Educational, Scientific and Cultural Organisation (UNSECO) World Heritage site.	Chapter 4 Baseline: Protected and Internationally Recognised Areas
13.	Convention on the Conservation of Migratory Species of Wild Animals (CMS) or Bonn Convention (Bonn, 1979)	The convention provides a global platform for the conservation and sustainable use of migratory animals and their habitats. The CMS aims to conserve terrestrial, aquatic and avian migratory species throughout their range.	Migratory species use North Sea waters for feeding and to overwinter or pass through outside of the breeding season. There were 15 seabirds identified during a three-year monitoring survey of the project area (Skov & Piper, 2009). Fish and marine mammals are also known migratory species present within the DEWTA project area.	Chapter 4 Baseline: Biological Environment – Ornithology, Marine Mammals, Fish Chapter 5 Impact Assessment

2.3 TotalEnergies Standards

All work conducted for the DEWTAESIA will consider the TotalEnergies' standards and guidelines as described in Table 2.2.

Table 2.2 TotalEnergies Standards

Standard		Description
GS EP ENV 001 (May, 2015)	Environmental requirements for projects design and E&P activities	To reduce any significant impact of the future activities on the natural and human environment, mitigation measures shall be identified and selected according to the BAT concept and approved by Company. The EIA study requirements, when available, shall be integrated in the design definition. The standard includes: Environmental footprint, flaring and GHG emissions, other atmospheric emissions, liquid effluents, waste management, drilling fluids and cuttings, chemicals, noise level, spill response equipment and decommissioning of installations.
GS EP ENV 112 (January, 2017)	Environmental baseline and monitoring studies in Offshore and Coastal Waters	The objective of the Environmental Baseline Study (EBS) or reference status of an offshore or a nearshore site is to describe, before starting any new E&P project, the physic-chemical, biological, and general socio-economical characteristics of the site and highlight its main sensitivities. Any existing contamination of the natural environment by pollutants shall be identified and clearly assessed, in particular that related to oil industry activities. The EBS shall also provide an evaluation of the capacity of the disturbed environment for natural self-restoration. The objective of the Environmental Monitoring Study (EMoS) is to assess the site conditions at regular intervals during the operation phases or after the end of activities, and to compare to the original reference status.
GS EP ENV 120 (December, 2019)	Environmental impact assessment of E&P activities	The object of the present specification is to define the requirements for the preparation of an EIA study, and to provide the Contractor in charge of the study with instructions for its design and presentation. The EIA study begins by a description of the project objectives and technical aspects and includes a presentation of the main EBS results and socio-economic conditions. It gives a detailed description of the effects and potential impacts of the project on the natural and human environment, and of their extent. The measures envisaged for eliminating, limiting or offsetting such impacts are analysed, the substantiation for the chosen solutions in the light of the different alternatives proposed is provided, and the level of significance of the residual impacts after their implementation is assessed. Finally, the EIA study provides recommendations for the implementation of an Environment Management Plan (EMP), consisting of monitoring and audit programs, contingency plans, etc., during the construction, development, production and decommissioning phases.
GS-GR-HSE-412 (August 2022)	GIS deliverables for HSE	The objective of the present General Specification is to define the requirements to implement a Geographical Information System (GIS) with data generated in the context of HSE activities.
GM EP SDV 205 (June, 2017)	Guide and Manual for Stakeholder Engagement	The Guide and Manual sets out how to ensure meaningful engagement with all stakeholders and particularly with those people potentially affected by TotalEnergies' operations. It gives guidance on the methods to be used and on the development of a stakeholder engagement plan.
GS EP SDV 101 (May, 2015)	Social Baseline Study	This General Specification defines the Company requirements for establishing a Social Baseline Study (SBS). It is the basic standard required by the Company and sets out the study content, phases and expected results. Local laws and rules must be respected, and further specific conditions added if necessary.

Standard		Description
GS EP SDV 102 (May, 2015)	Social Impact Assessment (SIA)	The results of the SBS lead to an understanding of the project's socio-economic and human rights context. The SIA identifies the potential positive and negative social impacts of the project, particularly adverse human rights impacts, and engages with stakeholders on potential impacts. The Consultant is required to examine whether impacts of any sort also have negative human rights consequences.
GM EP ENV 124 (June, 2017)	Estimation, monitoring and reporting of atmospheric emissions	Provides the method to be followed for estimating, monitoring and reporting on atmospheric emissions. Methods for calculating GHG emissions and for estimating emissions from flaring are described. It applies to E&P activities.

3. PROJECT DESCRIPTION

3.1 Introduction and Source of Data

This chapter describes the scope of the DEWTA project and includes all the activities that will take place. The description is based on the following documents and direct input from the TEPDK project team:

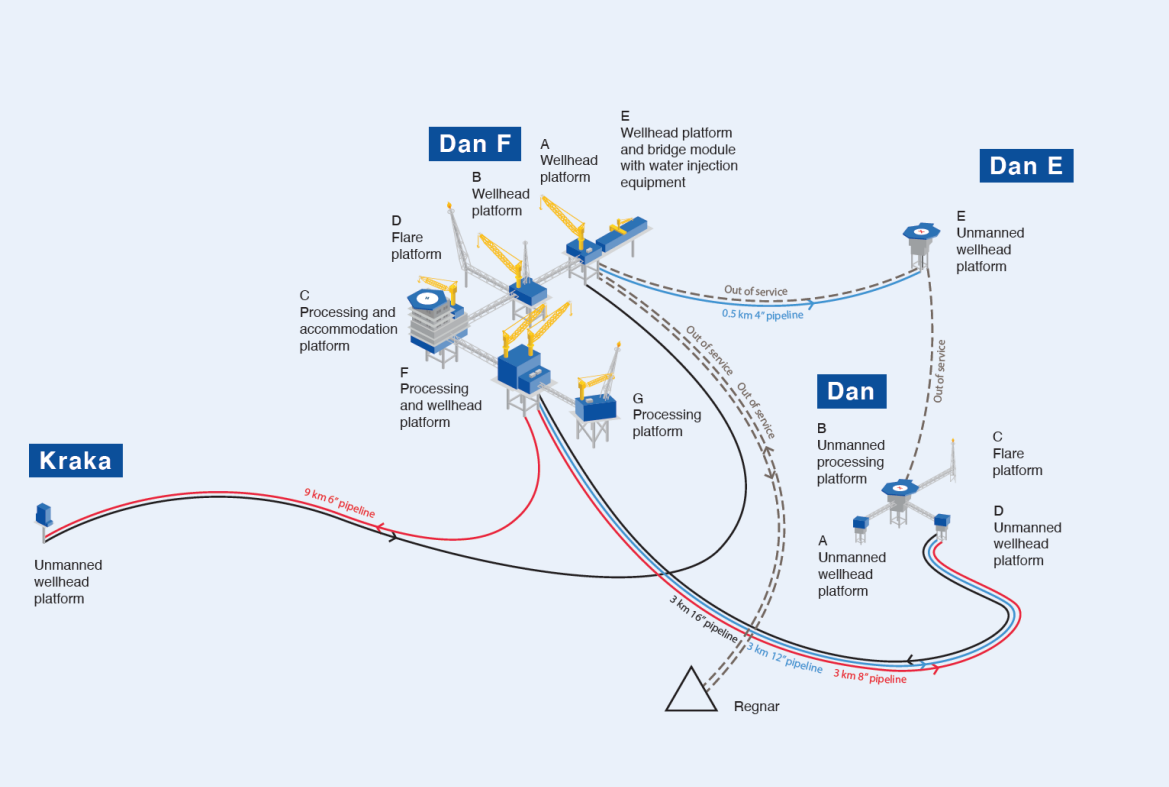
- Dan E General Project Description (TEPDK, 2023a);
- Dan E Project Review (TEPDK, 2023b);
- Dan E Estimated Chemical Use and Discharge (TEPDK, 2023c).

3.2 Project Location and Background

The DAN Field is in the Danish EEZ, approximately 185 km west of the Danish coastline and about 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. Figure 3.1 depicts an overview of the existing pipelines and infrastructure for the DAN Field.

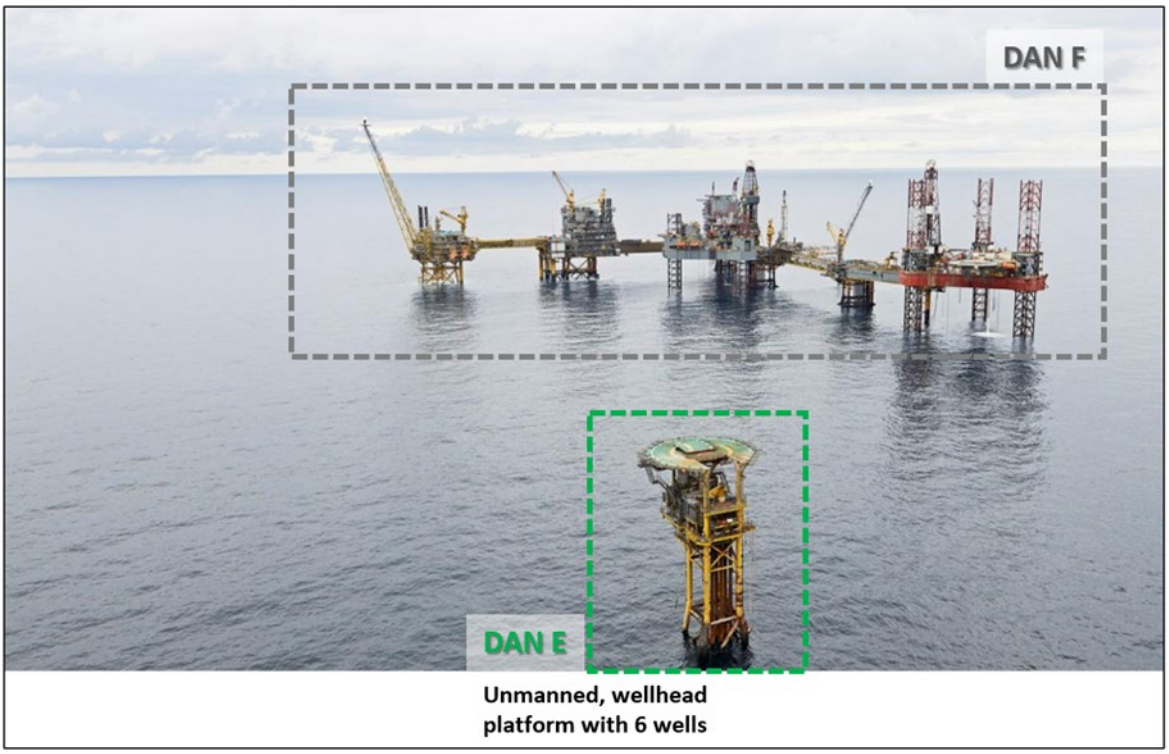
The main processes at the Dan facilities include separation and stabilisation, gas compression and dehydration, and water injection. There are 123 wells amongst the different platforms. Dan F consists of seven platforms connected by bridges and is the primary processing platform for the entire oil production from the DAN Field. Dan B includes a processing and accommodation platform, two wellhead platforms, and a flare platform. Dan E is a wellhead platform (Figure 3.3) and the location of the DEWTA project activities. The water depth is approximately 45 m.

Figure 3.1 Overview of Facilities in the DAN Field



Source: TEPDK, 2021

Figure 3.2 Dan F and Dan E Platforms – Aerial View



Note: Dan E coordinates (WGS84): Lat: 55° 28' 50.472" N; Long: 05° 06' 58.442" E

Source: TEPDK, 2023

The Dan E wells (DE-01, DE-02, DE-03, DE-04, DE-05 & DE-06) were drilled in 1976 and were originally oil producers. In 1996 four wells were converted to water injection wells and in 2013 two wells (DE-03 and DE-04) were temporarily abandoned. The platform has been shut down since 2018 and has no power supply.

Figure 3.3 Dan E Wellhead Platform

Source: TEPDK, 2023

3.3 Planned 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. For the temporary well abandonment, the “Two Barrier Policy” is applicable. The “Secondary Well Barrier” isolating the shallowest Individual Zone for Isolation (IZI) from the ground / seabed can be Temporary (containing at least one Temporary Barrier Element), with all the other Well Barriers being Permanent including isolation between IZIs. Refer to Section 3.3.5 for a detailed description of temporary abandonment activities.

3.3.1 Proposed Workflow

The proposed workflow for the DEWTA project is shown in Table 3.1.

Table 3.1 Proposed Workflow Process

Proposed Temporary Abandonment Workflow		
Task	**DE-01**	**DE-02**
1	Rig move /Skid over well	Skid over well

2	Recover the completion	Recover the completion
3	Base case is section mill 200 ft. of 7” casing above the Ekofisk (600 ft)	Base case is section mill 200 ft. of 7” casing above the Ekofisk (600 ft)
4	Base case is section mill 200 ft. of 7” casing above the Upper Lark (600 ft)	Base case is section mill 200 ft. of 7” casing above the Upper Lark (600 ft)
5	Set on combination plug/ two single plugs inside 9-5/8” casing above the Paleocene reservoir	Set on combination plug/ two single plugs inside 9-5/8” casing above the Paleocene reservoir

Source: TEPDK, 2023

The DEWTA project activities comprise the initial stage of well abandonment, the inner completion string will be removed from both wells, then the two lower isolation plugs only for the Ekofisk and Upper Lark respectively and to set an environmental plug above the Paleocene reservoir.

3.3.2 Schedule

TEPDK plans the DEWTA project in Q4 2023 (Table 3.2). The estimated project period is 99 days.

Table 3.2 Schedule

Task/ Days	Q4 2023		
Phase 1: Mobilization (Rig Move)			
Rig Move	9 days		
Phase 2: Well Temporary Abandonment			
DE-01		45 days	
DE-02			45 days

Source: TEPDK, 2023

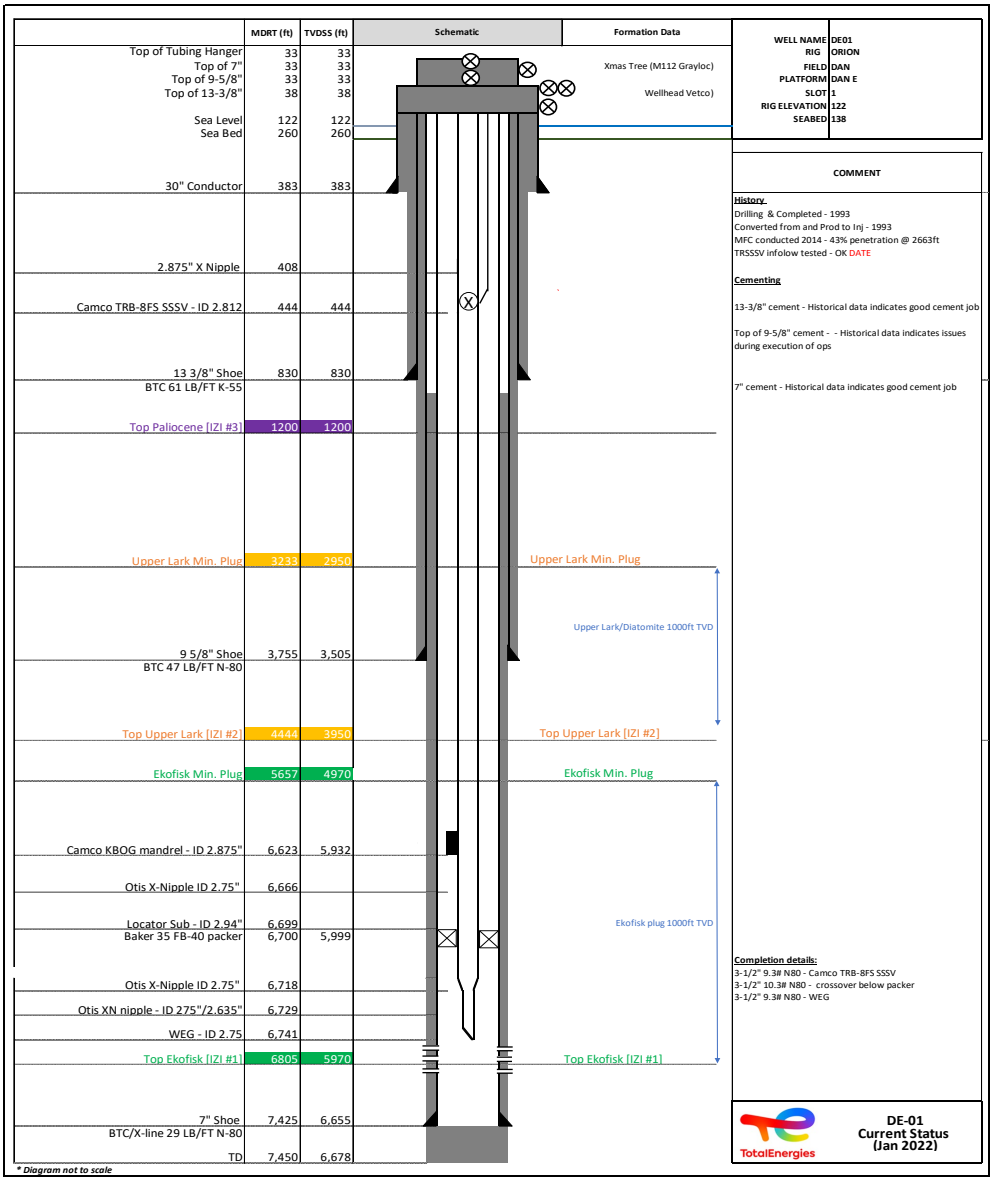
The expected schedule and the mobilization plan is as follows:

- Phase 1: The jack-up rig is mobilized to Dan E from Halfdan supported by 3 tugs and 1 supply vessel. This activity will last approximately 9 days. Once the jack-up rig is in place, it will not be moved during project activities.
- Phase 2: The wells DE-01 and DE-02 will be temporarily abandoned. This phase will last approximately 90 days, 45 days per well. The temporary abandonment activities include casing milling, well flushing and well plugging with cement.

3.3.3 Reservoirs/Well Status

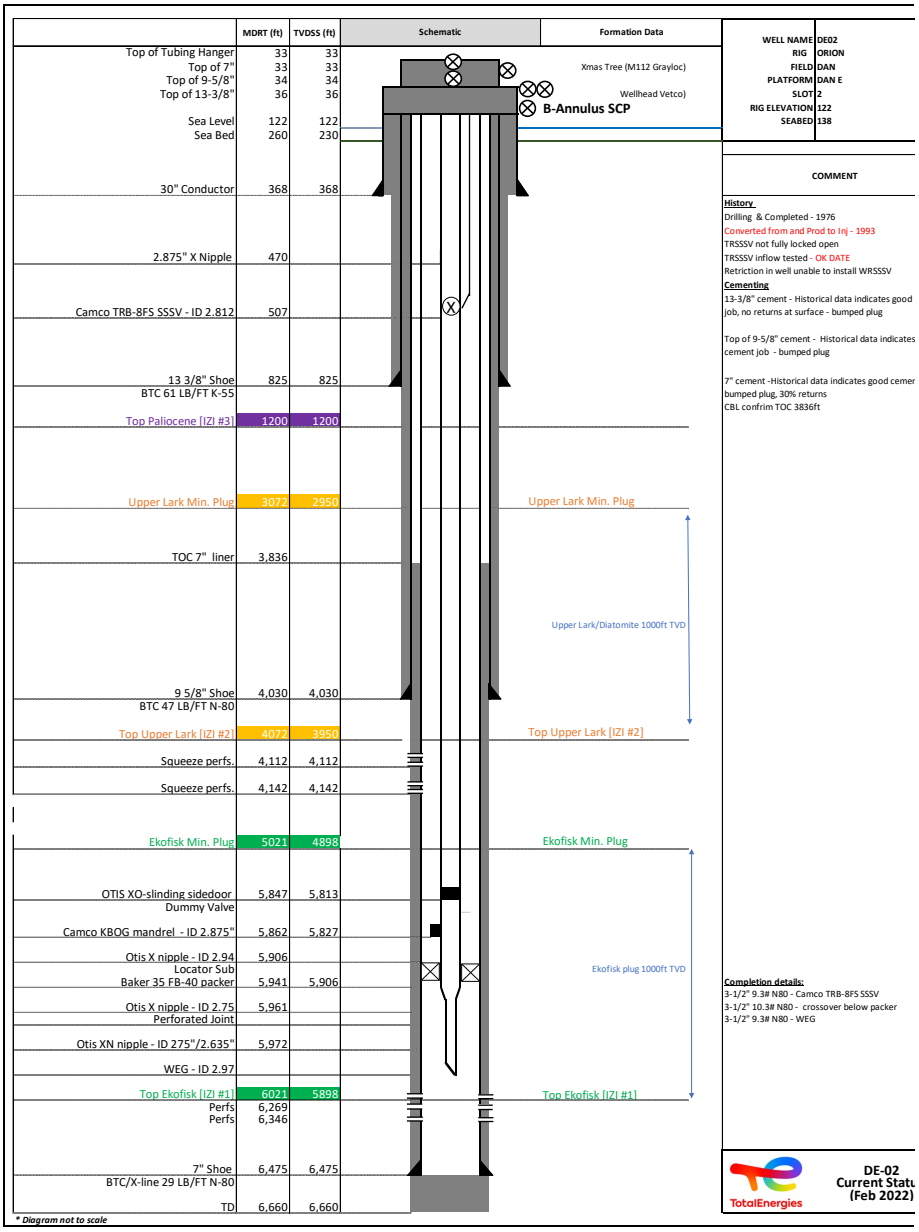
The Dan E platform has been shut down and water injection stopped since 2018, due to an electrical fire in the control room. The platform has been without power since. Wellheads and Xmas Trees (well control section that sits above the wellhead) are obsolete and most spare parts are difficult to source or are unavailable. Two of the wells (DE-03 and DE-04) were temporarily abandoned in 2013. The DE-01 and DE-02 wells have sustained casing pressure and recent investigations show that both wells only have one barrier (tubing and packer) between the reservoir and the surface. The initial risk assessment identified hazards such as degraded process lines and well integrity deterioration and as corrective action it was decided to initiate the abandonment process of Dan E (TEPDK, 2023f). Therefore, DE-01 and DE-02 shall be temporarily abandoned. Information about well DE-01 and DE-02 is provided in Table 3.3 and Table 3.4.

Table 3.3 DE-01 Well Information

Well Name	**DE-01**
License Area:	1962 contiguous area
Well Status:	■ Historical Sustained casing Pressure ■ Recent investigation indicates connection between B-section and C-section ■ B-Section cannot withstand current Tubing Pressure ■ Well has BTC connections on 7'', 9-5/8'' and 13-3/8'' which are not gas tight
Operator:	TotalEnergies EP Danmark A/S
Partners:	Noreco Olie-og Gasudvinding Danmark B.V. TotalEnergies Denmark ASW ASW, INC., USA Nordsøfonden
Schematic:	
Location:	N55° 28' 53.027"; E5° 7' 3.567"

Source: TEPDK, 2023

Table 3.4 DE-02 Well Information

Well Name	DE-02
License Area:	1962 contiguous area
Well Status:	■ Historical Sustained casing Pressure ■ Recent investigation confirms connection between B-section and C-section ■ B-Section cannot withstand historical recorded Tubing Pressure (max recorded: 2800 psi, 1650 psi in April 2022) ■ Well has BTC connections on 7'', 9-5/8'' and 13-3/8'' which are not gas tight
Operator:	TotalEnergies EP Danmark A/S
Partners:	Noreco Olie-og Gasudvinding Danmark B.V. TotalEnergies Denmark ASW ASW, INC., USA Nordsøfonden
Schematic:	
Location:	N55° 28' 52.982" E5° 7' 3.67"

Source: TEPDK, 2023

3.3.4 Phase 1: Mobilization

3.3.4.1 Mobilization of the Jack-Up Rig

A standard specification (harsh environment) North Sea jack-up rig will be required for the project activities. A typical jack-up rig (see Figure 3.4) consists of a buoyant steel hull with three lattice legs along which the hull can be 'jacked' up and down.

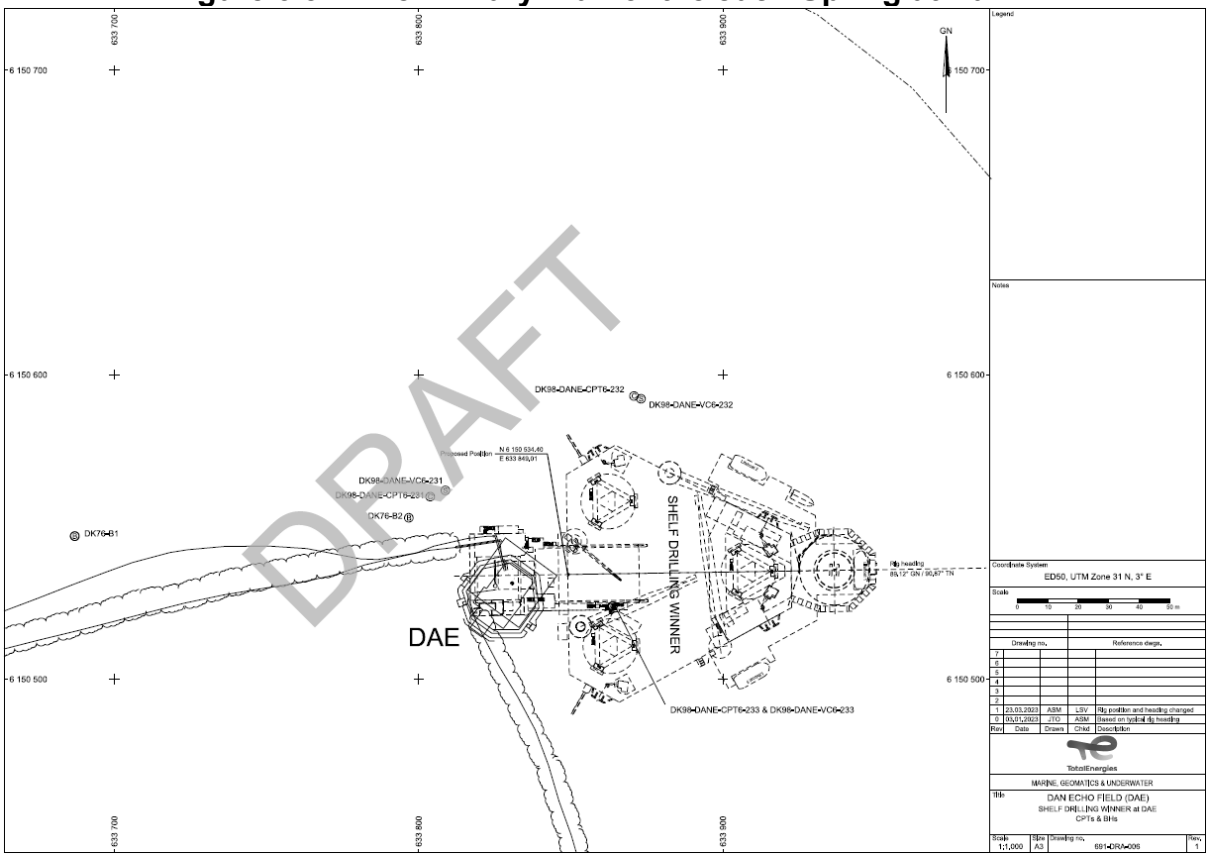
Figure 3.4 Typical Jack-Up Rig

The rig will be mobilized and skidded over each well for the temporary abandonment of both wells (DE-01 and DE-02). 3-4 anchors are usually used to support positioning of the rig close to the platform.

When the rig is in the right position, the rig will jack down its legs until the spud cans[18] are securely positioned. The hull will then be raised, and the anchors will be retrieved. Each spud has a diameter of 16 m. The footprints of the jack-up rig are approximately 201 m^2 per spud can (total area of 603 m^2). Figure 3.5 shows the preliminary plan for the jack-up positioning.

[18] Spud cans are inverted cones mounted at the base of the jack-up rig that provide stability to lateral forces on the jack-up rig.

Figure 3.5 Preliminary Plan of the Jack-Up Rig at Dan E



Source: TEPDK, 2023g

A 500 m operational safety zone will be imposed around the rig during project activities. Approximately 105 people will be operating on the rig.

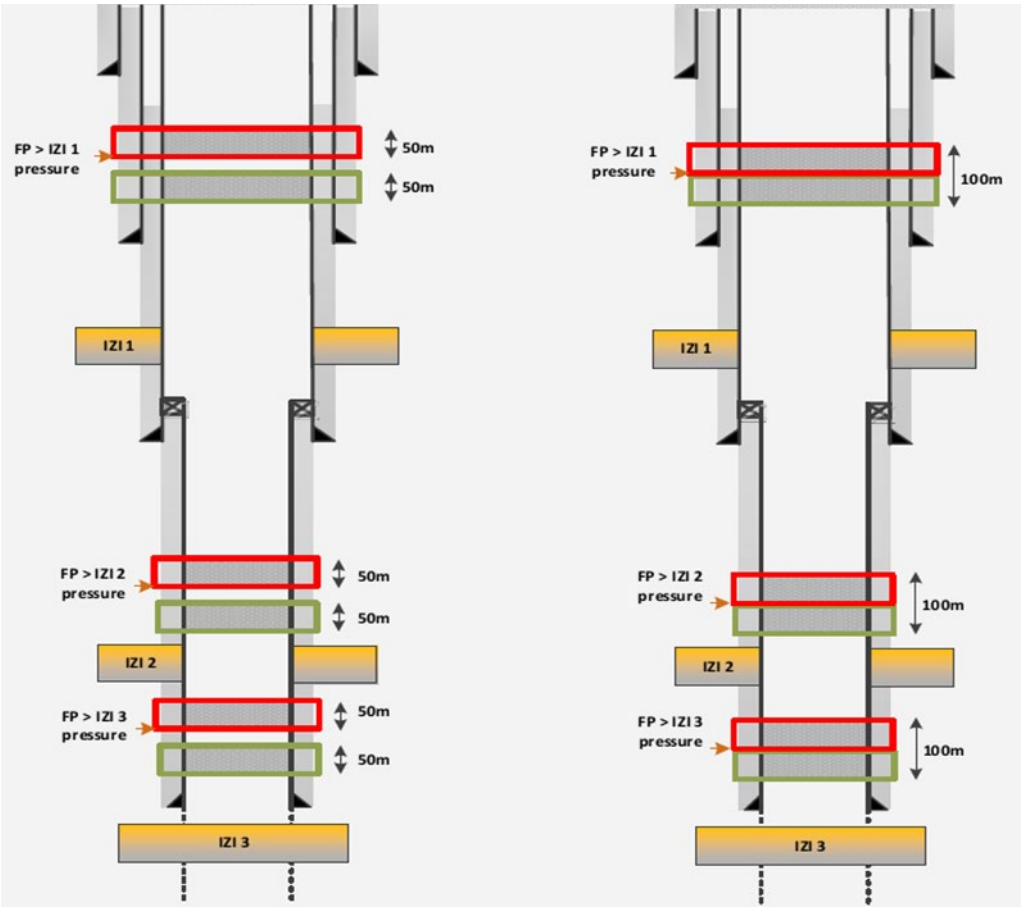
3.3.4.2 Support Vessels

During the temporary abandonment, the jack-up rig will be supported by platform supply vessels (PSVs), which are general purpose vessels designed to carry out a variety of equipment and cargo. Esbjerg will be the main hub for logistic support activities. There will be approximately three support vessel visits per week. The jack-up rig will also have a dedicated standby vessel (SBV). Approximately 5 personnel will operate each vessel.

3.3.5 Phase 2: Wells DE-01 and DE-02 Temporary Abandonment

The DEWTA project activities comprise the initial stage of well abandonment, which is to establish the two lower isolation plugs for the Ekofisk and Upper Lark respectively and to set an environmental plug above the Paleocene reservoir (Figure 3.6). As stated in Section 3.3, temporary abandonment means that the well at some unspecified point in the future will be permanently abandoned.

Figure 3.6 Well Abandonment-General Case



Source: TEPDK, 2023

3.3.5.1 Well Flushing

Inhibited seawater (seawater containing oxygen, H_2S scavengers and corrosion inhibitors) will be used to flush / bullhead all contents into the reservoir. Once the well contents have been bullheaded into the reservoir, clean inhibited seawater will be circulated in the well. Approximately 3,600 bbl of clean inhibited seawater may be used while temporarily abandoning the two wells. All inhibited seawater returns will be sampled using a centrifugal tester and any inhibited seawater returns with a hydrocarbon concentration above 30 mg/l will be contained and returned to shore for treatment and disposal. Inhibited seawater with a hydrocarbon concentration below 30 mg/l will be discharged. The environmental assessment has considered 3,600 bbl of discharged inhibited seawater from a conservative point of view. All chemicals used for inhibited seawater are listed in Table 3.5 and approved for discharging by DEPA.

3.3.5.2 Casing Milling

Milling is the cutting or removal of material from equipment or tools located in the well bore. For the temporary abandonment of DE-01 and DE-02, after the cement bond log has been completed and interpreted for the cement quality, the selected method will be executed and the base case for this application is section milling with cement plug placed afterwards.

Approximately 2,100 mT of water-based mud (WBM) will be used as milling fluid for the two wells. WBM comprises a specially formulated mixture of natural clays, polymers, weighting agents and/or other materials suspended in a fluid medium. Typically, the major ingredients that comprise over 90% of the total mass of the WBMs are freshwater or seawater, barium sulphate (barite), bentonite clay,

liquid viscosities and caustic soda. Other substances are added to gain the desired density and drilling properties.

The milled solids (swarf) will be removed from the WBM using magnets; the WBM will no longer be used once its specification cannot be maintained or the milling is over. All swarf will be retained and returned to shore for processing and disposal,

The estimated swarf volume is 9,700 lbs (4,400 kg). Nearly all of WBM is expected to be collected at surface and sent back onshore. A maximum of 10% (210 mT) of WBM (without swarf), can be discharged to the sea during operations and is considered as conservative estimate for this impact assessment. All chemicals used for WBM are listed in Table 3.5 and approved for discharging by DEPA.

3.3.5.3 Well Plugging– Cement Plugs

Wells will be secured with seawater and weighted with Glycol mud (14 pounds per gallon (ppg)). A cement slurry comprising a Class G cement with additives (e.g., retarder and fluid loss reducer to make the cement gas tight) and Microbond HT to enhance the properties for plugging, will be used for the cement plugs in each of the wells. Approximately 130.4 tonnes 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. Slight variations in down-hole or casing diameters can however have implications for the calculated volumes due to plug length and well diameter. 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 in case of milling and 51.4 mT in case of PWC)) may be discharged to the environment at the sea surface.

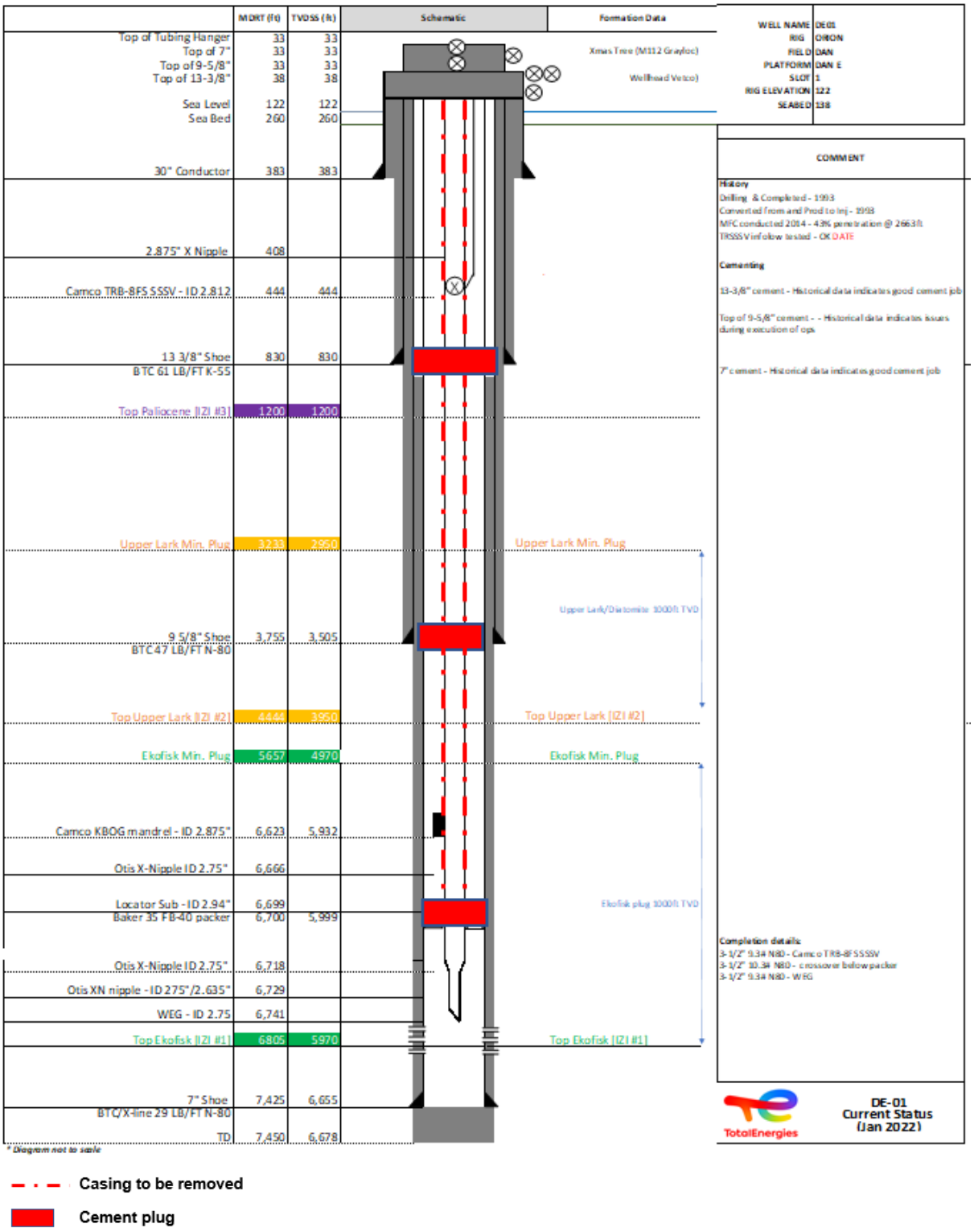
The cement that may be discharged at the sea surface during planned operation is only used cement that was mixed for the specific well and pumped through the cement pumps for the well activities.

The unavoidable discharge could be 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 (due to casing having slightly different diameter than expected) 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.

Figure 3.7 shows the well indicating the location where the cement plug is to be placed.

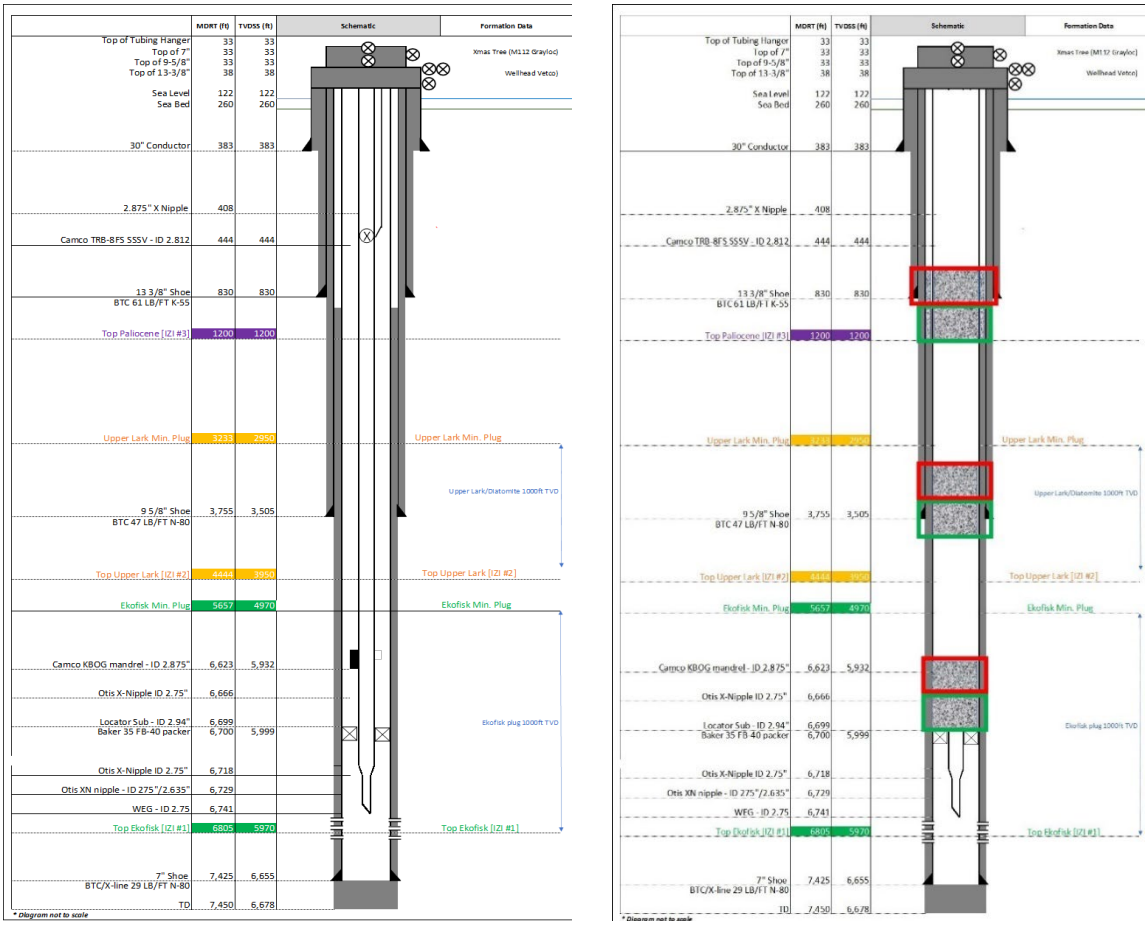
Figure 3.7 Location of Environmental Plugs in the Well



Source: TEPDK (2023)

Figure 3.8 shows an example of the well prior to and after cementing for temporary abandonment.

Figure 3.8 Example of a Well before and after Temporary Abandonment



Source: TEPDK (2023)

3.3.5.4 *Platform Brownfield Works*

The Dan E platform (e.g., jacket and topsides) will not be modified in any way during the proposed activities. The platform will not be decommissioned, as decommissioning will be undertaken in the future as part of the DAN Field decommissioning program.

3.3.6 Shore Base, Infrastructure and Support Services

Esbjerg will be the main hub for logistic support activities for the DEWTA project. Existing logistics and services will meet project requirements. The standard type of services required for the onshore base include the following:

- Offices (with communications and emergency procedures/ facilities);
- Stevedoring services;
- Equipment storage and transportation services;
- Fuel supply;
- Water supply; and
- Handling and storage services for chemicals and hazardous materials and wastes.

Vessels expected to be required are:

- The routine maintenance and supply vessels;
- A standby vessel; and

- A jack-up rig.

3.3.7 Transportation

Personnel will be transported to and from the rig via helicopter and equipment via supply vessels. Standby vessels may be employed in connection with the temporary abandonment at Dan E.

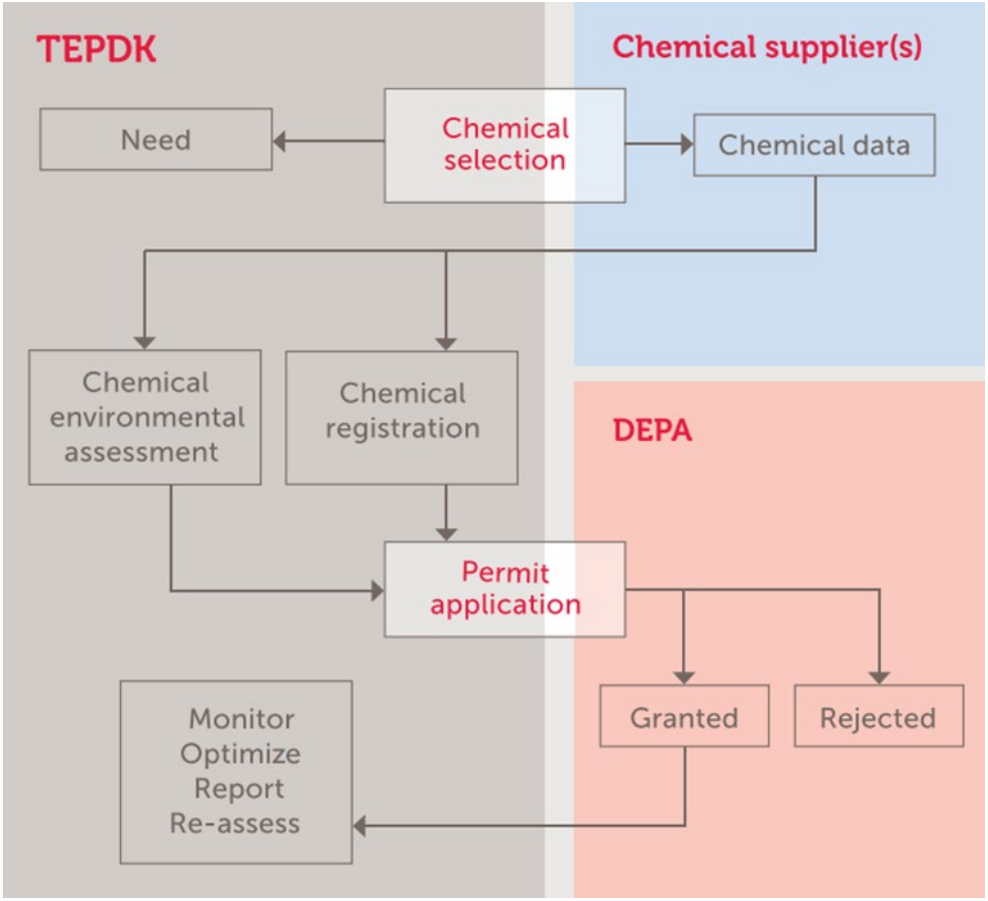
It is estimated 4 helicopters per well and 18 personnel onboard each journey.

3.3.8 Chemical Use and Discharge

Chemicals will be used in the temporary abandonment of the DE-01 and DE-02 wells. Some chemicals are added to the water-based mud to optimize the process, and some are used in the cementing.

Chemicals are used during project activities for technical, safety and environmental reasons. Prior to use, the chemicals are tested by a third-party laboratory to determine whether their components could bio-accumulate or are toxic and/or slow to biodegrade. The chemical vendor issues a certificate, called a Harmonized Offshore Chemical Notification Format (HOCNF), and the results are used to assess the OSPAR chemical classification. DEPA regulates chemical use and discharge through a permitting process (Figure 3.9). As a general practice, TEPDK fills in a permit application with an estimate of expected use and discharge to DEPA, which evaluates the products and decides whether the chemical can be used under the terms described in the application. The expected total use and discharge quantities for the two wells (including the conservative case scenario) have been compared with the already permitted quantities for 2023 (Table 3.5) and a new application will be submitted to DEPA for 2024.

Figure 3.9 TEPDK´s Chemical Permitting Procedure



Source: TEPDK, 2019

As presented in Table 3.5, TEPDK currently anticipates that no chemicals classified as ”Red” (see Section 2.2.3.4 for classifications) will be used in the DEWTA project. However, should a specific circumstance arise which requires their use, TEPDK will submit the permit requests to DEPA. Applications for red chemicals that can be discharged to the environment require a thorough assessment considering all technical, health, safety and environmental (HSE) aspects. The chemicals will either be "Green" (PLONOR) or "Yellow". The use of permitted chemicals will be monitored regularly. Annual reports on the use and discharge of chemicals will be submitted to DEPA.

The cementing, WBM and inhibited seawater chemicals for the temporary abandonment of wells DE-01 and DE-02 can be seen in Table 3.5, which also shows expected total use and discharge for the two wells. Table 3.5 includes the estimated chemicals including those used and discharged in case of using the PWC method (see Section 3.5.7) instead of milling.

Table 3.5 Use and Discharge of Chemicals during Well Temporary Abandonment

Activity	PR number	Color code	Chemical	Function	Expected use [mT]	Expected discharge [mT]	Permitted use for Well Activities Dan 2023 [mT]	Permitted discharge for Well Activities Dan 2023 [mT]	Permitted Discharge of Corresponding Chemical (%)
Cementing	1301850	Green	Tuned Spacer E+	Mud push spacer	8 *(12)*	1.6 *(2.4)*	20	20	8% *(12%)*
	4100173	Yellow	SEM-1205	Surfactant – for oily surface	4 *(6)*	0.8 *(1.2)*	6.67	6.67	12% *(18%)*
	1191209	Yellow	NF-6	Antifoam	2 *(3)*	0.2 *(0.3)*	3.33	3.33	6% *(9%)*
	1676804	Yellow	Musol Solvent	Surfactant - for oily surface	4 *(6)*	0.8 *(1.2)*	47.33	45	2% *(3%)*
	1496408	Green	Microsilica Liquid F	Slurry stabilizer	6	0.6	73.91	18.48	3%
	4152053	Green	MicroBond HT	Gas migration control agent	4.8	0.48	9.3	4	12%
	2416756	Green	HR-4L	Cement setting time retarder	1	0.11	28.1	5.6	2%
	2182259	Yellow	Halad-300L NS0.	Fluid Loss Additives	6	0.6	26.59	3.32	18%
	360576	Green	Dyckerhoff G Cement	Cement	160	32	466.7	200	16%
	1882771	Yellow	CFR-8L	Dispersants - Thinners	1.1	0.095	7.98	1.6	6%
	213808	Green	CaCl2	Cement setting time accelerator	4	0.4	13.2	4.6	9%
	1154758	Green	Barite	Weighting agent for Cement Spacer	60	12	2000	1800	1%
Total Cementing Chemicals					**260.9 *(269.9)***	**49.7 *(51.4)***			
Mud	1097482	Green	Calcium Carbonate	Bridging agent for losses	12	1.2	200	66.7	2%
	701692	Green	Citric Acid	pH Control	6	0.6	66.67	13.33	5%
	2429813	Yellow	Defoam Plus NS	Defoamer	2	0.2	12.8	6.4	3%
	1113008	Yellow	Glydril MC	Shale inhibitor	48	4.8	66	52.8	9%
	1164884	Green	KCL Brine	Shale inhibitor	800	80	800	800	10%
	1857541	Yellow	MB-5111	Bactericide	2	0.2	9.14	9.14	2%
	1463657	Green	M-I Pac	Fluid Loss Additives	20	2	100	93.3	2%
	336787	Green	Sodium Bicarbonate	Calcium Control	20	2	100	66.7	3%

	2251330	Yellow	Safecore EN	Corrosion Inhibitor	16	1.6	150.92	136.92	1%
	1244147	Green	Safescav NA	Oxygen corrosion inhibitor	1	0.1	53.4	21.07	0.5%
	2303866	Yellow	Safescav HSN	H_2S corrosion inhibitor	2	0.2	29.07	17.42	1%
	1244139	Yellow	Safe-Vis	Loss control agent	1	0.1	10	10	1%
	336795	Green	Soda Ash	Calcium control	2	0.2	0.2	0.2	100%
	1899864	Green	Sugar	Cement setting time retarder	1	0.1	10	3.3	3%
	2513855	Green	Xantham Gum	Viscosifier	20	2	49.85	39.88	5%
	1154758	Green	Barite	Weighting agent	1,140	114	2000	1800	6%
	2450655	Yellow	Baralube W-511	Completion fluid lubricant	8	0.8	36.31	36.31	2%
Total Mud Chemicals					**2,101.00**	**210**			
Inhibited Seawater	1857541	Yellow	MB-5111	Bactericide	0.6	0.6	9.14	9.14	7%
	2251330	Yellow	Safecore EN	Corrosion inhibitor	0.8	0.8	150.92	136.92	1%
	1244147	Green	Safescav NA	Oxygen corrosion inhibitor	0.8	0.8	53.4	21.07	4%
	2429813	Yellow	Defoam Plus NS	Defoamer	0.8	0.8	12.8	6.4	13%
Total Inhibited Seawater					**3**	**3**			
Total					**2,364.9** ***(2,373.9)***	**262.8** ***(264.5)***			
Total Yellow					**98.3** ***(103.3)***	**12.6** ***(13.5)***			
Total Green					**2,266.6** ***(2,270.6)***	**250.2** ***(251.0)***			

Note: The amount of chemicals in parentheses and italics are indicating the chemicals used and discharged in case of PWC instead of casing milling.

Source: TEPDK, 2023

3.3.9 Planned Emissions and Discharges, Waste Management

This section presents the main sources of emissions to air and acoustic environment, discharges to sea and waste due to the planned project activities.

Expected planned emissions and discharges from the DEWTA project include:

- Generation of underwater noise, emissions to air and liquid discharges (eg. 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. All swarf from milling will be retained and returned to shore for processing and disposal. Nearly all residual WBM is expected to be collected at surface and sent back onshore. A maximum of 10% (210 mT) of WBM (without swarf), can be discharged to the sea during operations and is considered as conservative estimate for this impact assessment (see Section 3.3.5.1).

The emissions and discharges from the DEWTA project are further detailed in the following sections.

3.3.9.1 Emissions to Air

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.

3.3.9.2 Noise Emissions

The main source of underwater noise associated with the project is from the jack-up rig and project vessels:

- Propeller and thrusters. Noise from propellers and thrusters is predominantly caused by cavitation around the blades whilst transiting at speed or operating thrusters under load to maintain a vessel's position. Noise produced is typically broadband noise, with some low tonal peaks.
- Machinery noise. Machinery noise is often of low frequency (LF), and often becomes dominant for vessels when stationary or moving at low speeds. The source of this type of noise is from large machinery, such as large power generation units (e.g., diesel engines or gas turbines), compressors and fluid pumps. Sound is transmitted through different paths, i.e., structural (machine to hull to water) and airborne (machine to air to hull to water), or a mixture of both. The nature of sound is dependent on various variables, e.g., number and size of the machinery operating and coupling between the machinery and the deck.

3.3.9.3 Discharges to Sea

The main liquid effluents generated by the DEWTA project will comprise:

- Inhibited seawater;
- Used cement;
- WBM
- Bilge water;
- Sewage; and
- Greywater (e.g., water from culinary activities, shower and laundry facilities, deck drains and other non-oily wastewater drains (excluding sewage)).

All vessels will have equipment, systems and protocols in place to prevent pollution by oil, sewage and garbage in compliance with MARPOL 73/78. TEPDK will apply its Waste Management Plan (TEPDK-L2-PRO-HSE-0026-E) covering all wastes generated offshore and onshore, that has been developed according to MARPOL requirements, Danish regulations and TotalEnergies waste management guidelines.

Inhibited Seawater Discharge

Inhibited seawater (seawater containing oxygen and H_2S scavengers, and corrosion inhibitors) will be used to flush / bullhead all contents into the reservoir. Once the well contents have been bullheaded into the reservoir, clean inhibited seawater will be circulated in the well. Approximately 3,600 bbl of clean inhibited seawater may be used while temporarily abandoning the two wells. All inhibited seawater returns will be sampled using a centrifugal tester and any inhibited seawater returns with a hydrocarbon concentration above 30 mg/l will be contained and returned to shore for treatment and disposal. Inhibited seawater with a hydrocarbon concentration below 30 mg/l will be discharged. The environmental assessment has considered 3,600 bbl of discharged inhibited seawater from a conservative point of view. The chemicals used and discharged with the inhibited seawater are described in Section 3.3.8. All chemicals will either be classified as "Green" (PLONOR) or "Yellow".

Used Cement Discharge

Approximately 130.4 tonnes 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. Slight variations in down-hole or casing diameters can however have implications for the calculated volumes due to plug length and well dimension. 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 % (on a conservative basis) of used cement (49.7 mT in case of milling and 51.4 mT in case of PWC) may be discharged to the environment. The cement that may be discharged at the sea surface during rig operation is only used cement that was mixed for the specific well and pumped through the cement pumps for the well activities. The discharged cement could be cement that remains in the surface lines (lines between the cement unit and wellhead) and needs to be removed before it becomes solid and damages the equipment and cementing plant. This is a contingency measure and will only happen under certain conditions. When discharging into the sea, a retarder will be added to the cement hence the cement will not be able to harden or set up once discharged.

Unmixed raw ingredients, not used during the well activities, are retained on the rig and are returned to shore, they are not discharged overboard as per TEPDK and TotalEnergies' internal procedures and policies.

The cementing chemicals used and discharged are described in Section 3.3.8. All chemicals will either be classified as "Green" (PLONOR) or "Yellow".

Water-based Mud Discharge

If casing milling is performed, WBM will be used with chemicals as milling fluid (refer to Section 3.3.8). WBM comprises a specially formulated mixture of natural clays, polymers, weighting agents and/or other materials suspended in a fluid medium. Typically, the major ingredients that comprise over 90% of the total mass of the WBMs are fresh or seawater, barium sulphate (barite), bentonite clay, liquid viscosities and caustic soda. Other substances are added to gain the desired density and drilling properties. The milled solids (swarf) will be removed from the WBM using magnets; the WBM will no longer be used once its specification cannot be maintained or the milling is over All swarf will be retained and returned to shore for processing and disposal. The estimated swarf volume is 9,700 lbs (4,400 kg). Nearly all of WBM is expected to be collected at surface and sent back onshore. A maximum of 10% (210 mT) of WBM (without swarf), can be discharged to the sea during operations and is considered as conservative estimate for this impact assessment. The chemicals used in the WBW for milling and discharged are described in Section 3.3.8. All chemicals will either be classified as "Green" (PLONOR) or "Yellow".

Bilge Water

All deck drainage from workspaces (bilge water) are collected and piped into a sump tank on board the project vessels to ensure International Convention for the Prevention of Pollution from Ships (MARPOL) 1973/78 Annex I compliance. The fluid is monitored, and any oily water will be processed through a suitable separation and treatment system prior to discharge overboard at a maximum of 15 ppm oil in water.

Sewage

Sewage discharge from the jack-up rig and supply vessels will meet the requirements of MARPOL 73/78 Annex IV. These vessels shall have an IMO-approved sewage treatment plant (STP).

All currently known physical, chemical or biological treatment processes of raw sewage produce solid residuals, called sewage sludge. Sewage sludge is stored in tanks and delivered to reception facilities and discharged according to regulation 11.1.1 of MARPOL Annex IV. Discharge of comminuted and disinfected sewage using an approved system will occur only at more than 3 nautical miles from the nearest land. Discharge of sewage that is not comminuted or disinfected using an approved system will be done at a distance of more than 12 nautical miles from the nearest land (IMO, 2023).

Galley Wastes

Special mandatory methods for prevention of sea pollution are required in the North Sea. According to MARPOL 73/78 Annex V, galley waste disposal into the sea is only allowed when the vessel is more than 12 nautical miles from land and the food waste has been ground to particle sizes smaller than 25 mm.

All TEPDK vessels will send galley waste and garbage to the shore base for management. Non-TEPDK vessels will have to discharge galley waste to meet, as a minimum, MARPOL 73/78 Annex V requirements.

Summary

A summary of all the discharges to sea during project activities is described in Table 3.6.

Table 3.6 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 in case of milling and 51.4 mT in case of PWC (less than 20% of chemicals used for cementing)	N/A	DEPA permit
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
Bilge water	Oil-water separation	Not available	Not available	■ 15 mg/l of oil concentration	MARPOL 73/78 Annex I
Storage displacement water (ballast water)	Oil-water separation	Not available	Not available	■ 15 mg/l of oil concentration ■ 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	Not available	Not available	■ No free oil (Free oil is characterized by droplet sizes greater than 150 µ ■ 15 mg/l of oil concentration instantaneous reading oil water threshold	MARPOL 73/78 Annex I

3.3.9.4 Waste Management

Non-hazardous and Hazardous Solid Waste

TEPDK transports all non-hazardous and hazardous solid waste from the project activities to the onshore base for recycling, incinerating or landfilling according to Danish legislation.

Other types of wastes generated during project activities (e.g. removed casing) will not be discharged at sea but will be transported to shore for disposal under TEPDK's Waste Management Plan. These wastes will be recycled or re-used if possible or transported and disposed of at an appropriate licensed municipal landfill facility or at an alternative approved site.

Where practicable, the following waste types will be recycled or reused onshore:

- Garbage (e.g., paper, plastic, wood and glass) including wastes from accommodation and workshops;
- Scrap metal and other material;
- Used oil, including lubricating and gear oil; solvents; hydrocarbon-based detergents, possible drilling fluids and machine oil; and

The following wastes will be disposed of by a licensed waste contractor at licensed waste facilities:

- Drums and containers containing residues (e.g., lubricating oil) that may have environmental effects;
- Hazardous wastes including:
  - Batteries - including large lead-acid type (small quantities, order of 1 m^3, at the shore base);
  - Empty chemical packaging (drilling mud additives);
  - Clinical/medical wastes;
  - Oil filters; oily rags and absorbents;
  - Used oil from engine maintenance;
  - Oily bilge water from vessels; and
  - Filters and filter media from machinery.

Wastes will be minimized, appropriately segregated and stored onboard prior to disposal at authorized and adequately equipped port reception facilities. The typical waste that will be produced by the project activities are presented in Table 3.7.

Table 3.7 Typical Waste Types

Category	Waste Type
Non-hazardous	General domestic waste
	Wood
	Plastic
	Scrap metal
Hazardous	Oily rags and oil filters
	Used oil
	Batteries
	Medical waste
	Oily water (slops)
	Filter cartridges
	Drums (with residues)
	Other various wastes

Naturally Occurring Radioactive Material (NORM)

Naturally Occurring Radioactive Material (NORM) in the offshore environment is found in sand, scale, clean-up materials from tubing, valves or pipes. NORM is not expected for the proposed activities. In the unlikely event of NORM during temporary abandonment activities, TEPDK has measures in place to detect and handle NORM under the current permits and in compliance with Danish legislation. Handling of NORM offshore is limited to activities related to inspection, cleaning, decontamination and maintenance of process equipment, vessels and wells. Under normal circumstances equipment is sent onshore for decontamination in a controlled environment by trained and competent personnel. The NORM is securely stored after treatment.

3.3.10 Energy Demand and Consumption

The DEWTA project energy demand will be covered by diesel power generators on the jack-up rig and vessels. There will be no energy consumption at Dan E considering that the platform has been shut down since 2018 and has no power supply.

The energy needed on offshore jack-up rigs is usually supplied by diesel engines. TEPDK records from the GORM project indicate approximately 6.4 tonnes per day (TEPDK, 2023h). The DEWTA project jack-up rig will therefore require approximately 576 tonnes of diesel globally.

The volume of diesel consumed by the supporting vessel is variable and depends to the actual speed and routes followed by the vessel involved in the project. As presented earlier, during the temporary abandonment, the jack-up rig will be supported by platform supply vessels (PSVs) from Esbjerg traveling approximately three times per week. The jack-up rig will also have a dedicated standby vessel (SBV) for the whole period. TEPDK records from the GORM project indicate approximately 3.76 tonnes per day (TEPDK, 2023h). The DEWTA project vessel will therefore require approximately 516 tonnes of diesel globally[19].

3.3.11 Use of Natural Resources

This section considers the use of natural resources, in particular land, soil, water and biodiversity in the DEWTA project.

The only predicted use of natural resources will come from the use of freshwater and seawater. There will be no consumption of land, soil nor biodiversity for the proposed activities in this report. The project will use freshwater for human consumption and seawater. 3,600 bbl of seawater will be used for flushing and, after sampling and hydrocarbon analysis, discharged to the sea (up to 100%). Given the volume of the North Sea, the amount of freshwater and seawater used will have a negligible impact on freshwater or seawater as a natural resource and it will not contribute to its depletion.

3.4 Unplanned and Non-Routine Events

Accidental events that could take place during project activities that can lead to environmental or social impacts are as follows:

- Hydrocarbon / chemical spills (minor / Tier 1): e.g. hose failure during bunkering;
- Hydrocarbon spills (Tier 2): e.g. diesel spill from a vessel collision with the jack-up rig or platform and vessel to vessel / helicopter to platform collisions;
- Hydrocarbon spills (major/Tier 3): well blowout;
- Loss of containment due to a dropped object.

Relevant accidents involving dispersion of oil, gas or chemicals may occur (e.g., vessel collisions, well blow out). However, the likelihood of such events is very low. Mitigation measures will be in place during project operations to minimize the risk associated with major accidents. Furthermore, TEPDK

[19] based on 90 days SBV, 9 days move-in supported by 3 PSVs, 36 days for PSV (3 travels / week)

has an existing Oil Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016) and a Blowout Contingency Plan (BOCP) for managing hydrocarbon spills from all its offshore activities. Impacts from unplanned / accidental events are assessed in Section 5.6.

3.5 Project Alternatives

This section presents the rationale behind the choice of the current project design and the possible alternative scenarios deviating from the project description presented in this chapter.

3.5.1 "No-Go" Alternative

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.

3.5.2 Alternative Location

All production has been shut in on Dan E since 2018 due to the poor condition of the platform and wells. There are no feasible alternative locations for the project.

3.5.3 Piling/conductors

No piling will occur during the abandonment of wells DE-01 and DE-02.

The well conductors will be left in place after the temporary abandonment to allow long term monitoring. They will be removed later during the decommissioning of all Dan E wells, and this will be executed as part of a decommissioning campaign for the DAN Field.

3.5.4 Abandonment

There is no alternative to abandonment for offshore restoration of the cap rock within the well bores.

However, the selection of mud and chemicals determines the environmental performance of the activity. TEPDK has the option to use two different mud systems: a Water Based Mud (WBM) system or an Oil Based Mud (OBM) system. Muds are selected based on soil characteristics. Only WBM will be used for this project. The optimal type of mud based on the experience and soil characteristics are the following:

- Section 1: Seawater Lime Mud – a WBM system;
- Section 2-5: WBM

Abandonment through a depleted reservoir poses technical challenges. Various techniques have been evaluated through the years, e.g. mud cap drilling and designer muds (with glass beads, for instance). All were deemed too complex.

3.5.5 Annulus remediation

During the construction of the wells DE-01 and DE-02, there is a potential that the cement that provides an annular barrier can be compromised during the lift of the well. There are several remediation methods to replace cap rock, e.g. perforate, wash and cement. Section milling and cementing can be options to provide the correct solution for these applications. Both options will be

used during the temporary abandonment of DE-01 and DE-02. Furthermore, they are industry standard practice.

3.5.6 Cement plug

Cement will be used as a barrier material; it is currently the only material that complies to the regulator's requirements.

3.5.7 Perforate, Wash and Cement

The Perforate, Wash and Cement (PWC) technology is an alternative to section milling. 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 TVD in this case) where there is no cement or poor cement behind casing.

The casing is perforated using 7'' guns, 12spf, 135/45deg phasing with entry hole of 0.4'' – 0.6'' inside of 9-5/8'' casing. mechanical washing tool, Archer's Barricade PWC system is then lowered into the hole to wash the annular space behind the perforated casing to remove the debris. All debris will be collected on board, tested for contamination and sent onshore for treatment if necessary. When washing is completed, cementing is carried out. 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 greater amount of cement chemicals required is included in Table 3.5. Similarly, to the milling technique (see Section 3.3.5.1) there will be an unavoidable discharge of excess cement due to operations. 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 (see Section 3.3.5.1). Table 3.8 summarizes the relevant impacts from PWC. The discharge will be intermittent and short term during the project. Modelling simulation for this type of discharge shows that the impact is localized. Noise during perforation will occur downhole in the rock formation below the seabed (approximately 3,400 ft below the seabed) resulting in insignificant underwater noise emission levels in the water column.

Table 3.8 Summary of relevant Impacts from PWC

Impacts on	Impacts from	Assessment
Marine Mammals, Fish and Plankton	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Scoped-out and **not assessed further** (see Table 5.6 item 5.2).
Marine Mammals, Fish and Plankton	Underwater noise from perforation	Noise during perforation will occur downhole in the rock formation below the seabed (approximately 3,400 ft below the seabed) resulting in insignificant underwater noise emission levels in the water column. Scoped-out and **not assessed further** (see Table 5.6 item 5.1).
Benthic Communities	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Scoped-out and **not assessed further** (see Table 5.6 item 6.2).

Impacts on	Impacts from	Assessment
Protected Areas, Critical and Sensitive Habitats	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Scoped-out and **not assessed further** (see Table 5.6 item 8.1).
Seawater Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Scoped-in and assessed as **negligible** (see Table 5.7 item 2.1 and section 5.4.2.2).
Seabed and Sediment Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Scoped-in and assessed as **negligible** (see Table 5.7 item 3.1 and section 5.4.2.3)

3.5.8 Transportation

Eight helicopter round trips are expected during the 90 days of the temporary abandonment with 18 people onboard each journey. Transportation of personnel by helicopter is fast and flexible, and the possible alternative of using ship-based transport is impractical, due to the long transport time. Personnel may also get seasick if transported by boat. Ship-based transport is preferred for cargo transport.

4. BASELINE CHARACTERISTICS

4.1 Introduction

This chapter describes the current knowledge of the environmental and socio-economic conditions in the DEWTA project area and the project's area of influence; it serves as the reference point against which changes can be predicted and monitored in the future. The area of influence is the area likely to be directly and/or indirectly affected by the project including:

- the physical project footprint;
- areas adjacent to the site that may be affected by emissions and effluents; and
- the area affected by any unplanned event from project activities.

The potential impacts of the proposed DEWTA project and the area of influence of the sensitive receptors directly influence the scope of the baseline study. The list of receptors and impact mechanisms described in this report can be directly related to the descriptors set within the Marine Strategy Framework Directive (MSFD). The MSFD outlines the following 11 descriptors used to assess the good environmental status of the marine environment:

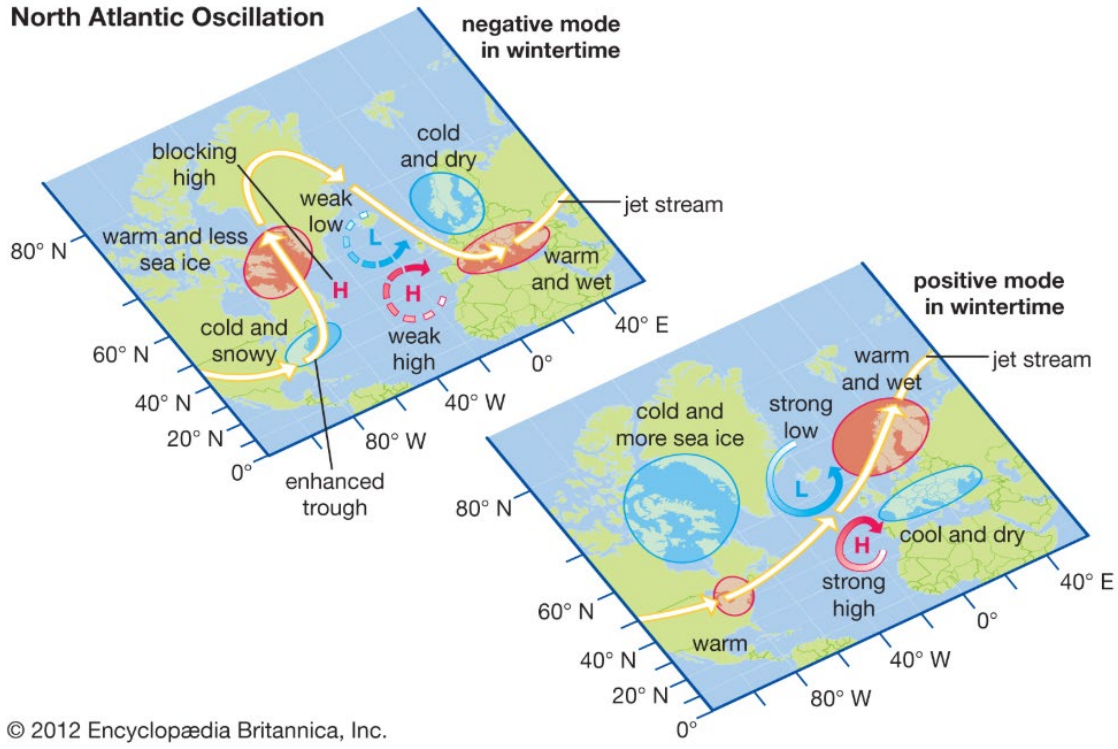
- D1- Biological diversity is maintained. The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions;
- D2 - Non-indigenous species introduced by human activities are at levels that do not adversely alter the ecosystems;
- D3 - Populations of commercially exploited fish and shellfish are within safe biological limits, exhibiting a population age and size distribution that is indicative of a healthy stock;
- D4 - All elements of the marine food webs, to the extent that they are known, occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity;
- D5 - Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters;
- D6 - Sea-floor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected;
- D7 - Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems;
- D8 - Concentrations of contaminants are at levels not giving rise to pollution effects;
- D9 - Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards;
- D10 - Properties and quantities of marine litter do not cause harm to the coastal and marine environment;
- D11 - Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.

4.2 Physical Environment

4.2.1 Meteorology

The North Sea is a semi-enclosed basin in the north-west European sea shelf. Countries surrounding this sea have a temperate oceanic climate, characterized by relatively cool summers and relatively mild winters. The climate in the DEWTA project area is governed by the inflow of oceanic water from the northern Atlantic Ocean and westerly air circulation (i.e., the polar jet stream). The polar jet stream moves from west to east in the mid higher latitudes containing low-pressure systems (OSPAR, 2000). The pressure index fluctuations by the North Atlantic Oscillation (NAO) defines the intensity and the location of the North Atlantic jet stream and the strength and persistence of the westerly winds generated (Figure 4.1). In the autumn, winter and early spring, the low-pressure systems and storms are more active than in the summer, when the high pressures push the westerlies towards the north (NOAA, 2023).

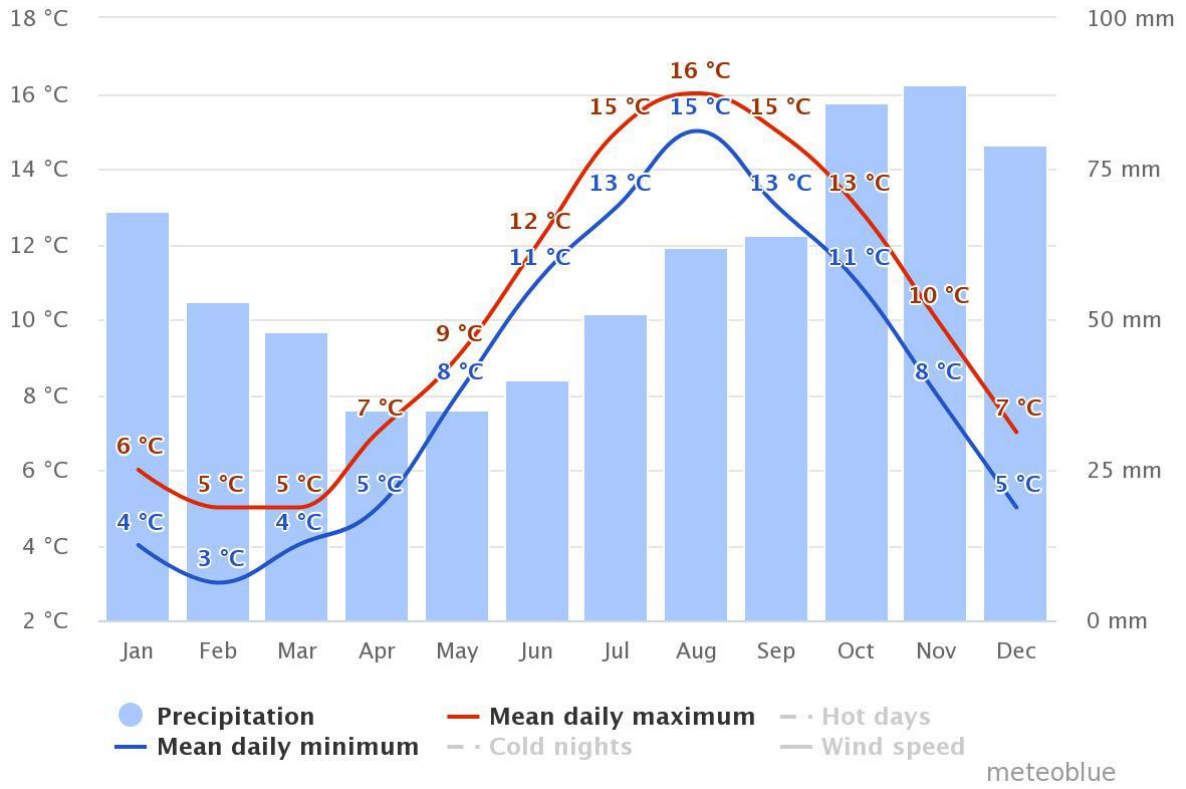
Figure 4.1 North Atlantic Jet Stream and Oscillation Patterns



4.2.1.1 Air Temperature and Rainfall

Figure 4.2 shows the average monthly temperature and rainfall at the DEWTA project area, produced by Meteoblue (2023) from hourly weather data using the global NEMS models (National Energy Modelling System) with 30 km spatial resolution. The lowest mean daily temperatures at the DEWTA project area are registered in February (3ºC) whilst the highest mean daily temperatures are reported in August (16ºC). Average monthly rainfall throughout the year ranges between 35 and 89 mm, peaking in November and dropping towards April and May.

Figure 4.2 Average Temperatures and Precipitation at the DEWTA Project Area

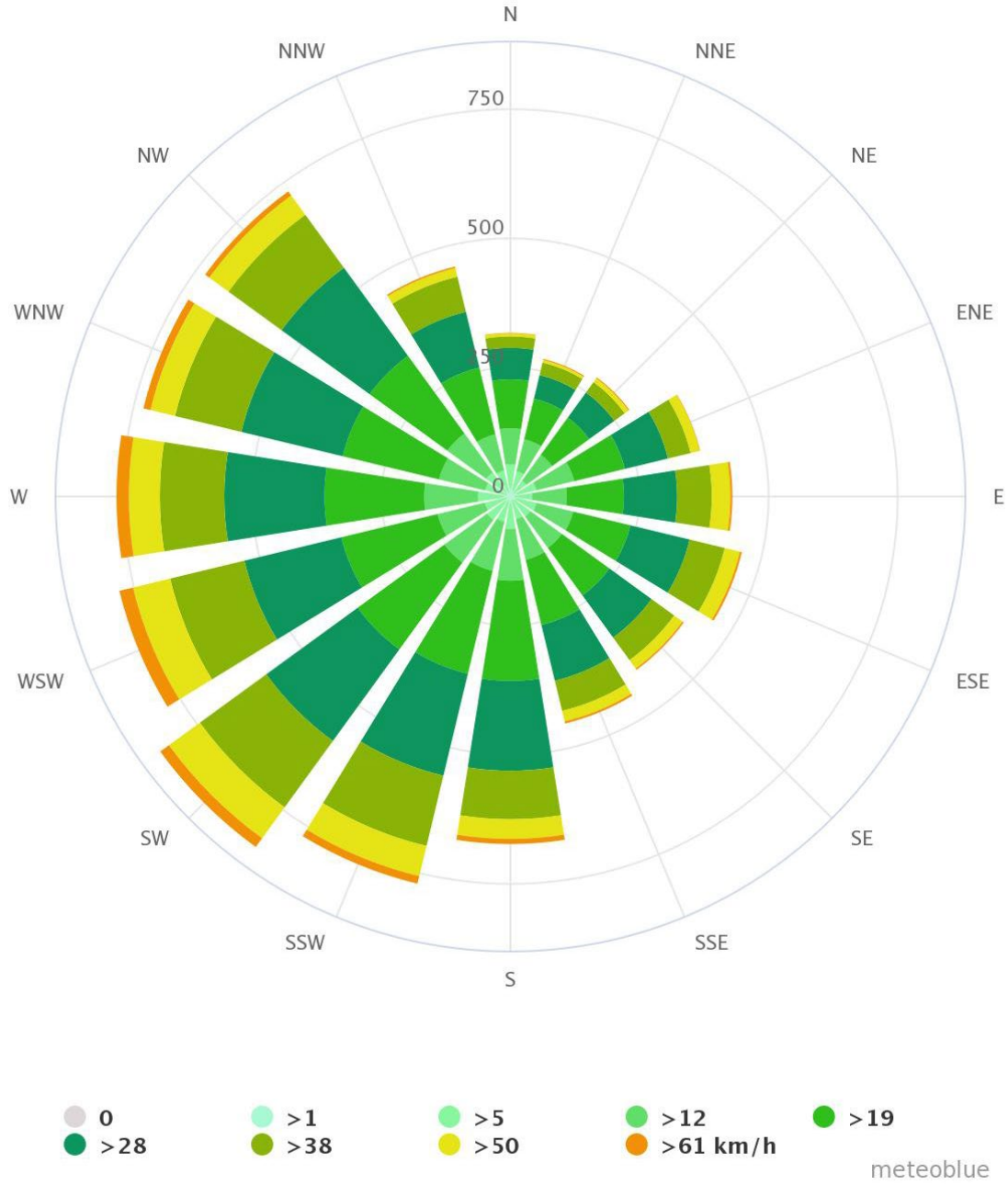


Source: Meteoblue, 2023. Meteorological data for Dan E (Lat: 55.4; Long: 5.12).

4.2.1.2 Wind

Wind is an important consideration in the North Sea due to its influence over sea conditions. Winds in the North Sea are governed by the jet stream storms, which come predominantly from the west (NOAA, 2023). This weather system explains the predominance of westerly winds typically between 12 and 50 km per hour (km/h) at the DEWTA project area as represented in the wind rose in Figure 4.3, produced Meteoblue (2023) using its 30-year model. Stronger winds over 60 km/hr are also predominantly from the west at a minor degree. In addition, wind speeds are characterized by a pronounced seasonality; in general, winds from November to March are stronger due to larger temperature differences between the subtropical and polar regions leading to more intense low-pressure systems (Meteoblue, 2023).

Figure 4.3 Wind Rose for the DEWTA project Area



Note: The wind rose shows how many hours per year the wind blows from the indicated direction.

Source: Meteoblue, 2023. Meteorological data for Dan E (Lat: 55.4; Long: 5.12).

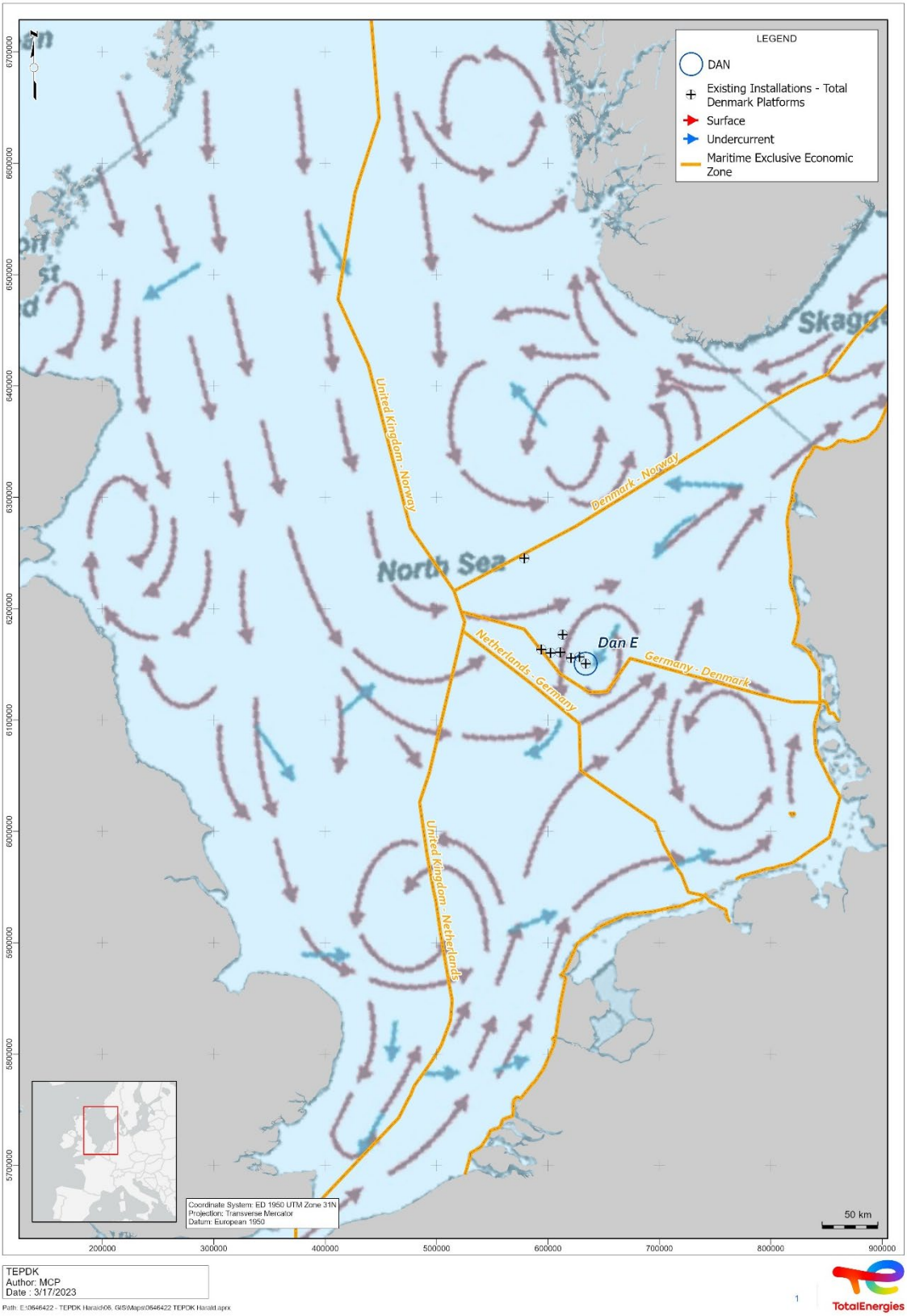
4.2.2 Currents and Waves

4.2.2.1 Currents

The currents in the semi-enclosed basin of the North Sea are governed by two primary transport systems. Inflow takes place through the connection with the North Atlantic Ocean and with the English Channel, to the southwest of the basin (Lenhart *et al*., 2004). The southern part of the North Sea is heavily influenced by the incoming flow through the English Channel and by the freshwater runoff off the mainland. The Baltic outflow is also a large contributor to freshwater inflow into the basin (Lenhart *et al*., 2004).

The DEWTA project area is located in the Central North Sea, where the dominant surface circulation is eastward, and the undercurrent flows in a south-westerly direction (Figure 4.4).

Figure 4.4 Currents System in the North Sea



Source: VLIZ, 2016. Prepared by ERM, 2023.

Water circulation is also caused by differences in properties of water masses. Hydrographic fronts occur when these differing water masses meet, and include areas of upwelling, tidal fronts and saline fronts. Ten hydrographic fronts have been identified in the North Sea (Belkin and Cornillon, 2007) and are important to the marine ecosystems. Fronts are more clearly marked in the summer than in the winter when the waters are less agitated and when less vertical mixing occurs. In the DEWTA project area, however, no hydrographic front has been identified. Figure 4.5 presents the hydrographic fronts in the North Sea. The Dogger Bank Front is the closest to the DEWTA project area. Upwelling takes place at the Dogger Bank Front when dense, nutrient rich colder water rises to surface waters, causing a mixing of shallow and deep-water masses and generating rich ecological biodiversity.

4.2.2.2 Waves

Available wave estimates in the Halfdan field (Maersk, 2016), located at about 8 km to the northwest from the DEWTA project area, are presented in Figure 4.6. The figure indicates that smaller wave conditions occur in the summer months, during which significant waves heights of one meter are only exceeded approximately 50% of the time. During the winter months of October to February, wave heights of one meter are exceeded significantly more frequently (i.e., more than 85% of the time), and waves over 4 m occur significantly more frequently than in summer. Throughout the seasons, most of the waves approach from the southwest to northwest directions (Beels *et al*., 2007).

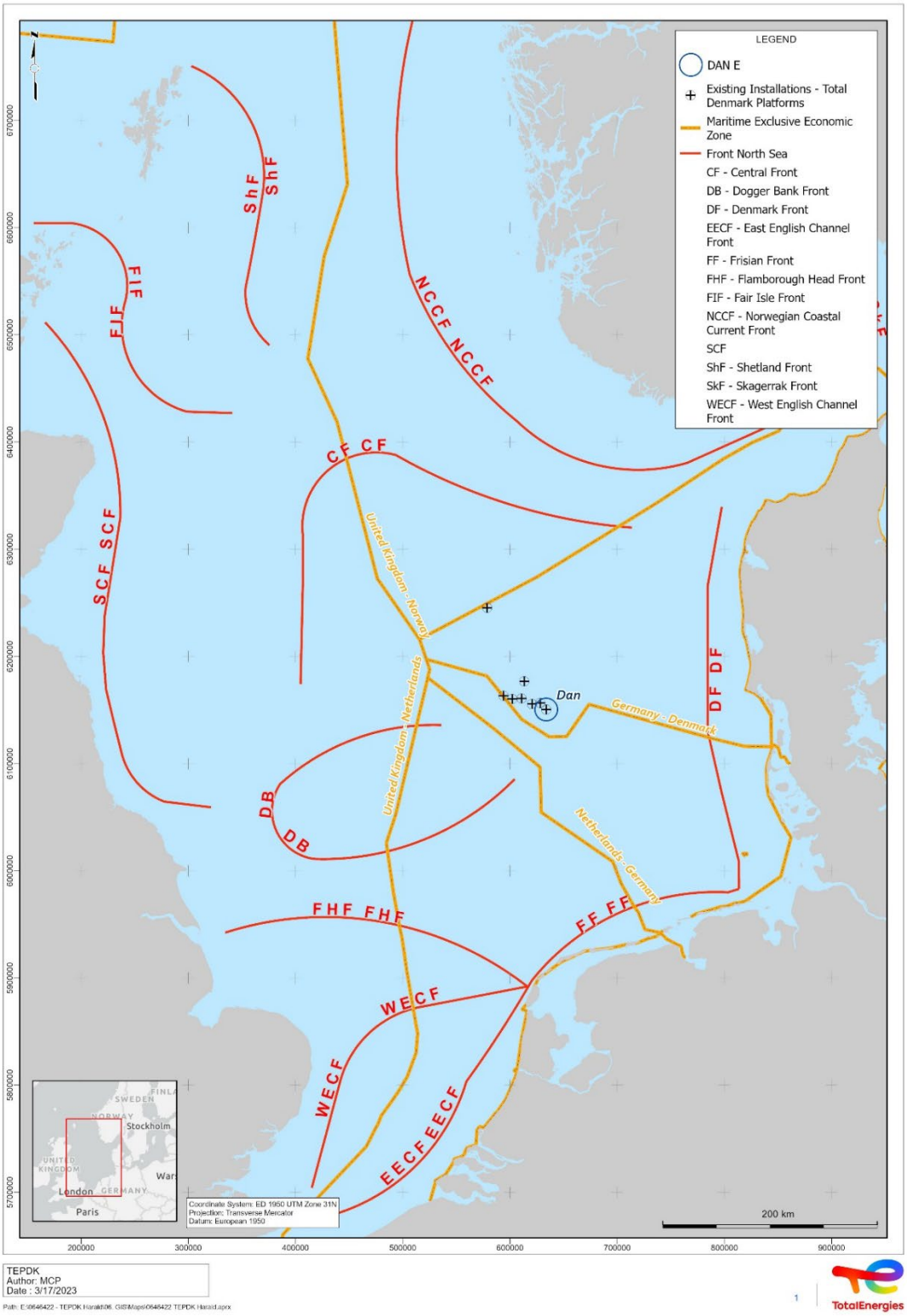
The extreme wave conditions provide critical information to account for the worse case conditions. Table 4.1 presents the wave heights and waves periods for 50-year,100-year and 10,000-year return periods at the nearby Halfdan Field.

4.2.2.3 Tides

The tidal range at the Halfdan field, approximately 8 km to the northwest of the DEWTA project area, is characterized by a semi diurnal cycle, of small tidal range amplitude. Tidal modelling indicates that the mean seawater level (MSL) is 0.25 m above the Lowest Astronomical Tide (LAT) and 0.26 m below Highest Astronomical Tides (HAT) (Maersk, 2016).

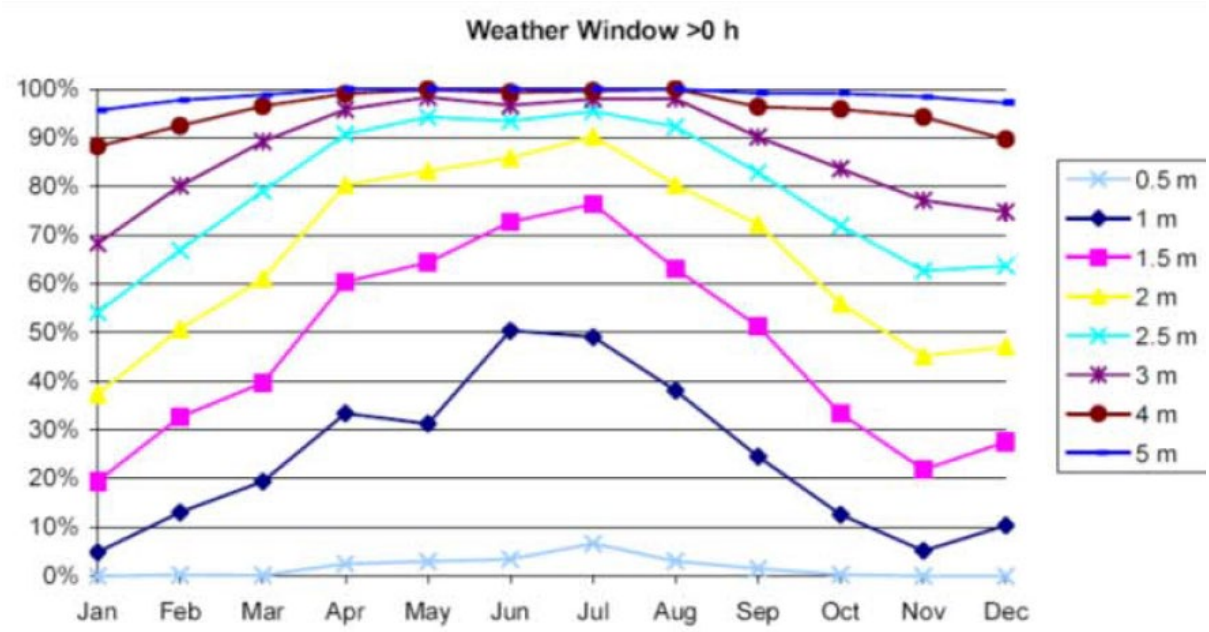
Although tidal ranges can vary depending on location, especially within semi-enclosed basins such as the North Sea, tidal predictions and measurements will not vary significantly over such short distances. Therefore, the tidal predictions from Maersk (2016) in the Halfdan Field remain relevant for the DEWTA project area.

Figure 4.5 Fronts in the North Sea



Source: Belkin *et al.*, 2009.

Figure 4.6 Percentage of Time of Specific Wave Height Exceedance at the Halfdan Field



Source: Maersk, 2016.

Table 4.1 Extreme Wave Heights at the Halfdan Field

Location	Hs [m] Significant wave height			Tz [s] Up or down crossing period			Hmax [m] Maximum individual wave height		
Return period	50 years	100 years	10,000 years	50 years	100 years	10,000 years	50 years	100 years	10,000 years
Halfdan Field	11.1	11.5	14.2	10.5	10.7	11.7	21.7	22.7	28.9

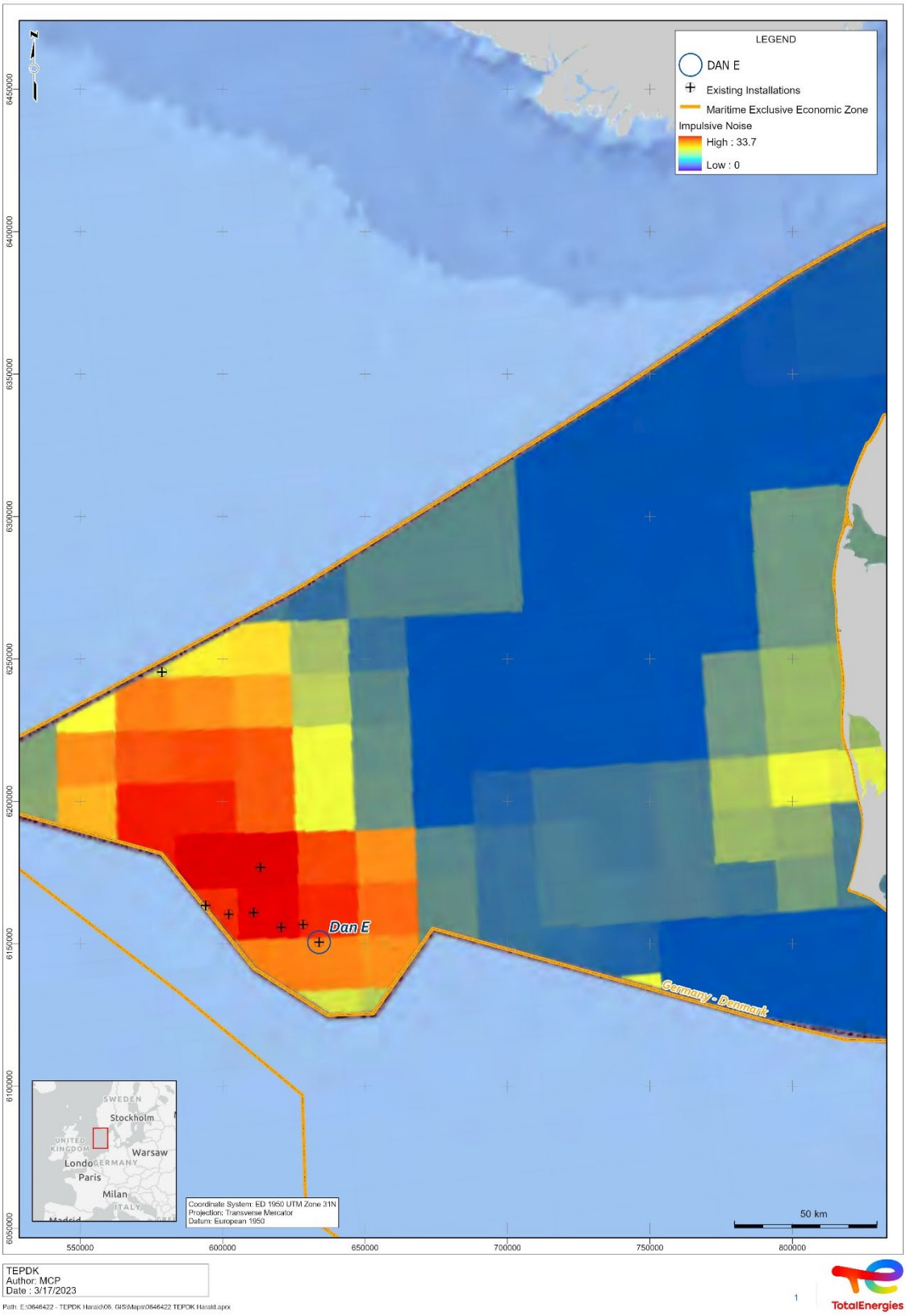
Source: Maersk, 2016.

4.2.3 Underwater Noise

Underwater noise in the North Sea is produced from a combination of both natural and anthropogenic sources. Anthropogenic sources are categorised as either continuous or impulsive. Shipping is the main source of continuous anthropogenic noise and is usually low frequency. The main sources of impulsive noise include air guns, pile and conductor driving, explosions, and sonar, and these range from low to mid frequencies (Andersen *et al*., 2020).

The average continuous noise over one year in the region of the Danish North Sea, in which the DEWTA project area is located, was 105 to 110 decibels (dB) which is 5 to 10 dB above the natural ambient levels (Andersen *et al*., 2020; JOMOPANS, 2023). The average impulse days per year over a three-year period (2016-2018) were determined to assess impulsive sound in the DEWTA project area. The area of the Danish North Sea in which the DEWTA project area sits had a much higher average impulse day per year than other areas of the Danish EEZ with a maximum of 33.7 impulse days per year (Figure 4.7) (Andersen *et al.*, 2020).

Figure 4.7 Underwater Noise in the North Sea



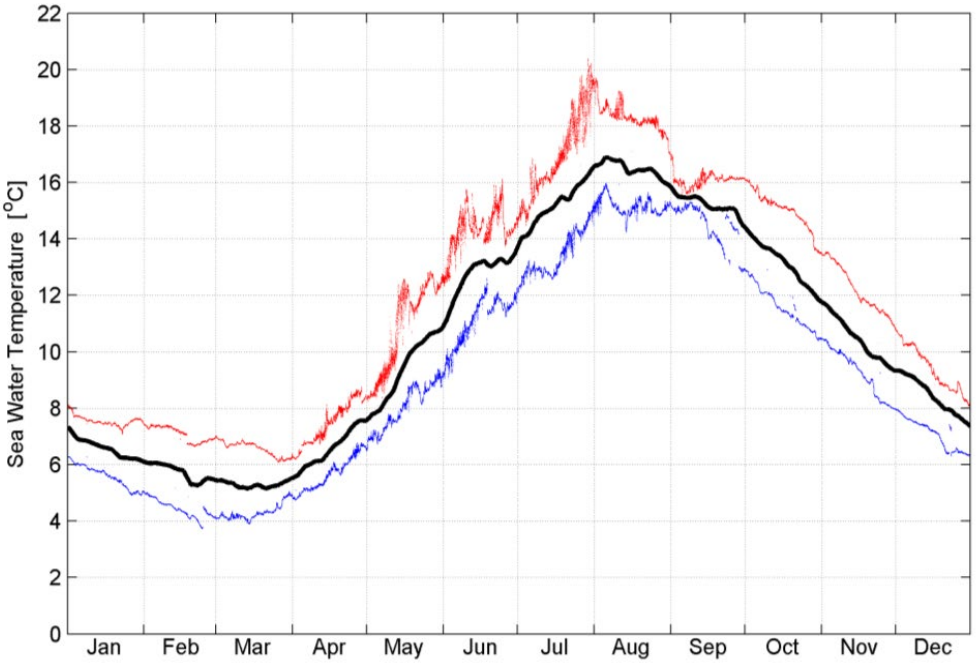
Source: Andersen *et al.*, 2020.

4.2.4 Water Temperatures and Salinity

4.2.4.1 Sea Temperature

There is a strong seasonal variation in sea temperature throughout the North Sea. Seasonal water temperatures were measured at the Gorm Field, located in a similar environment in the Central North Sea, approximately at 25 km to the northwest from the DEWTA project area. The temperature at the Gorm Field is approximately 7°C in winter and 15-19°C in summer, while bottom temperatures vary from 6-8°C in winter and 8-18°C in summer (Figure 4.8) (Maersk, 2016).

Figure 4.8 Minimum, Maximum and Average Sea Temperature Curve at the Gorm Field Area (At 10 m depth, between 2001 and 2009)

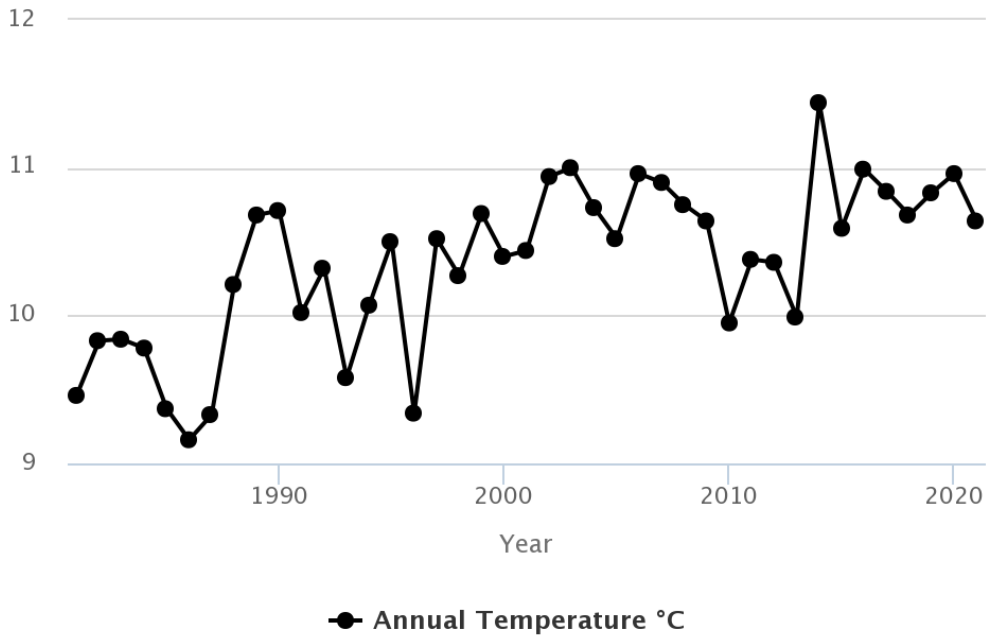


Legend:
Red *= Maximum Temperature at 10 m depth*
Black *= Average Temperature at 10 m depth*
Blue *= Minimum Temperature at 10 m depth*

Source: Maersk, 2016 and DHI, 2012.

The sea-surface temperature throughout the North Sea is 1- 20°C, with an average water temperature of approximately 10°C. This value is supported by ICES data for the North Sea, which documents an average sea surface temperature for the North Sea of 10.36°C (Figure 4.9) (ICES, 2022). The average mean sea temperature (surface and bottom waters) in the North Sea generally increases towards the south during the summer (August) and decreases towards the north during the winter (January).

Figure 4.9 Sea Surface Temperature for the North Sea from 1981-2022



Source: ICES, 2022.

Globally both air and sea surface temperatures are expected to increase as future greenhouse gas emissions continue to rise. The OSPAR Quality Status Report 2010 (OSPAR, 2010) states there is evidence within contemporary studies that recent increases in sea surface temperature within the North Sea have been increasing at a disproportionately greater rate when compared to the rest of the world oceans. This could affect future temperatures within the North Sea and Western Europe. OSPAR (2010) presents evidence of increased sea surface temperatures in the North Sea of 1-2°C over the past 25 years and that the summer periods in the surface waters have become longer and warmer, and winters have become shorter and cooler.

4.2.4.2 Salinity

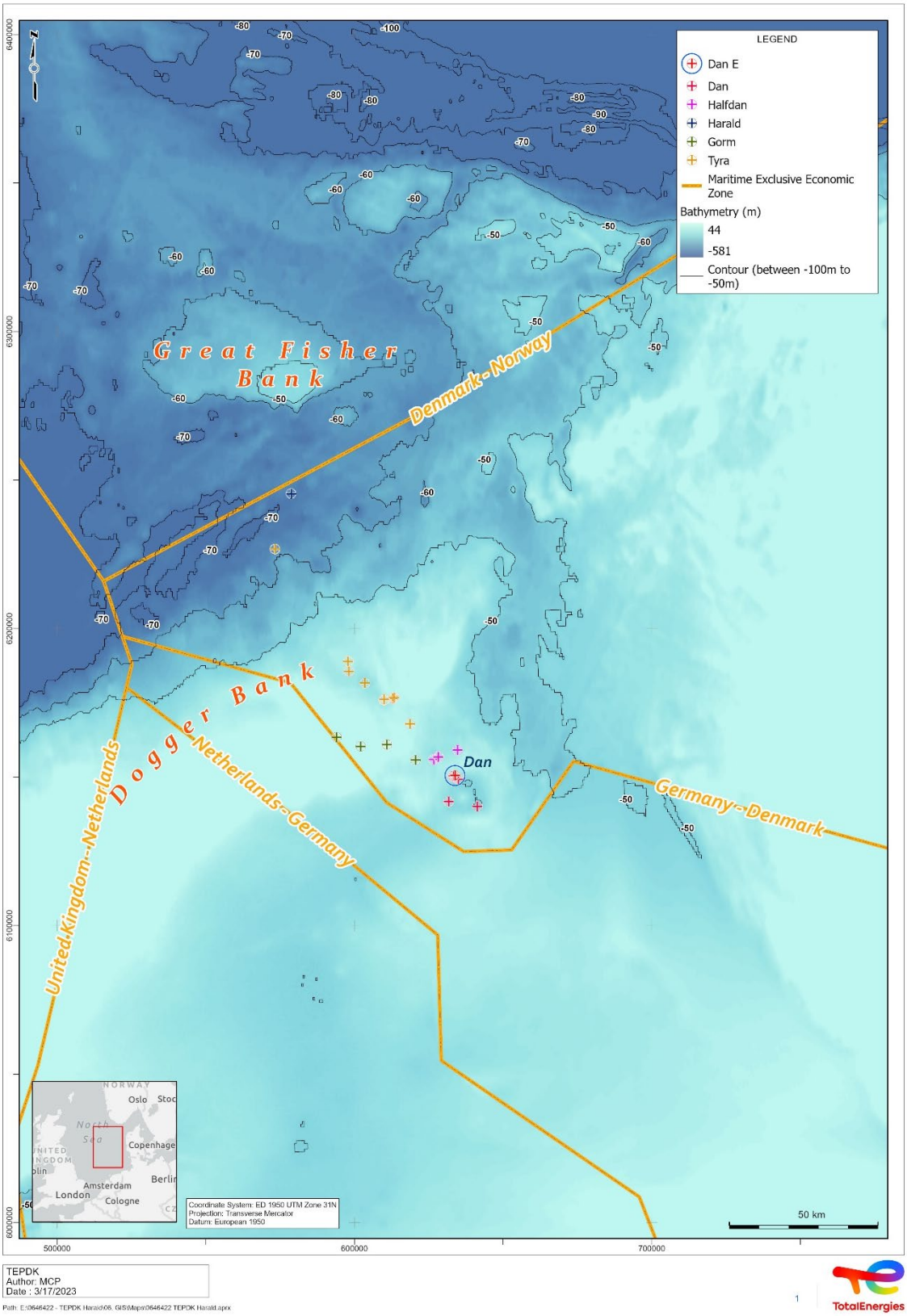
The salinity in the North Sea ranges between approximately 25 to 35 practical salinity units (psu) and is generally more saline in the west, becoming more brackish in the coastal areas in the east; correlating with an increase in freshwater runoff (EEA, 2008). Salinity in the coastal regions fluctuates with seasons more than in the offshore environment. In the DEWTA project area, the salinity does not show much seasonal variation with surface and bottom salinity of 34-35 psu (DHI, 2014).

4.2.5 Bathymetry

The water depths in the North Sea are generally less than 100 m, generally increasing towards the north, and the mean depth is 74 m (Lenhart *et al*., 2004); an exception to this being the Norwegian trench, which reaches a depth of 725 m. The western sector of the Danish North Sea is relatively shallow, with water depths of 20-40 m.

Linear elongated sandbanks, which can be up to 50 km long by 6 km wide and with heights of up to 40 m, characterize the southern region of the North Sea. These sandbanks are formed by strong tidal currents found in the region. The water depth in the DAN Field is about 45 m (Figure 4.10). The Dogger Bank is approximately 17 km to the west of the DEWTA project area, in the EEZs of Denmark, Germany, the Netherlands and the United Kingdom (Figure 4.10).

Figure 4.10 Bathymetry in the North Sea



Source: ERM, 2023.

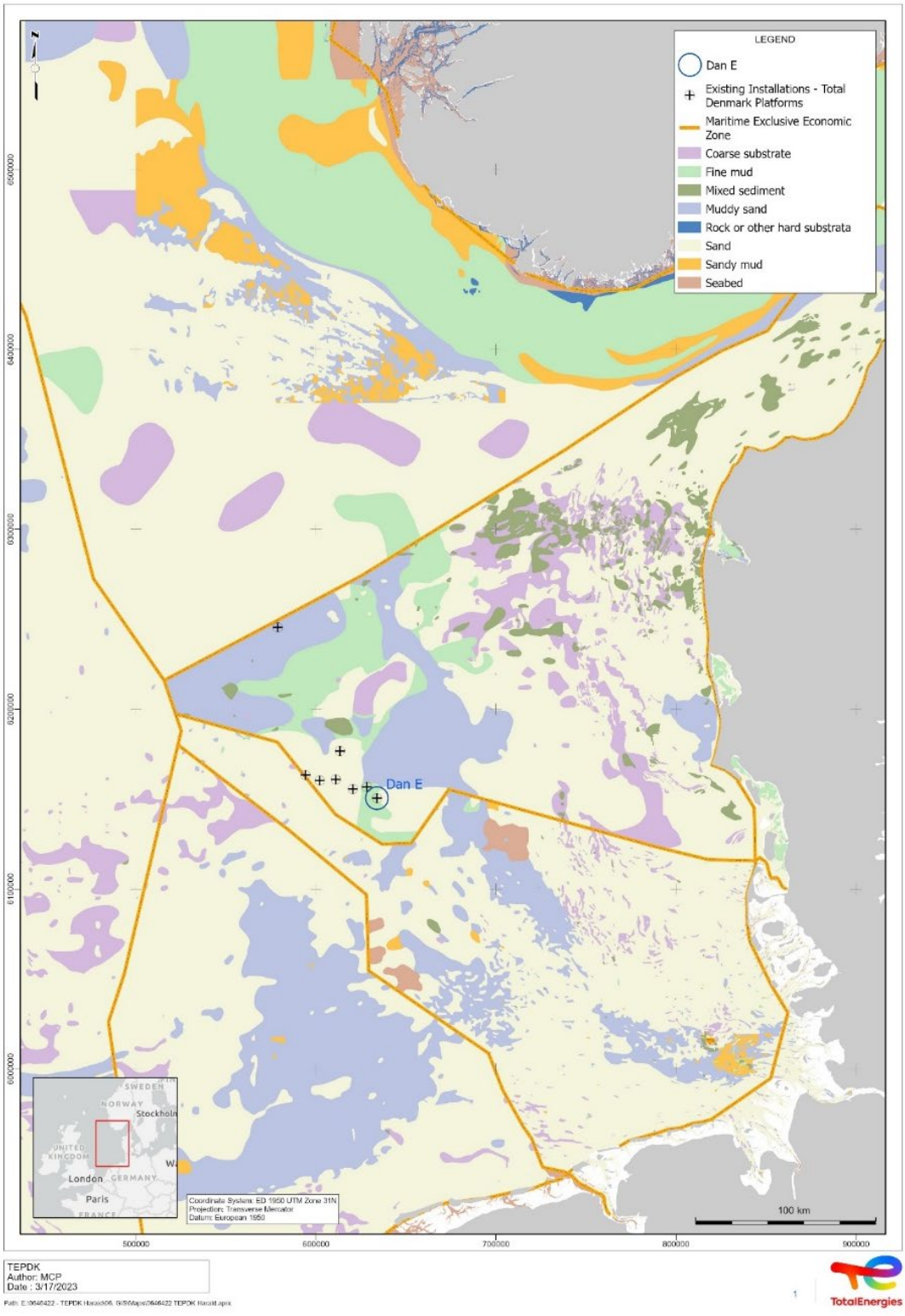
4.2.6 Sediment Characteristics

4.2.6.1 Regional Context

Throughout the North Sea, bottom sediments are frequently set in motion through resuspension and vertical dispersion processes. Wind-induced currents, tides and wave action all contribute to the sediment transport occurring (OSPAR, 2000). As described in *Section 4.2.2*, the hydrographic circulation, wave and tidal regime create the sediment dynamics and sediment distribution pattern observed throughout the North Sea.

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 broad-scale distribution of substrate type across the Danish EEZ is illustrated in Figure 4.11.

Figure 4.11 Seabed Sediments in the North Sea



Source: ERM, 2023.

4.2.6.2 Local Context

Sediment monitoring was carried out in May-June 2021 by DHI around the Dan F platform at distances of 100, 250, 1,500 and 3,000 m, approximately 0.5 km to the west of the DEWTA project

area (DHI, 2022). The monitoring showed that the seabed surface consisted of fine sands with a median grain size (D50) of around 0.11 mm and a content of fines (<63 µm) accounting for 7% on average (DHI, 2022). The content of organic matter measured as loss on ignition (LoI) was low with an average of 0.62% of the dry matter of the sediment (DM). The content of total organic carbon (TOC) was also low with an average of 0.15 % of DM. The total hydrocarbons concentrations (THC: C12-C35) in the surface sediment ranged from 6 to 100 mg/kg DM. The sum of polycyclic aromatic hydrocarbon (PAH) concentrations were below 0.12 mg/kg DM while the sum of alkylated aromatic hydrocarbon (NPD) concentrations were below 1.23 mg/kg DM. All BTEX concentrations were below the Limits of Quantification (LoQ) of the laboratory. Metal (Ag, As, Cd, Cr, Cu, Hg, Ni, Pb, V and Zn) concentrations were below HELCOM and Danish targets and TEL values (low range for potential toxicological effect), except for Barium (Ba) which was above the 130 mg/kg DM TEL value[20]. The maximum Ba value (3,383 mg/kg DM) was found in station DE100 (at 100 m to the east of the platform). The highest Ba concentrations were found near the platform and decreased with distance (DHI, 2022).

Another recent sediment monitoring carried out by DHI in 2020 was conducted at 19 locations around and along existing and new pipeline alignments between the TYRA, GORM, SKJOLD, HALFDAN and DAN Fields, using a HAPS[21] corer (DHI, 2020). Seabed contamination was assessed for MSFD Descriptor 8: Contaminants. The approach to assess environmental status outlined in the MSFD requires that selected indicators are compared to reference conditions. Average historical values from reference stations measured at seabed monitoring campaigns from 1989-2015 were calculated for the northern and the southern Danish North Sea, by dividing monitored platforms into the relevant region and averaging values within each group. The southern reference is most relevant for this assessment and is used to compare to the measured indicators at the pipeline surveys. Additionally, a background reference level (BRL) was obtained from a bootstrap analysis, conducted by Oil Gas Denmark of values measured at regional reference stations in the southern part of the North Sea. BRL is presented for all selected regional descriptors and indicators in Table 4.2. The analytical results were scaled against the BRL and the Effect Range Low (ERL)[22] to arrive at index values between 0 and 100 (the results of the survey index scores are presented in Table 4.3), 100 being the conditions similar or superior to the reference conditions. For contaminants, the “one-out-all-out” (o-o-a-o)[23] principle from the Water Framework Directive is applied, and if any of the contaminants exceed the ERL-values, the contaminant indicator will score a zero for that station.

Table 4.2 Regional Background Reference Level (BRL) based on Reference Stations of Southern Platforms and Effects Range Low (ERL) for Descriptor 8

Indicators	BRL South	ERL
Contaminants - Metals (mg/kg dry weight)		
Cd	0.01	1.20
Cr	4.00	81.00
Cu	0.50	34.00
Pb	4.70	47.00
Hg	0.05	0.15

[20] Threshold Effect Level (TEL) value for Barium found in Leung *et al.* (2005).

[21] The HAPS frame supported corer is highly suitable for taking well defined, virtually undisturbed seafloor samples of soft and hard sediments.

[22] ERL indicates the concentration below which toxic effects are scarcely observed or predicted. The ERM indicates that above which effects are generally or always observed.

[23] The ‘one-out all-out’ principle is a key principle that reflects the Water Framework Directive (WFD) integrated approach for the protection of water resources and associated aquatic ecosystems. Quality elements in the definition of ecological status provide a holistic picture of the health of the aquatic environment. The overall status would only be ‘good’ if all the elements are at least considered ‘good’.

Indicators	BRL South	ERL
Zn	7.80	150.00
Contaminants - Hydrocarbons (mg/kg dry weight)		
PAH*	52.8	3,340
Naphthalene	6.1	160
Anthracene	1.0	85
Phenanthrene	2.0	240
Dibenzothiophene	1.8	190
Fluoranthene	4.0	600
Benzo(a)anthracene	1.1	261
Chrysene (incl. triphenylene)	2.0	384
Benzo(g,h,i)perylene	8.8	85
Benzo(a)pyrene	2.0	430
Indeno[1,2,3 - cd]pyrene	12.0	240
Pyrene/ thiphenylene	12.0	665

Source: DHI, 2020.

Table 4.3 outlines the Environmental Status (EnS) Indices of all the stations sampled as part of the DHI 2020 surveys. The lowest EnS reported for all stations was 97, which is due to the estimated copper (Cu) load at all stations (Table 4.3). The Cu concentration was below detection range at all stations. As a default, half the concentration is then assumed resulting in a concentration of 1.5 mg/kg at all stations. However, the BRL at south stations is 0.5 mg/kg, which results in a score of 97 at all stations. If this was disregarded, most stations would score 100 or 99. The metal and hydrocarbon concentrations had an EnS score close to 100 and were low compared to indicators for Good Environmental Status. The heavy metal concentrations in the sediment samples are below all targets for Good Environmental Status, although Ba may be present in concentrations which are above the potential effect level. This is likely caused by past drilling activities (DHI, 2020).

Table 4.3 Indices for Indicators, Descriptors and Environmental Status

Survey	Station	Distance From the Platform (m)	Contaminants																		EnS
			Metal						PAH[24]												
			Cd	Cr	Cu	Pb	Hg	Zn	1	2	3	4	5	6	7	8	9	10	11	D8	EnS
A	TyraE-S750	50.2	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	99
A	TyraE-Ref.2	50.9	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	99
A	Gorm-E750	78.8	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	97
A	Gorm-N750	83.6	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
A	Gorm-N6250	101.8	99	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	99
A	Gorm-N11900	103.3	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
A	Gorm-Ref.1	3,008.8	100	100	97	100	100	100	100	100	99	100	100	100	100	100	100	100	100	97	100
B	Halfdan-N750	50.6	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
B	Halfdan-W5000	104.1	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100
B	Halfdan-W3000	230.1	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100
B	Halfdan-W1500	336.1	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
B	DanF-W5000	1,743.2	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100
B	DanF-Ref.1	4,952.9	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100
C	Halfdan-N750	50.6	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
C	Gorm-E750	78.8	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	97
C	Gorm-SE5100	99.9	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	99
C	Halfdan-NW4800	103.9	100	100	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100
C	DanF-W5000	1,743.2	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100

[24] PAH1 naphthalene, PAH2 anthracene, PAH3 phenanthrene, PAH4 dibenzothiophene, PAH5 fluoranthene, PAH6 benzo(a)anthracene, PAH7 chrysene (incl. triphenylene), PAH8 benzo(g,h,i)perylene, PAH9 benzo(a)pyrene, PAH10 indeno[1,2,3-cd]pyrene, PAH11 pyrene/ thiphenylene.

Survey	Station	Distance From the Platform (m)	Contaminants																		EnS
			Metal						*PAH[24]*												
			Cd	*Cr*	*Cu*	*Pb*	*Hg*	*Zn*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*D8*	*EnS*
C	Gorm-Ref.1	3,008.8	100	100	97	100	100	100	100	100	99	100	100	100	100	100	100	100	100	97	100
D	Halfdan-SE2250	104.1	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
D	Halfdan-SE5000	107.6	100	98	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
D	Halfdan-S650	116	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
D	DanF-W750	334.4	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	98
D	DanF-W5000	1,743.2	100	99	97	100	100	100	100	100	100	100	100	100	100	100	100	100	100	97	100

Note: The closest stations to the DEWTA project area are highlighted.

Source: DHI, 2020.

4.2.7 Seawater Quality

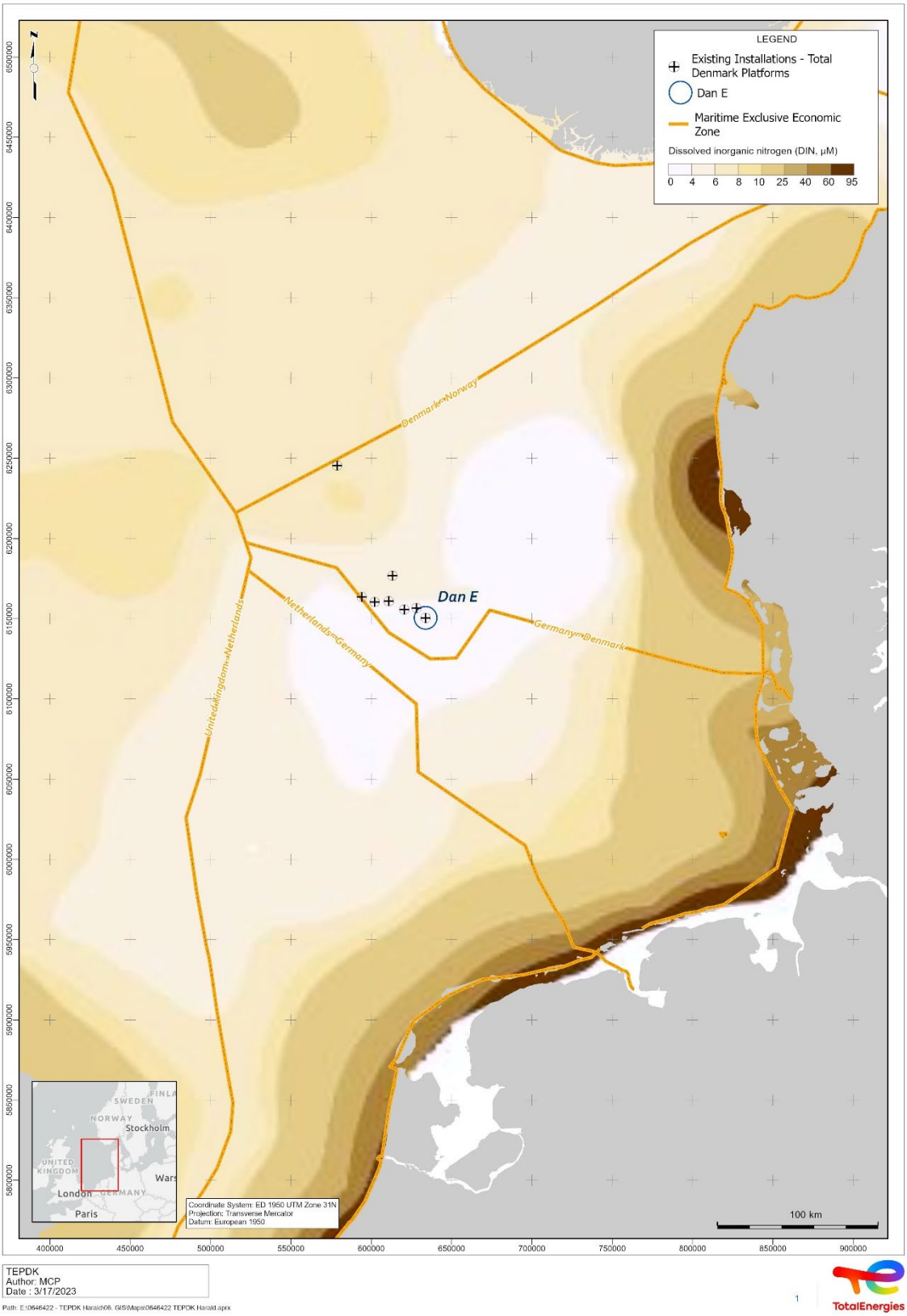
4.2.7.1 Nutrients

Nitrogen, phosphorous and silicate are nutrients that reach the North Sea via land runoff, the atmosphere, rivers and direct discharge. Anthropogenic sources such as agriculture, aquaculture, combustion, and wastewater are the main contributors to these nutrient discharges. Measuring the levels of dissolved inorganic winter nutrient concentrations are a good indicator of such discharges (OSPAR, 2017). The presence of nitrogen in rivers typically originates from the use of fertilizer on agricultural soil and the presence of phosphorous from erosion or wastewater (EEA, 2008).

As photosynthesis requires oxygen, significant growth of marine flora can cause a decrease in the available oxygen in the water, which affects the growth capability of other living organisms (EEA, 2008).

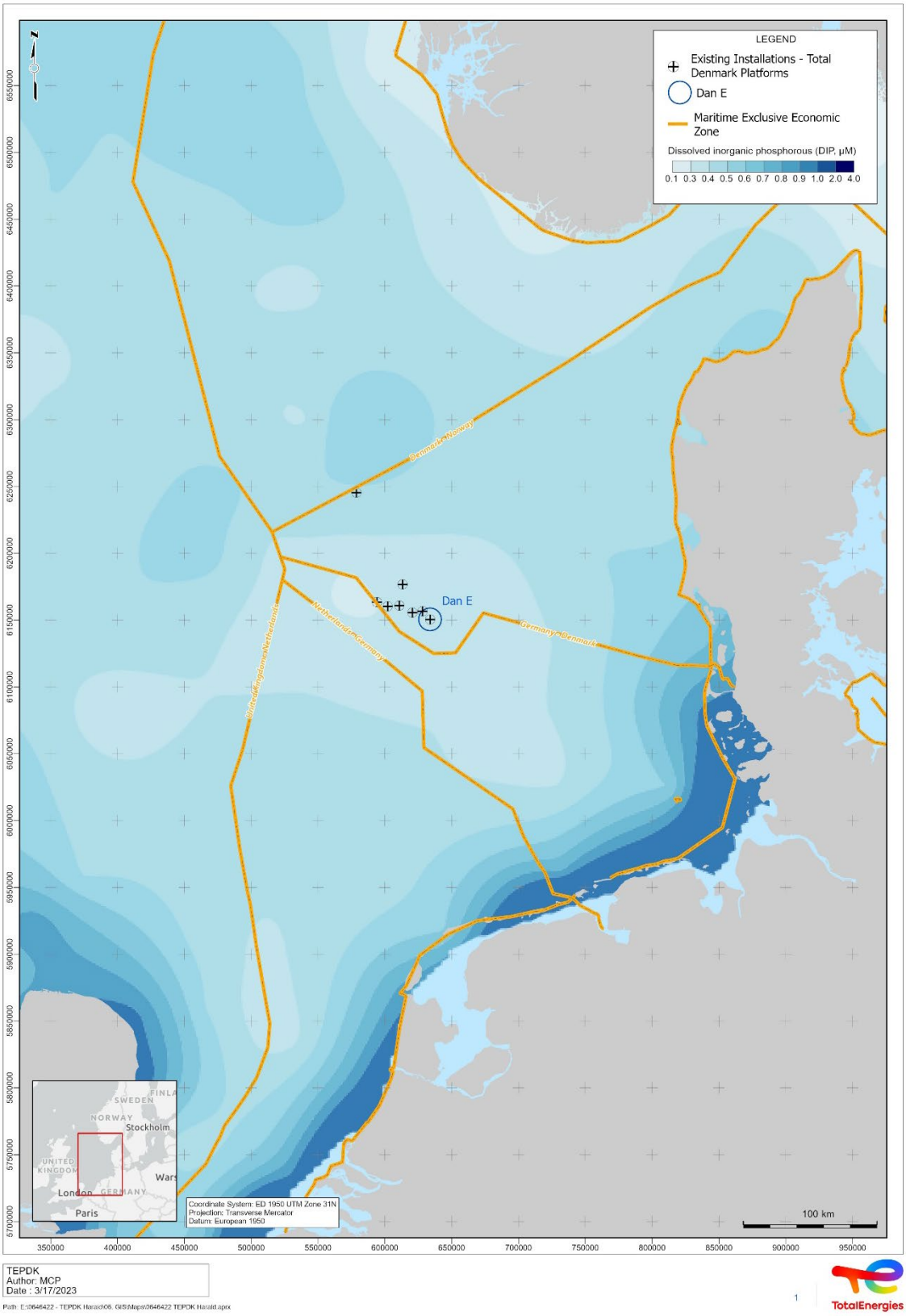
Concentrations of Dissolved Inorganic Nitrogen (DIN) and Dissolved Inorganic Phosphorous (DIP) in the North Sea and the DEWTA project area are shown in Figure 4.12 and Figure 4.13, respectively. DIN and DIP concentrations in the surface sea layer of the DEWTA project area are less than 4 µM for DIN and 0.3-0.4 µM for DIP. The distribution of silicate levels reassembles the DIN and DIP concentration patterns (OSPAR, 2017). DIN, DIP and silicates present higher concentrations near coastal areas and more specifically near river mouths and estuaries, from where a significant amount of nutrients is discharged (OSPAR, 2017). The variations caused by the river discharges are unlikely to affect DIN and DIP levels in the DEWTA project area given it is approximately 200 km offshore.

Figure 4.12 Average Dissolved Inorganic Nitrogen (DIN) Concentrations in the North Sea and the DEWTA Project Area (1990 – 2014)



Source: OSPAR, 2017. Prepared by ERM, 2023.

Figure 4.13 Average Dissolved Inorganic Phosphorous (DIP) Concentrations in the North Sea and the DEWTA Project Area (1990 – 2014)



Source: OSPAR, 2017. Prepared by ERM, 2023.

4.2.7.2 Heavy Metals

Heavy metals are the natural constituents of the Earth's crust, found in very low concentrations; however, human activities have inevitably increased the metal concentrations in the marine environment. Heavy metals are classified as both essential and non-essential elements. Essential heavy metals have known biological roles and are only toxic above threshold concentrations whilst non-essential heavy metals lack any known biological role in marine invertebrates and exhibit high degree of toxicity if allowed to accumulate at metabolically active sites. Heavy metals are non-biodegradable, persistent and toxic to the environment, thus causing serious eco-toxicological problems. Heavy metals tend to bioaccumulate, and the extent of their bioaccumulation is dependent on the total amount, the bioavailability of each metal in the environmental medium and the route of uptake, storage and excretion mechanisms. Metal speciation influences metal bioavailability and toxicity to biota, its transportation and mobilization, and its interaction with the environment. The actual metal speciation is influenced by factors such as pH, the types and concentrations of inorganic ligands and organic ligands and colloidal species present (Shah, 2021).

Metal cycles in the ocean are governed by seasonally variable physical and biological processes. Results from OSPAR studies show that the marine environment has large metal concentration variability Table 4.4). The response time to identify elevated metal contaminants is regionally and element specific, and dependent on the assessment techniques used.

Table 4.4 Concentration Levels of Metals in OSPAR Region II (Greater North Sea)

Metal	Concentration levels
Cadmium (Cd)	6-34 ng Cd/l
Copper (CU)	140-360 ng Cu/l
Lead (Pb)	20-30 ng Pb/l
Mercury (Hg)	0.05-1.3 ng Hg/l
Nickel (Ni)	100-400 ng Ni/l

Source: OSPAR, 2004.

Sources of zinc and lead in the southern North Sea sediments have been linked to the Elbe and Weser River discharges that pass through the mining regions in the Harz Mountains and the Erzgebirge of Germany. Quantitative assessments of the zinc and lead content in the sediments suggest that since the onset of enhanced zinc and lead deposition, for example the entire anthropogenic zinc and lead inputs to the Helgoland Mud Area in the Bight of Germany, are estimated at 12,000 tonnes and 4,000 tonnes of sediment, respectively (Boxberg *et al*., 2019) although the loads of the suspended heavy metals in the Elbe showed peak values of 4,400 tonnes of zinc and 350 tonnes of lead per year at the station Magdeburg in 1986 (Boxberg *et al*., 2019).

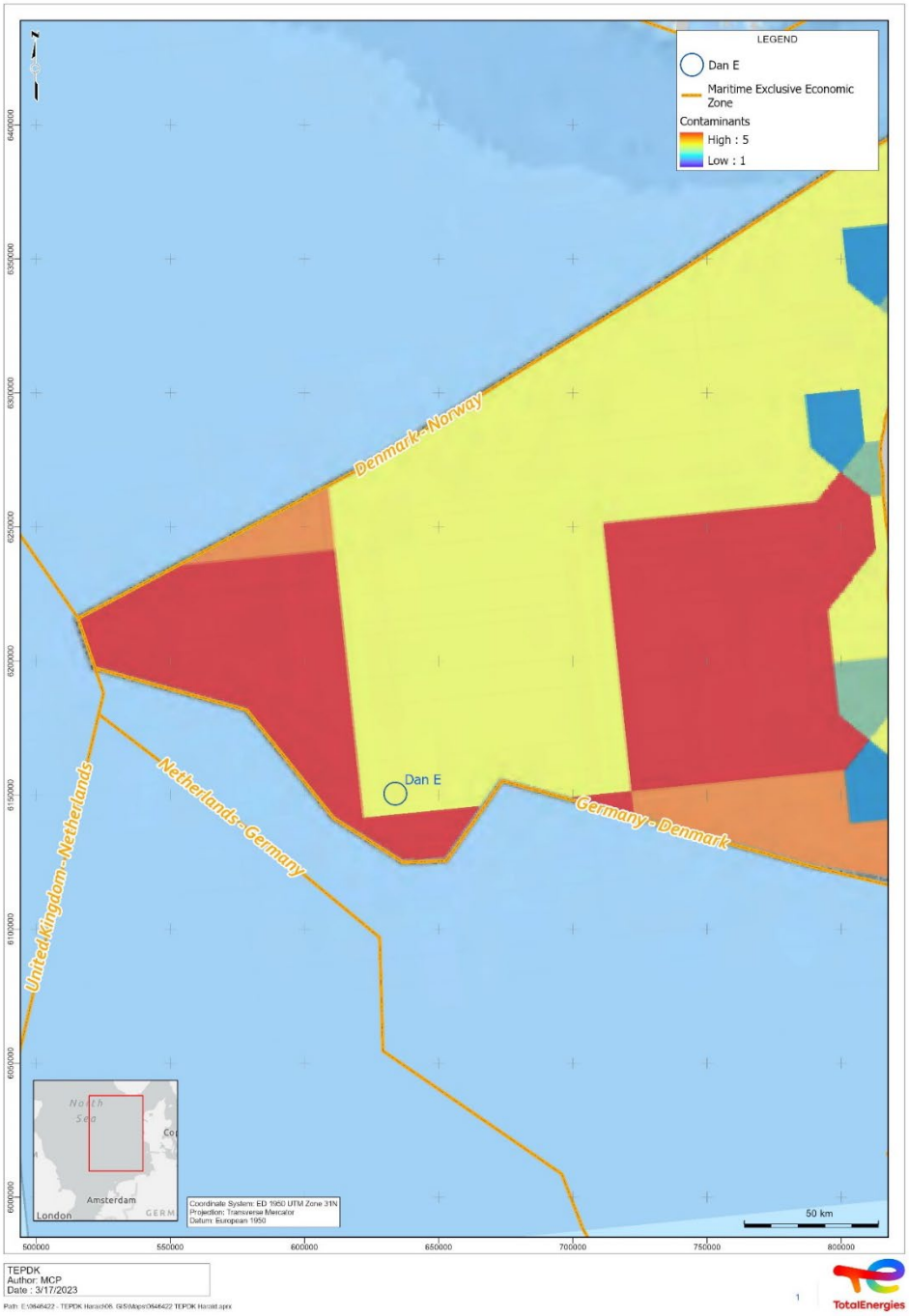
4.2.7.3 Contaminants

There are over 150,000 contaminants, including heavy metals and harmful synthetic chemicals, known to have been introduced to the marine environment due to human activity. The chemical status assessment tool (CHASE+) was developed by the European Environmental Agency (EEA) and it uses quantitative measures of contaminants to provide a framework to assess the level of contamination within an area. To remove the complexities in directly comparing levels of different contaminants across different receptors, CHASE+ ranks levels of contamination from 1 (low level of contaminants) to 5 (high level of contaminants) (EEA, 2019).

Andersen *et al.* (2020) used the CHASE+ method to assess the level of contamination of Danish waters and found that the DEWTA project area is in a Level-3 area (moderate contamination) (Figure 4.14). Levels 3-5 areas are defined as "problem areas" where there is evidence of undesirable

disturbance[25] to the marine ecosystem due to contaminants (Tett *et al.*, 2007). Although the ECOMAR supporting documentation report draws no conclusions to the reasoning behind the observed contamination levels in Figure 4.14, it does provide the primary offshore contaminant producers for the DEWTA project area, which are shipping, aquaculture, oil spills, deep sea mining and offshore oil platforms.

Figure 4.14 Marine Contaminants in the Danish North Sea



Source: Andersen *et al.*, 2020. Prepared by ERM, 2023.

[25] The Department for Environment, Food and Rural Affairs (DEFRA) further defined "undesirable disturbance" as ''a perturbation of a marine ecosystem that appreciably degrades the health or threatens the sustainable human use of that ecosystem' (Tett, *et al*., 2007).

4.2.8 Air Quality

Aulinger *et al*. (2016) estimated emissions from international shipping in the seas surrounding Europe (i.e., the Baltic Sea, the North Sea, the north-eastern part of the Atlantic, the Mediterranean and the Black Sea) during 2011 as follows:

- Sulphur dioxide (SO_2) emissions at 123,000 tonnes per year;
- Nitrogen dioxide (NO_x) emissions at 540,000 tonnes per year.

Due to the application from the start of 2015 of the 0.1% MARPOL 73/78 limit in Sulphur Emissions Control Areas (SECAs) in the North and Baltic Sea and English Channel, ship-sourced sulphur emissions have reduced considerably in these areas. Emissions will be further reduced in the remaining European Union (EU) seas with the implementation in 2020 of the global sulphur cap, which limits sulphur to 0.5% in shipping fuel.

High contributions from shipping to the NO_2 and SO_2 concentrations are restricted to the open sea and the coastal areas in the southern North Sea and in Denmark, where the concentrations reduce near the more open North Sea near Denmark compared to the English Channel (Matthias *et al*., 2016). Increasing restrictions on air emissions from shipping will lead to an improvement in the levels of air pollutants in the future.

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.

4.2.9 Climate Change

4.2.9.1 Global Context

In the recent decades, the increased consciousness about risks associated with global climate change, influenced by the increasing volumes of greenhouse gases in the atmosphere, has produced various international initiatives and led countries to act over the issue.

Milestones of international effort against climate change are:

- In 1988, creation by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) of the Intergovernmental Panel on Climate Change (IPCC) whose objective is to provide governments at all levels with scientific information that they can use to develop climate policies and produce key inputs into international climate change negotiations;
- In 1992, adoption of the United Nations Framework Convention on Climate Change (UNFCCC) by 197 countries (including Denmark);
- In 1997, adoption of the Kyoto Protocol (ratified by Denmark on May 31st, 2002), which operationalized the UNFCCC by committing industrialized countries to limit and reduce greenhouse gases (GHG) emissions in accordance with agreed individual targets;
- In 2015, adoption of the Paris Agreement (ratified by Denmark on November 1st, 2016), that for the first time brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. It was committing to limit temperature rise to 2°C by 2100;
- On 22 April 2016, 174 countries formally signed the Paris Agreement in New York. For the Paris Agreement to become law, at least 55 countries representing at least 55% of global emissions had to formally ratify it. The EU formally ratified the deal on 5 October 2016, triggering its entry into force on 4 November, less than a year after it was adopted.

4.2.9.2 Climate Change Risks in Denmark

Denmark has developed and adopted several policies on climate change mitigation that are driven by compliance with international climate obligations set within the European Union and the United Nations and by achievement of specific national targets. As described in Chapter 2 Policy, Legal and Administrative Framework, the regulatory framework for the Danish climate related policies is laid out in the Danish climate law.

According to ClimateChangePost (2023), the following changes have been identified in Denmark:

- Mean air temperature is approaching 8.5°C, an increase of almost 1.5°C since the end of the 19th century. Now, the average winter temperature is most often warmer than 2°C and the average summer temperature is about 16°C;
- The annual precipitation measured in Denmark is now about 750 mm. Precipitation is greatest in west and southern Jutland, with almost 1,000 mm/year, and least on the eastern islands, where about 600 mm is recorded each year;
- The average wind speed is expected to increase by 1-4% from 2071-2100 compared with 1961-1990, while the maximum storm strength is expected to increase on both sea and land, i.e. by 10%; and
- A tendency towards more frequent westerly winds and at the same time a shift of the storm tracks over the North Atlantic slightly eastward, leading to a small increase in storm activity over Denmark and the adjacent waters. On this basis, calculations with storm surge models show that for 2071-2100, the highest sea level in the more extreme cases could rise by 5-10% relative to today (about 0.3 m on the west coast). In addition, there is the global rise in sea level, which the Intergovernmental Panel on Climate Change (IPCC) estimates at between 0.1–0.9 m over the level today for 2071-2100.

The Danish Ministry of the Environment and Food and the Danish Environmental Protection Agency have identified climate change risks in collaboration with several other ministries, agencies and organizations. They identify that various Danish natural habitat types will be affected by climate change due to increased sea levels, altered precipitation patterns or increased biological production. In many places, the expected rise in water levels will force back the existing coastline (Danish Environmental Protection Agency, 2023).

Globally both air and sea surface temperatures are expected to increase as future greenhouse gas emissions continue to rise. OSPAR (2010) states there is evidence within contemporary studies that recent increases in sea surface temperature within the North Sea have been increasing at a disproportionately greater rate when compared to the rest of the world oceans. This could impact future temperatures within the North Sea and Western Europe. OSPAR (2010) presents evidence of increased sea surface temperatures in the North Sea of about 1-2°C over the past 25 years. Summer periods in the surface waters have become longer and warmer while winters have become shorter and cooler.

4.2.9.3 Danish Emissions

Denmark's oil production is one of the world's least carbon-intensive due to the crude oil being of a high quality and a co-production of natural gas (Masnadi *et al.*, 2018).

The European Database for Global Atmospheric Research (EDGAR), developed by the European Commission DG JRC and the Netherlands Environmental Assessment Agency (PBL), presents GHG emission data for Denmark, as for all the world countries. This database provides global past and present-day anthropogenic emissions of greenhouse gases and air pollutants by country. According to the latest data available from EDGAR, in 2021, the Danish total CO_2 emissions accounted for 27.28 Mt, representing 0.07% of the world's total; in addition, the CO_2 emissions per capita were 4.69 t (Crippa *et al.*, 2022). Regarding total GHG emissions in 2021, which includes fossil CO_2, CH_4, N_2O

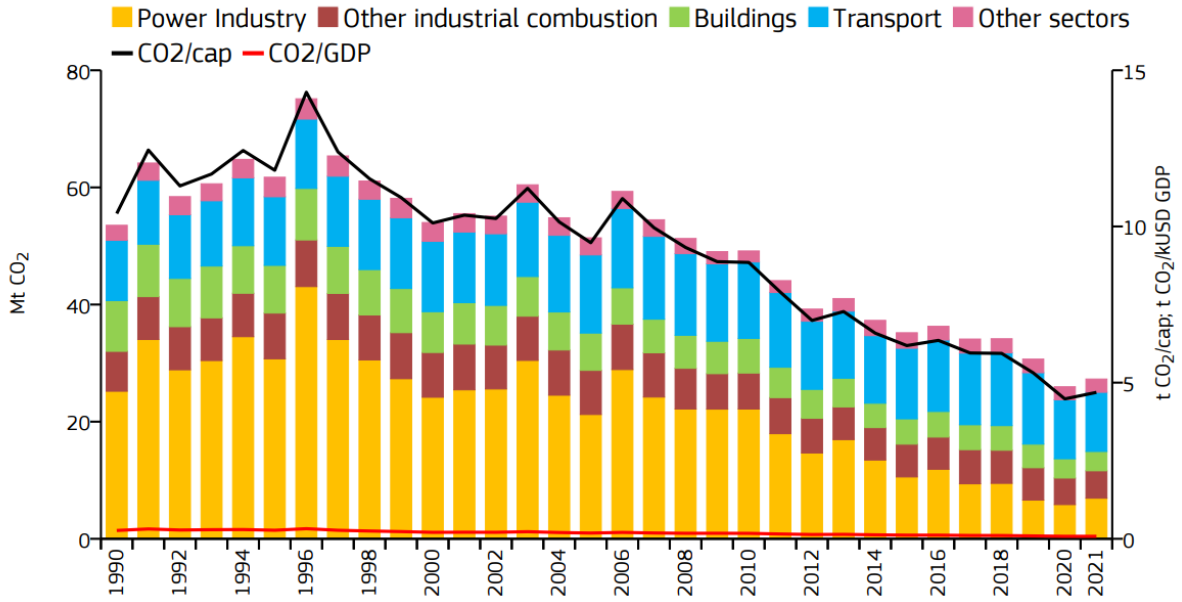
and fluorinated gases, the Danish emissions accounted for 40.48 Mt CO_2 equivalent, representing 0.0008% of the world's total (EDGAR, 2023b,c).

Figure 4.15 presents Danish CO_2 emissions by sectors from 1990 to 2021, whereas Figure 4.16 presents Danish GHG total emissions (CO_2 equivalent) for the period 1990-2015, both extracted from EDGAR. Figure 4.17 shows a scheme of the general trends by sector observed in the country.

Data from the EDGAR shows a significant decrease in CO_2 emissions with the exception of 2021. The increase is mainly due to the energy industry but is in line with the pre-pandemic level (Figure 4.17) showing a significant decrease in the latest years. GHG total emissions, (Figure 4.16) N_2O and CH_4 emissions have remained almost constant since 1990, while CO_2 emissions have decreased since 1996.

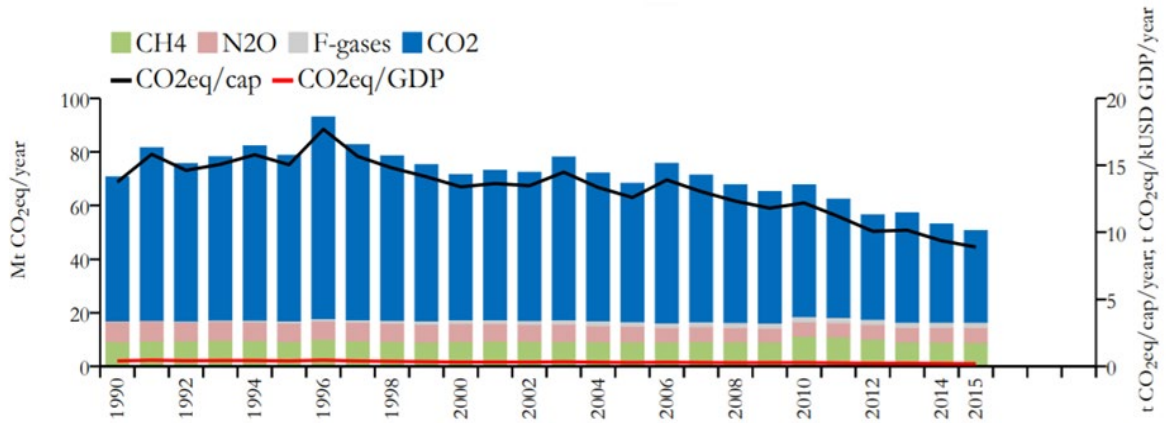
The decrease in these emissions is particularly significant with regards to the energy industry. The transport sector is the only exception (Figure 4.17) and is the only contributor showing an increase in both CO_2 and GHG total emissions from 1990 to recent years. However, there is a decrease in GHG total emissions when comparing 2015 data with 2005 data, which highlights that efforts in this sector to reduce GHGs have been successful in reversing the trend.

Figure 4.15 Danish Fossil CO_2 Emissions by Sector from 1990 to 2021



Source: Crippa *et al.*, 2022.

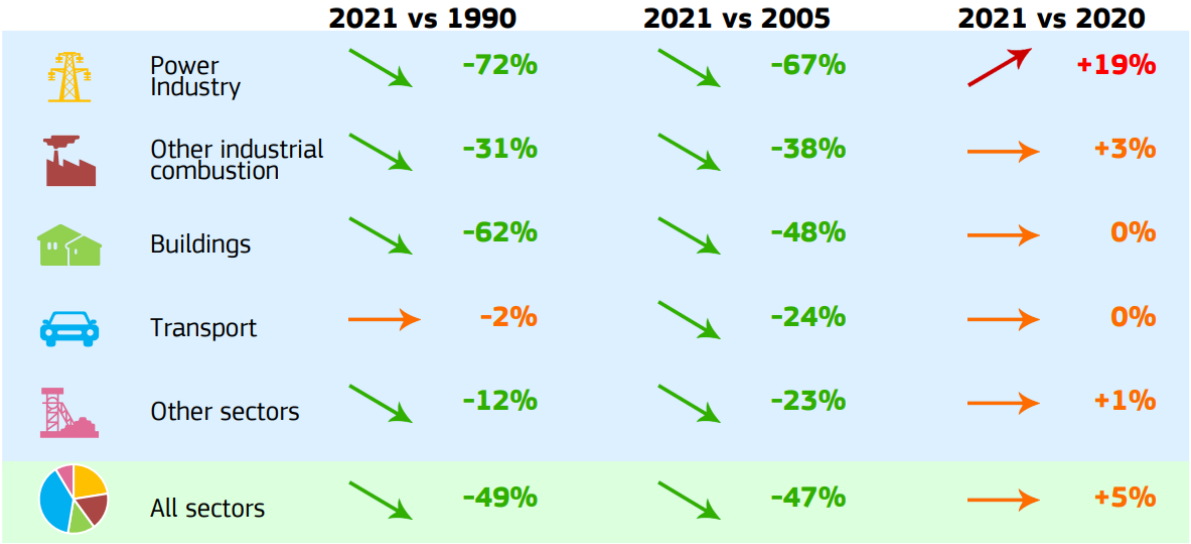
Figure 4.16 Danish GHG Total Emission (CO_2 equivalent) from 1990 to 2015



Source: Crippa *et al.*, 2019.

Figure 4.17 Danish Trends in CO_2 and GHG Emissions

Year	CO_2 emissions Mt CO_2/yr	CO_2 emissions per capita t CO_2/cap/yr	CO_2 emissions per unit of GDP PPP t CO_2/kUSD/yr	Population
2021	27.280	4.688	0.080	5.819M
2020	25.963	4.479	0.080	5.797M
2005	51.392	9.479	0.184	5.422M
1990	53.534	10.413	0.267	5.141M



Note: Mt CO_2/yr = metric tonnes of CO_2 per year, GHG: Mt CO_2eq/yr = Greenhouse Gases: metric tonnes of CO_2 equivalent per year, GHG: t CO_2eq/cap/yr = Greenhouse Gases: tonnes of CO_2 equivalent per capita per year, tCO_2/kUSD/yr = tonnes of CO_2 per thousand US dollars per year

Source: Crippa *et al.*, 2022.

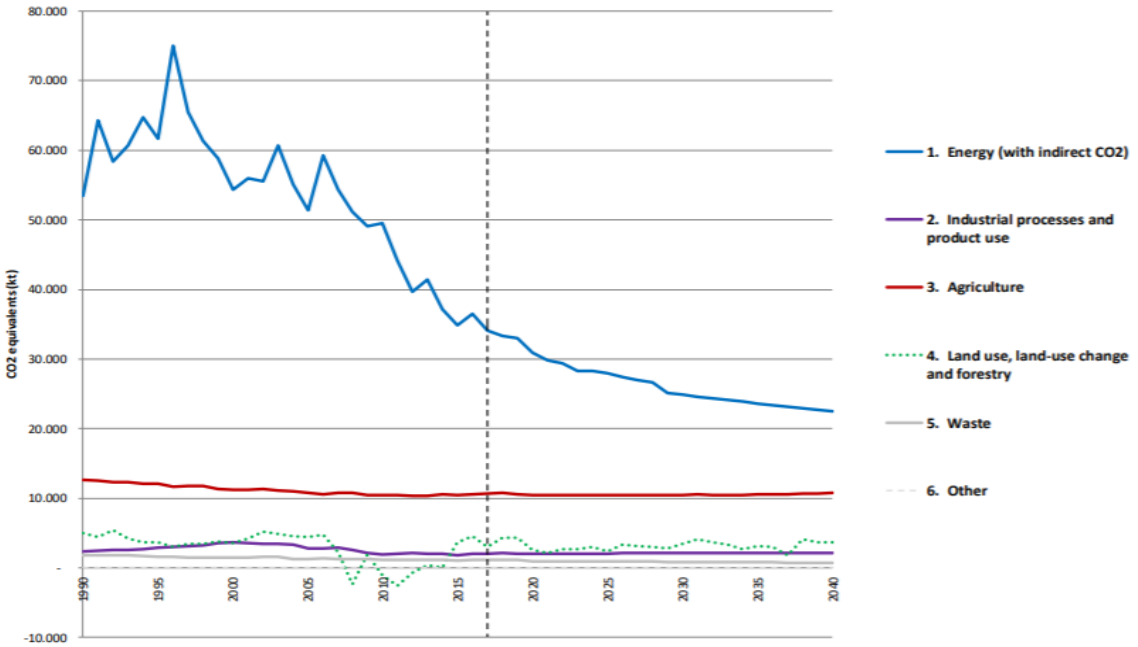
Figure 4.18 shows, together with the past and current data from 1990 to 2017, the projections of the total GHG emissions by Intergovernmental Panel on Climate Change (IPCC) sector until 2040, as reported by the Danish Ministry of Climate, Energy and Utilities in Denmark's Integrated National Energy and Climate Plan issued in December 2019.

The projections have been developed by considering the adoption of the existing policies and measures on climate change mitigation.

The projection shows that:

- Energy sector emissions will decrease by 53% from 1990 to 2030 and by 58% from 1990 to 2040.
- Industrial processes and product use emissions will decrease by 12% from 1990 to 2030 and by 9% from 1990 to 2040.
- Agricultural emissions will decrease by 17% from 1990 to 2030 and by 15% from 1990 to 2040.
- Land use, land-use change and forestry emissions will decrease by 31% from 1990 to 2030 and by 25% from 1990 to 2040.
- Emissions from waste will decrease by 52% from 1990 to 2030 and by 63% from 1990 to 2040.

Figure 4.18 GHG Emissions by IPCC Sector from 1990-2040



Source: Danish Ministry of Climate, Energy and Utilities, 2019.

4.2.9.4 Danish Climate Commitments

The purpose of the Climate Act (Act. No 965 of 26 June 2020) is for Denmark to reduce greenhouse gas emissions in 2030 by 70% compared to the level of emissions in 1990, and for Denmark to achieve a climate-neutral society by 2050 at the latest, taking into account the Paris Agreement target of limiting the global temperature rise to 1.5°C.

The climate effort must adhere to the following guiding principles:

- The climate challenges are a global problem. Therefore, Denmark must be a leading nation in the international climate effort, a nation that can inspire and influence the rest of the world. Furthermore, Denmark has both a historical and a moral responsibility to take the lead;
- The realisation of Denmark's climate targets must be as cost effective as possible, taking into account the long-term green transition, sustainable business development and Danish competitiveness, sound public finances and employment, and that Danish business must be developed rather than diminished.

- Denmark must show that a green transition is possible while maintaining a strong welfare society, where cohesion and social balance are secured.
- The initiatives to be taken to reduce greenhouse gas emissions must result in real domestic reductions, but it must also be ensured that Danish measures do not simply relocate all of the greenhouse gas emissions outside of Denmark's borders.

The Act sets a rolling five-year target, 10 years in advance.

4.3 Biological Environment

4.3.1 Plankton

Plankton communities can be categorised in two groups: marine algae (phytoplankton) and marine animal organisms (zooplankton). Plankton constitutes the main primary and secondary biomass in marine ecosystems and plays a fundamental role in marine food webs.

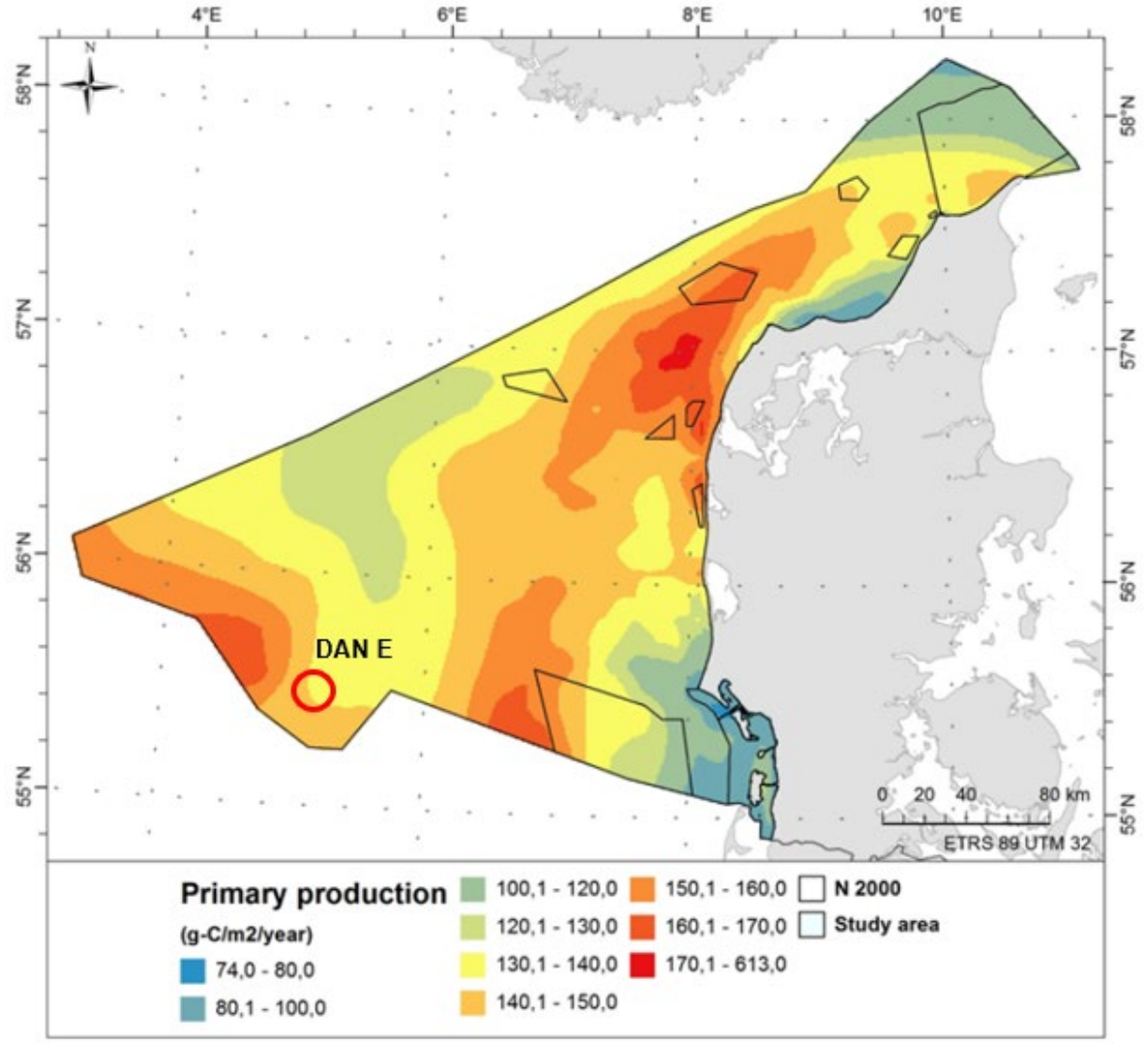
4.3.1.1 Phytoplankton

Phytoplankton production is dependent upon nutrient and light availability. The main source of nutrients in the North Sea is from the Atlantic Ocean inflows, while in continental coastal waters, the rivers which drain into the North Sea contribute approximately 24% of nutrient inputs (Edelvang *et al.*, 2017). Phytoplankton in the North Sea is light limited in the winter, and nutrient limited in the summer above the thermocline (EEA, 2008). The highest primary production in the Danish EEZ is found in the eastern and southern parts. Primary production around the DEWTA project area is 130-150 g-C/m^2/year (Figure 4.19).

The dinoflagellate genus *Ceratium* dominates the phytoplankton community in the North Sea. The species of this genus are relatively well able to tolerate the variations of temperature and salinity of the area (Johns & Reid, 2001). Phytoplankton, which may be present at the DEWTA project area, include the species listed in Table 4.5.

A phytoplankton bloom is a phenomenon during which the concentration of phytoplankton increases significantly due to the introduction or availability of a lacking nutrient in an environment. Blooms occur annually each spring and on a smaller scale in the autumn in the North Sea (Johns & Reid, 2001). Deeper, nutrient-rich water surface due to vertical mixing in the water column, enabling photosynthesis production to rise, increasing the abundance of phytoplankton. Zooplankton abundance peaks about two weeks after the phytoplankton peak (EEA, 2008).

Figure 4.19 Modelled Primary Production as a Yearly Average (2009-2013)



Source: Edelvang *et al.,* 2017.

Table 4.5 Phytoplankton and Zooplankton in the Southern North Sea

Phytoplankton	Zooplankton
Ceratium fusus	Total copepods
Ceratium furca	*Echinoderm* larvae
Ceratium tripos	*Pseudocalanus* spp.
Chaetoceros (Phaeoceros) spp.	*Acartia* spp.
Chaetoceros (Hyalochaete) spp.	*Temora longicornis*
Ceratium macroceros	*Evadne* spp.
Thalassiosira spp.	*Pseudocalanus* adult.
Protoperidinium spp.	*Oithona* spp.
Ceratium horridum	*Calanus traverse*
Ceratium longipes	*Podon* spp.

Source: Maar *et al.*, 2016.

4.3.1.2 Zooplankton

Zooplankton is on the second trophic level of the food chain because they predominantly feed off primary production organisms (i.e., phytoplankton). Zooplankton biomass depends on the growth and quality of their food, and on hydrodynamic and chemical factors. There is considerable variability in zooplankton biomass across the North Sea, with higher concentrations occurring in inshore regions, within tidal fronts, and at the Oyster Ground and Dogger Bank due to its relatively shallow bathymetry (the latter being the closest to the DEWTA project area 26.9 km to the west) (Peters *et al*., 2005).

The most common zooplankton community comprises copepods (all copepods species under 2 mm), including various smaller species, such as *Para-Pseudocalanus* spp*., Acartia* spp. and the younger stages of *Calanus* (Johns & Reid, 2001). The most abundant zooplankton species in the North Sea are presented in Table 4.5.

4.3.2 Benthos

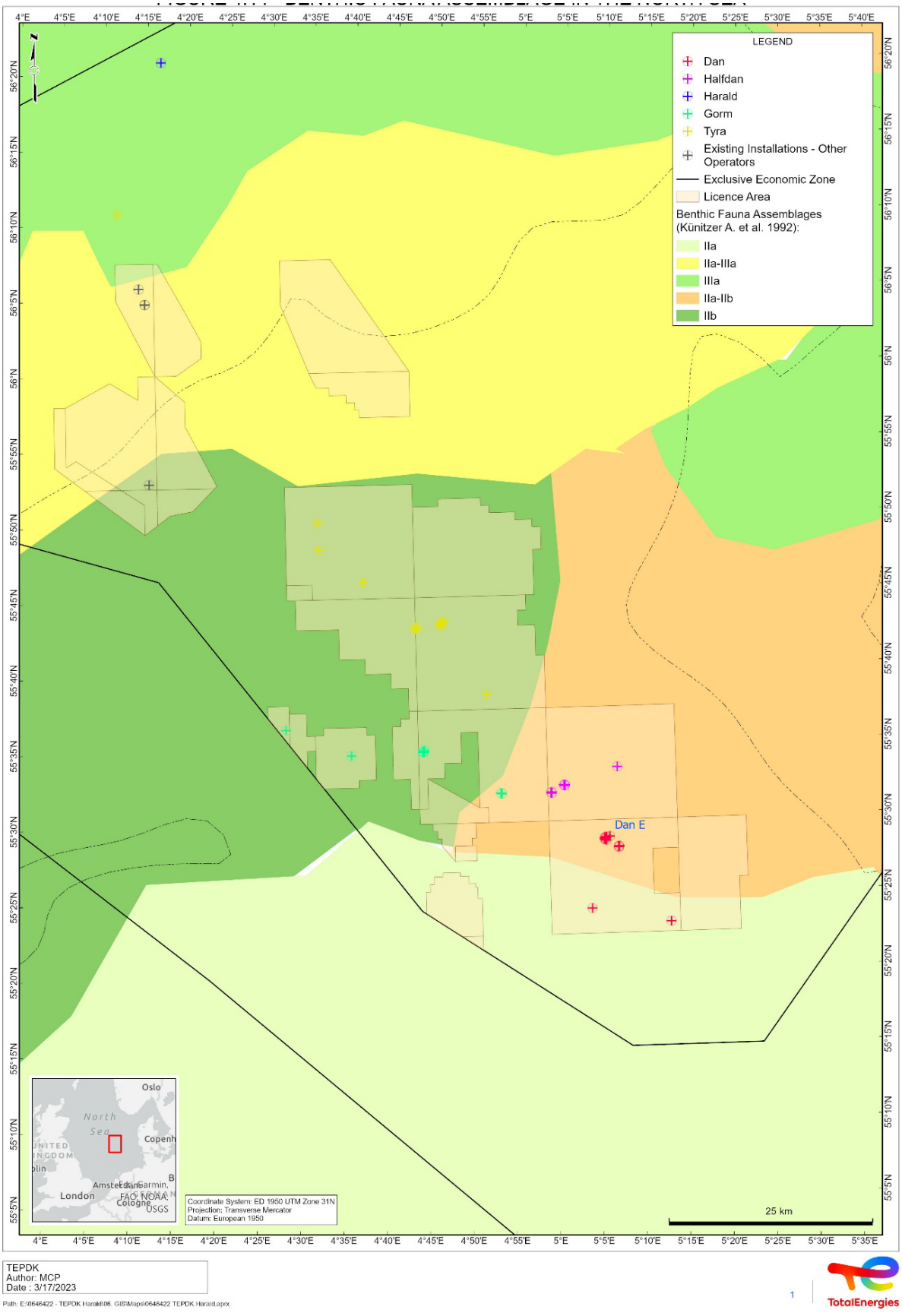
Benthos comprises the benthic communities that occur on the seabed and the benthic communities that have colonised existing subsea structures.

4.3.2.1 Overview

The water depth around the DEWTA project area is approximately 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[26] 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 subterranean* and *Eudorella truncatula*. The biomass in this class is in the order of 12.6 ± 7.5 g AFDW/m^2 (Figure 4.21). Figure 4.22 shows sea benthic habitat classification of EMODnet (2023). Based on another seabed habitat classification, the DEWTA project area is surrounded by deep circalittoral mud (AS.37) and deep circalittoral sand (AS.27), similar to the TWINSPAN classification.

[26] Two Way INdicator SPecies Analysis (TWINSPAN).

Figure 4.20 Benthic Fauna Assemblage in the North Sea



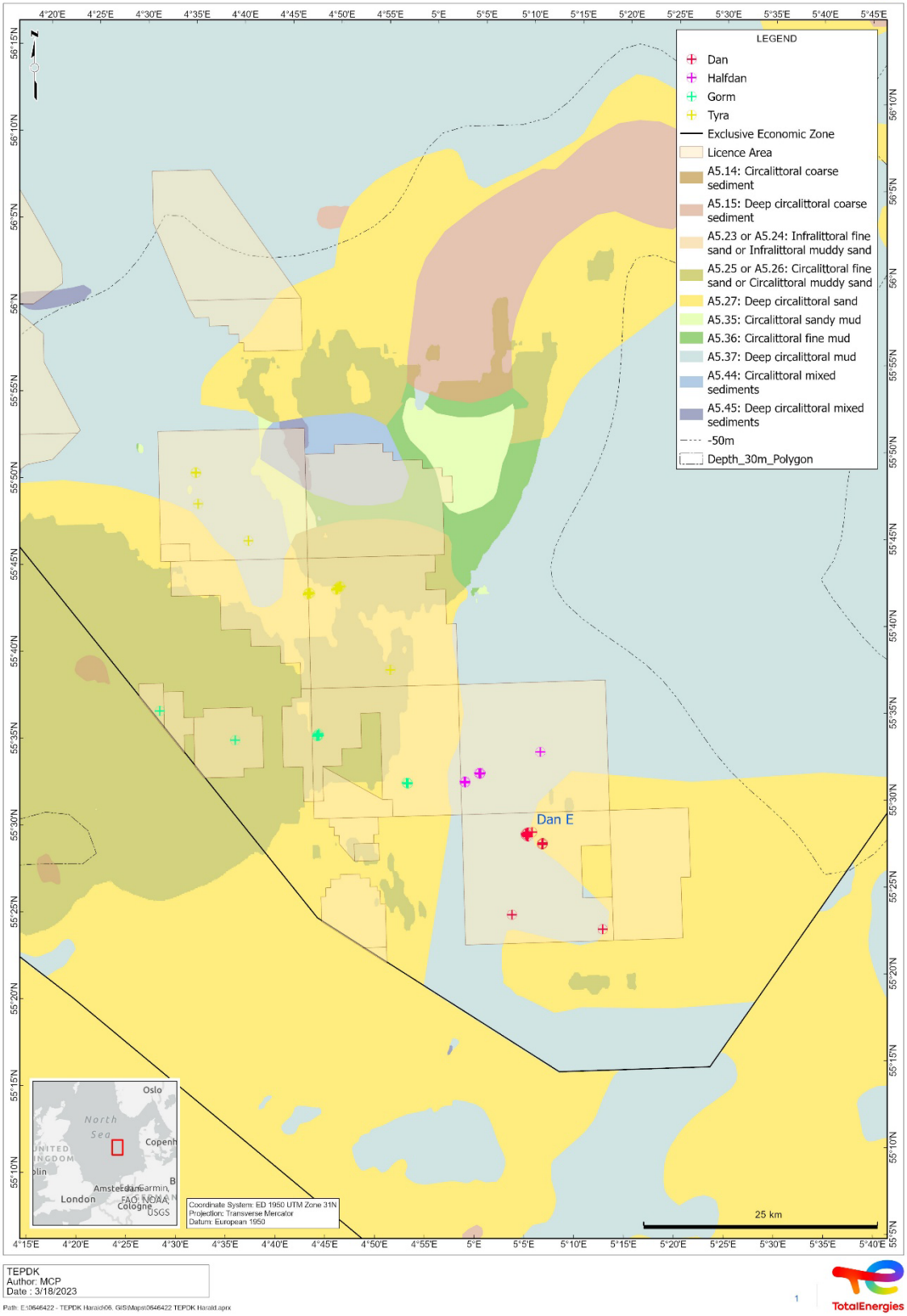
Source: Künitzer *et al.*, 1992. Prepared by ERM, 2023.

Figure 4.21 TWINSPAN Classification

1st dichotomy	depth < 70m				depth > 70m			
2nd dichotomy	I		II		III		IV	
depth	mainly <30m		30-70m				<100m	
deposit	coarser sediment		finer sediment		finer sediment		coarser sediment	
3rd dichotomy	Ia	Ib	IIa	IIb	IIIa	IIIb	IVa	IVb
depth			30-50m	50-70m	70-100m	> 100m		
deposit			muddy fine sand	fine sand				
indicator species	*Nephtys c.*	*Aonides p.*	*Nucula n.*	*Ophelia b.*	--	*Minuspio c.*	*Ophelia b.*	*Protodorvilla k.*
	Echinocardium c.	*Phoxocephalus h.*	*Callianassa s.*	*Nephtys l.*		*Thyasira sp.*	*Exogone h.*	
	Urothoe p.	*Pisione r.*	*Eudorella t.*			*Aricidea c.*	*Spiophanes b.*	
						Exogone v.	*Polycirrus sp.*	
number of stations	52	19	40	61	46	41	12	2
number of species	27 ± 8	29 ± 9	44 ± 9	43 ± 10	54 ± 16	51 ± 13	44 ± 12	
exp ($H^{'}$)	12 ± 4	14 ± 5	14 ± 5	28 ± 5	24 ± 10	25 ± 7	23 ± 5	
Ind.m^{-2}	805 ± 728	873 ± 623	1995 ± 1499	1093 ± 686	1224 ± 1233	2863 ± 1844	1775 ± 1114	
biomass (g AFDW.m^{-2})	9.5 ± 9.9	4.3 ± 4.3	12.6 ± 7.5	7.6 ± 6.5	7.4 ± 7.0	3.5 ± 3.7	3.8 ± 2.2	
	--------- southern North Sea ---------			--- central North Sea ---		--------- northern North Sea ---------		

Source: Künitzer *et al*., 1992.

Figure 4.22 Benthic Substrate in the North Sea



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

4.3.2.2 Benthos Close to Platforms/Pipelines

DHI, on behalf of TEPDK, has undertaken biological surveys every few years since 2006 (including 2009, 2015, 2018 and 2021) at Dan F (approximately 0.5 km from the DEWTA project area). Given the proximity of Dan E to Dan F, the benthic habitat is expected to be comparable. The survey conducted by DHI in 2021 provided an overview of the most important species based on their abundance. The polychaeta *Galathowenia oculata* was the most abundant (15.1%) during the survey. Other abundant species included the polychaeta *Lanice conchilega*, *Pectinaria* (Lagis) *koreni*, *Owenia fusiformis, Scoloplos armiger*, and *Spiophanes bombyx*, and species from the taxa Echinodermata (*Amphiura filiformis*), Bivalvia (*Thyasira flexuosa*), Phoronida (*Phoronis muelleri*) and Edwardsiidae (*Edwardsia* sp.). Similar results have been found in the previous DHI survey in 2018. The main difference between 2018 and 2021 was the distribution of *Galathowenia oculata*, which had a wider presence throughout the Dan F area in 2021.

DHI conducted seabed monitoring along pipelines between the HALFDAN and DAN Fields (DHI, 2020). An average abundance of 766 ± 150 ind./0.1 m^2 was found in the survey area. A total of 85 taxa were identified to species level. The identified taxa represented 14 families comprising a wide variety of species classified as crustaceans, molluscs, annelids (ringed worms) and echinoderms. The Polychaeta family registered the most species, followed by Crustacea and Bivalvia (Table 4.6).

Table 4.6 Benthos Richness along Pipelines between Dan and Halfdan

Family	Common name	No. of species
Cnidaria	Polyp animals	2
Anthozoa	Anemones	1
Hydrozoa	Polyp animals	1
Bivalvia	Bivalve	14
Gastropoda	Snails	3
Crustacea	Crustacean	15
Echinodermata	Sea urchins	8
Ophiuroids	Brittle star	1
Polychaeta	Bristle worms	35
Enteropneusta	Acorn worms	1
Plathyhelminthes	Flatworms	1
Phoronida	Horseshoe worms	1
Priapulida	Priapulid worms	1
Nemerteans	Ribbon worms	1

Source: DHI, 2020.

4.3.2.3 Habitats and Species of Conservation Concern

No benthic species on the IUCN Red List of Threatened Species (IUCN Red List) have been identified near the DEWTA project area, although very few European benthic species have been assessed for inclusion on the IUCN Red List.

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the OSPAR Convention) has identified a list of threatened and declining species and habitats, some of which occur in the North Sea (OSPAR, 2008). None of the OSPAR threatened and declining habitats have been identified in TEPDK areas in Danish waters; however, the habitat *sea-pen and burrowing megafauna communities* has been recorded in German waters in similar habitats to those present in TEPDK areas. The closest recorded location is approximately 15 km from the Danish EEZ. The OSPAR threatened and declining benthic species Ocean Quahog (*Arctica islandica)* has a distribution

that overlaps TEPDK areas; however, the IUCN has not evaluated its conservation status at a global or European level.

The EU Habitats Directive Annex I habitat *Sandbanks* has been mapped within the Doggerbank Site of Community Interest (SCI) in the German EEZ, 26.9 km west of the DEWTA project area.

4.3.3 Fish

4.3.3.1 Overview

There are approximately 230 recorded fish species in the North Sea, some of which are present year-round, whilst others exhibit migratory behaviour. The presence and distribution of species throughout the North Sea is related to a variety of environmental conditions and habitats each species requires (Quirijns & Pastoors, 2014). Various demersal and pelagic fish species[27] and some that transition from one behaviour to the other throughout their lifetimes are present.

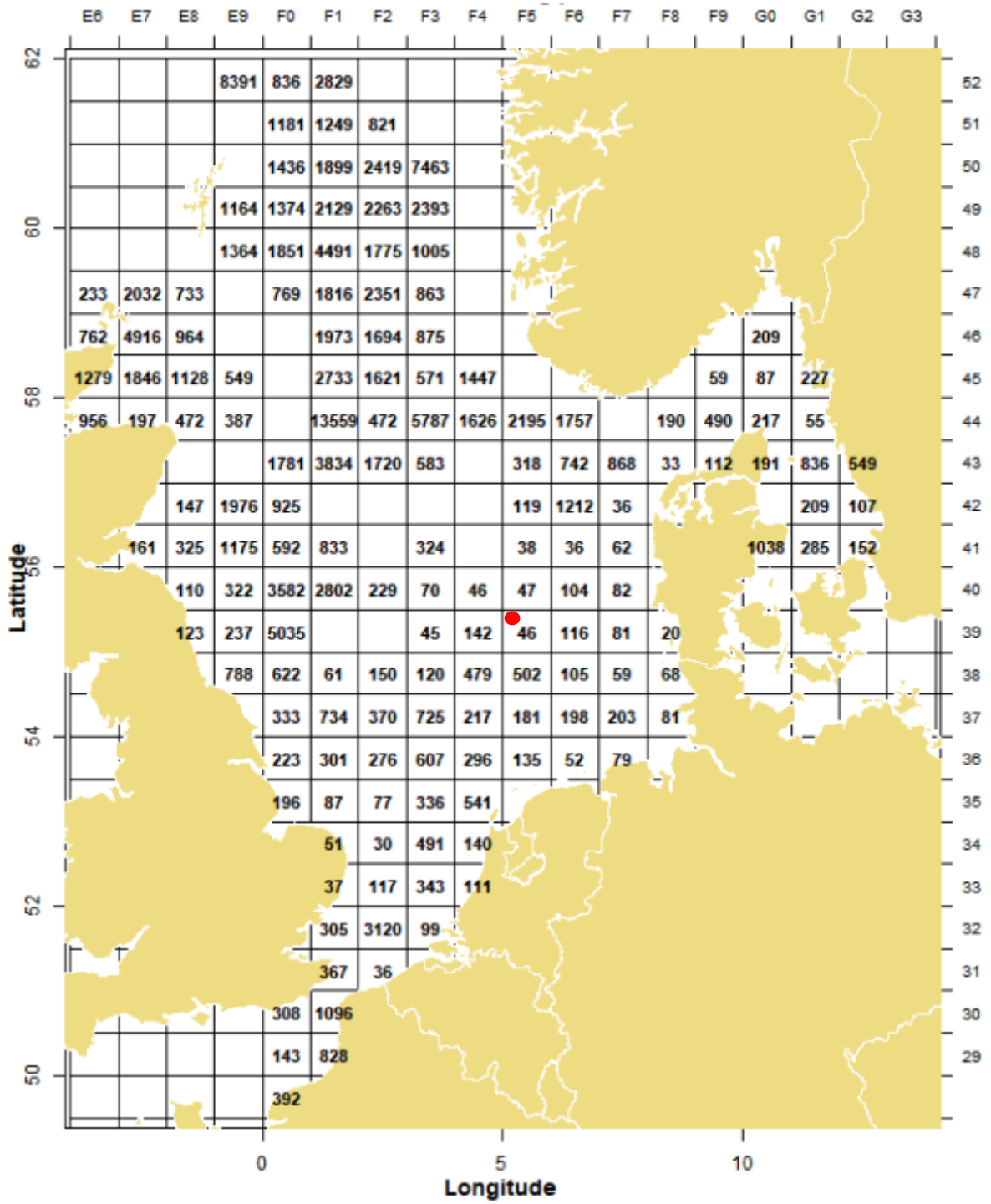
The International Bottom Trawl Surveys (IBTS) of the International Council for the Exploration of the Sea (ICES) have been undertaken yearly since 1970, with subsequent reports of the findings per ICES rectangle (a standardized unit area used in fisheries management) being published. Figure 4.23 provides a representation of the fish biomass distribution derived from the IBTS surveys undertaken in quarter one (Q1) of 2022 (ICES, 2022). This serves as a general indicator of the abundance of fish species in different areas. The southern North Sea generally shows lower abundance levels than the northern North Sea. This is particularly reflected in the Dan area where the fish biomass is 46 kg/h, in contrast with the fish biomass reaching values above 1,000 kg/h in the northern part of the North Sea.

According to ICES (2022), fisheries in the Greater North Sea catch a large diversity of species. The landings of the most fished species are an indication of the different fish communities in the Greater North Sea (Figure 4.24). The main targets of major commercial fisheries are cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), whiting (Actinopterygii), saithe (*Pollachius virens*), plaice (*Pleuronectes platessa*), lemon sole (*Microstomus kitt*), mackerel (*Scomber scombrus* and *Trachurus trachurus*), herring (*Clupea harengus*), Norway pout (*Trisopterus esmarkii*), sprat (*Sprattus sprattus*), sandeel (*Hyperoplus* sp.), Norway lobster (*Nephrops norvegicus*) and deep-water prawn (*Pandalus borealis*). Norway pout, sprat and sandeel are predominantly the targets of industrial fisheries for fishmeal and fish oil, while other species are the targets of fisheries for direct human consumption. High catches of both pelagic species (mackerel and herring) and demersal species (cod and haddock) accounted for the increase in total landings in the late 1960s (Figure 4.24). Total landings declined after 1995 to a low of 1.4 million tonnes in 2012. This decline is attributed to overfishing and decreased productivity of important stocks such as cod and herring, but also to the successful reduction of fishing mortality to more sustainable levels after 2000.

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 4.25).

[27] Demersal species live near the bottom while pelagic species live in open water.

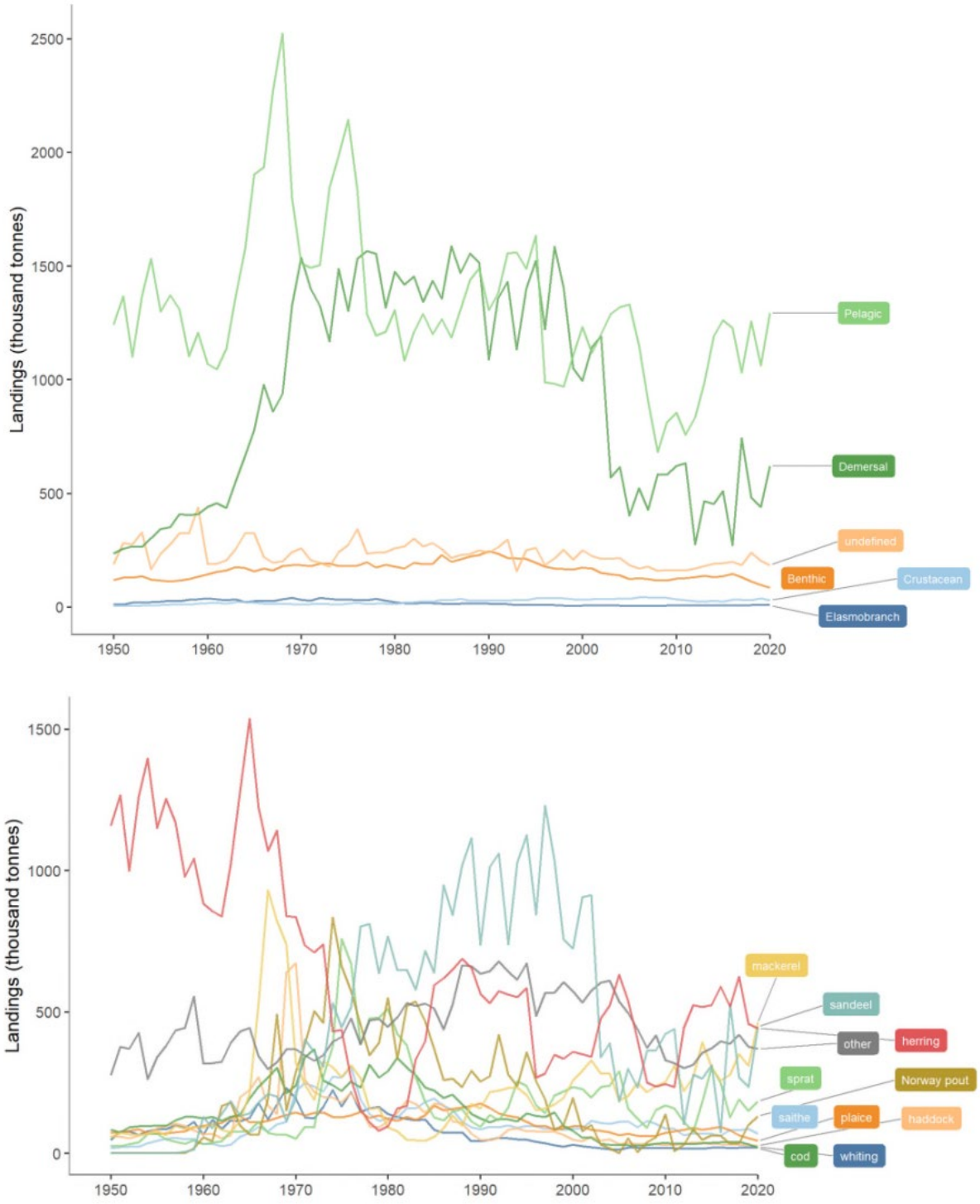
Figure 4.23 Distribution of Fish Biomass (kg/h) in IBTS Hauls by ICES Rectangle in the North Sea in Q1 2022



Note: Values standardized to kg/h haul duration; mean per rectangle. The DEWTA project area represented by red point.

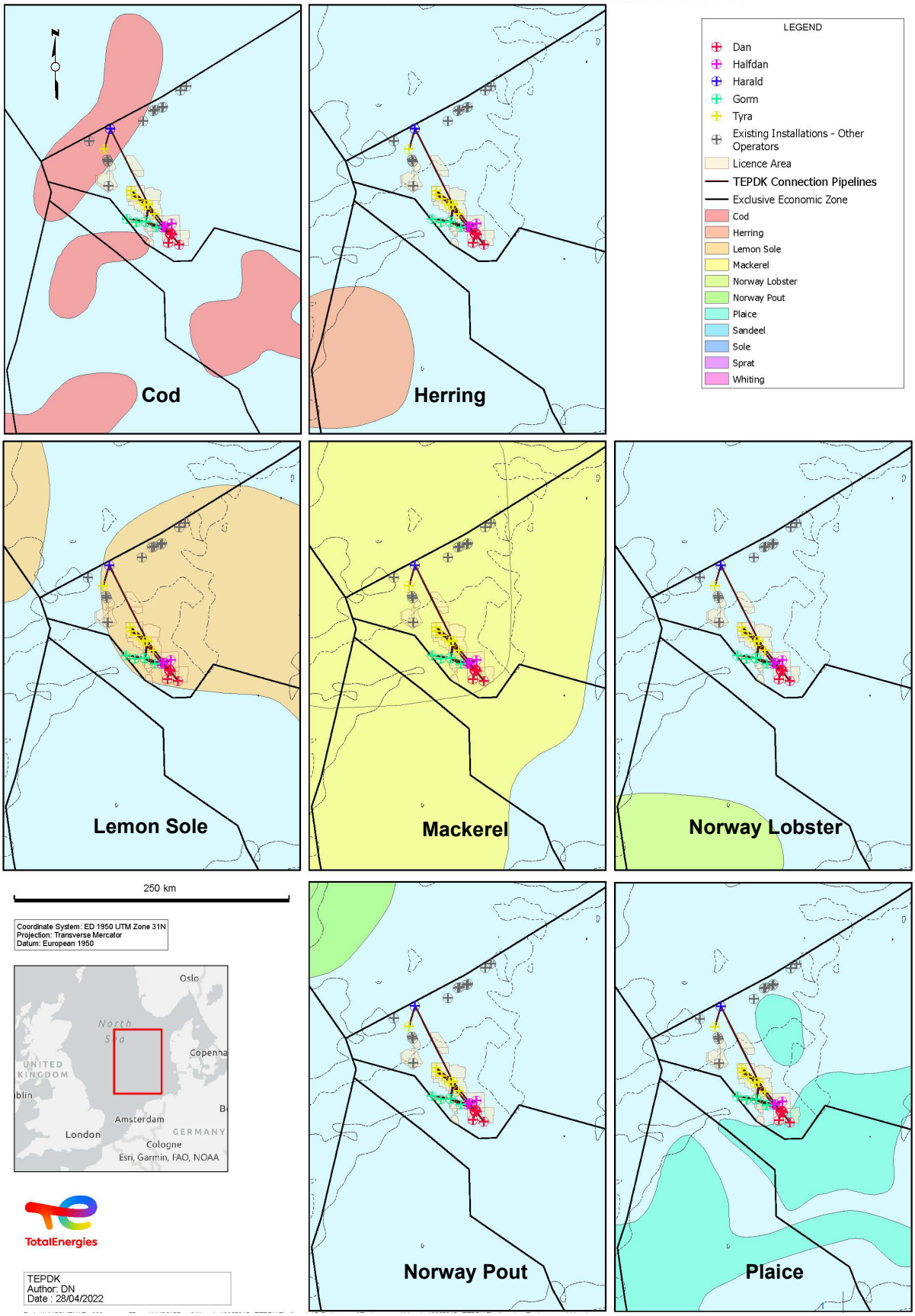
Source: ICES, 2022.

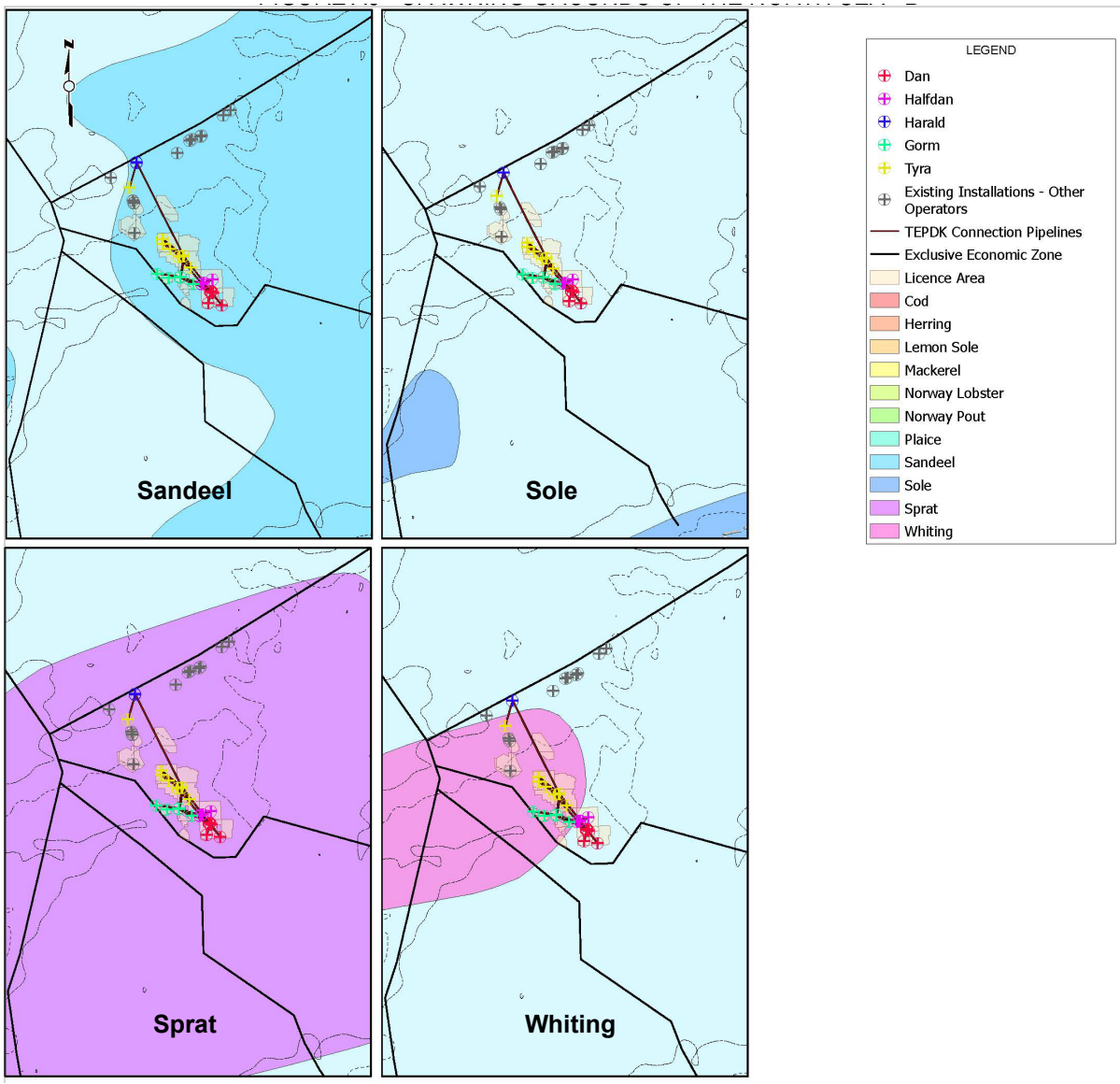
Figure 4.24 Landings from the Greater North Sea (1950–2020), by Fish Category and by Species



Source: ICES, 2022.

Figure 4.25 Spawning Grounds for Key Commercial Fish Species





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

4.3.3.2 Species of Conservation Concern

According to species distribution data for species listed in the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (IUCN Red List), there are four critically endangered (CR) and two endangered (EN) fish species that could occur in the North Sea. All of these species are rare shark, skate or ray species; among which tope (*Galeorhinus galeus*), common blue skate (*Dipturus batis*) and basking shark (*Cetorhinus maximus*) are likely to be present near the DEWTA project area. In addition, eleven fish species are listed as vulnerable (VU) on the IUCN Red List which have distributions that overlap with the DEWTA project area, two of which (Atlantic horse mackerel - *Trachurus trachurus* and Atlantic cod - *Gadus morhua*) are commercially exploited. Of these species, only the Atlantic horse mackerel and the Atlantic cod are likely to occur regularly within the DEWTA project area.

Table 4.7 Fish Species of Conservation Concern with Published Distributions overlapping the DEWTA Project Area

Species	IUCN Red List Status/ European Red List Status/ local population trend	Biology and geographical distribution
Angelshark *(Squatina squatina)*	Critically Endangered Critically Endangered Declining	A bottom-dwelling shark of the continental shelves of Europe and the Mediterranean basin, occurring on or near the bottom from close inshore in the shallow sublittoral (<1 m deep) to at least 150 m deep. It prefers sandy substrates. It is considered possibly extinct from the southern North Sea. Threatened as bycatch from demersal trawling activities. No distribution in the offshore Danish North Sea. Presence uncertain in Danish coastal waters. It is considered possibly extinct in other parts of the North Sea.
Tope *(Galeorhinus galeus)*	Critically Endangered Vulnerable Declining	A bentho-pelagic species of temperate waters on continental and insular shelves and upper to mid slopes from shallow inshore to well offshore. It most frequently occurs to depths of 200 m. Has a large distribution in temperate seas in both the northern and southern hemispheres. Threatened by bycatch and targeted fisheries. It is distributed in the entire North Sea.
Flapper skate *(Dipturus intermedius)*	Critically Endangered Not Evaluated Declining	Occurs in the Northeast Atlantic from French Waters to Iceland and Norway and throughout the North Sea. It is demersal on the continental shelf and slope to depths of 20–1,500 m, although it is primarily found within the 200 m depth range. Targeted as an important component of demersal fisheries which has led to population declines. Its distribution range covers the northern North Sea, with uncertain presence in Danish waters.
Common blue skate *(Dipturus batis)*	Critically Endangered Critically Endangered Declining	Similar distribution to flapper skate (*Dipturus intermedius*) and occurs in the northeast Atlantic from French waters to Iceland, Norway and the Faroe Isles and throughout the North Sea. It is demersal on the continental shelf and slope to depths of 20–1,500 m, although it is primarily found within the 200 m depth range. Targeted as an important component of demersal fisheries which has led to population declines. Its distribution range covers the entire North Sea, including Danish waters.
Basking shark *(Cetorhinus maximus)*	Endangered Endangered Declining	A planktivorous coastal-pelagic species. In temperate waters it is typically encountered swimming slowly at the surface but it also vertically migrates to depths of 1,264 m, typically in tropical waters. It occurs mainly in the Atlantic and Pacific Oceans; in the Indian Ocean, it is reported only from southern Australia, Indonesia, and South Africa. Its distribution range covers the entire North Sea. Although basking sharks migrate to North Atlantic waters during summer months, they are rarely found in the North Sea. However, one was spotted during an MMO survey near oil and gas structures in the North Sea in 2014 (Todd *et al*., 2016).
Angular roughshark *(Oxynotus centrina)*	Endangered Vulnerable Declining	The Angular Roughshark is found in the Northeast and Eastern Atlantic Ocean (from Norway to South Africa) and the Mediterranean Sea. It is found in the northern half of the North Sea (not including Danish waters). It is demersal on the continental shelf and upper slope at depths of 35–805 m. Threatened by deep water trawling fisheries, predominantly off north and west Africa.

Source: IUCN, 2023. Nieto *et al*., 2015.

4.3.4 Birds

4.3.4.1 Overview

The coastlines of the North Sea are a habitat for seabirds that inhabit estuaries, rocky coasts and cliffs. Coastal birds and migratory species use the waters of the North Sea for feeding and to overwinter or pass through outside of the breeding season. Fifty-five seabird species are present on the Danish coast that may use the waters of the Danish EEZ (Birdlife International, 2023a) (Table 4.8).

The seabirds identified during a three-year aerial seabird monitoring survey in 2006-2008 covering the DEWTA project area are highlighted in yellow in Table 4.9 (Skov & Piper, 2009).

There is a clear seasonal pattern in seabird species found in the Dan area. Black-legged kittiwake (*Rissa tridactyla)*, European herring gull (*Larus argentatus)*, common guillemot (*Uria aalge)*, and razorbill (*Alca torda)* are more commonly sighted in the North Sea during winter while lesser black-backed gull (*Larus fuscus)*, northern fulmar (*Fulmarus glacialis)*, great skua (*Stercorarius skua),* and northern gannet (*Morus bassanus)* are more commonly sighted in the North Sea during summer (Waggitt *et al*., 2019).

4.3.4.2 Species of Conservation Concern

Seabirds, included on the IUCN (International Union for Conservation of Nature) Red List of Threatened Species, which are regularly occurring within the Dan area include the black-legged kittiwake (*Risa tridactyla*), listed as vulnerable (VU). Additionally, the northern fulmar (*Fulmarus glacialis*) is regularly occurring which is listed as endangered (EN) at a European level. Regularly occurring species included in the IUCN Red List of Threatened Species are shown in Table 4.9. Of these species, black-legged kittiwake (*Risa tridactyla*) and northern fulmar (*Fulmarus glacialis*) are likely to occur regularly within the Dan area.

Various species that occur within the area are listed on Annex I of the EU Birds Directive meaning that member states have an obligation to identify Special Protection Areas (SPAs) to protect key areas for their survival. Member states are also obliged to identify SPAs for regularly occurring migratory species, which are not listed by species in the Birds Directive, but which include all seabirds because of their migratory and congregatory behaviour. Denmark has identified SPAs for both Annex I and migratory species within its waters.

Denmark has now designated 113 SPAs under the EU Birds Directive across the country and EEZ for the protection of Annex 1, migratory or congregatory birds (EU Biodiversity, 2023). The closest SPA to TEPDK infrastructure within Danish waters is Sydlige Nordsø situated 109 km southeast of the Dan area.

Table 4.8 Seabirds of Denmark

Scientific name	English name	Birds Directive Status	Global IUCN Red List Status	Scientific name	English name	Birds Directive Status	Global IUCN Red List Status
Clangula hyemalis	Long-tailed Duck		VU	*Larus hyperboreus*	Glaucous Gull		LC
Fratercula arctica	Atlantic Puffin		VU	*Larus marinus*	Great Black-backed Gull		LC
Hydrobates leucorhous	Leach's Storm-petrel	Annex 1	VU	*Larus melanocephalus*	Mediterranean Gull	Annex 1	LC
Melanitta fusca	Velvet Scoter		VU	*Larus michahellis*	Yellow-legged Gull		LC
Podiceps auritus	Horned Grebe	Annex 1	VU	*Larus ridibundus*	Black-headed Gull		LC
Rissa tridactyla	Black-legged Kittiwake		VU	*Melanitta nigra*	Common Scoter		LC
Alca torda	Razorbill		LC	*Mergus merganser*	Goosander		LC
Ardenna grisea	Sooty Shearwater		NT	*Mergus serrator*	Red-breasted Merganser		LC
Gavia adamsii	Yellow-billed Loon		NT	*Morus bassanus*	Northern gannet		LC
Somateria mollissima	Common Eider		NT	*Phalacrocorax carbo*	Great Cormorant		LC
Alle alle	Little Auk		LC	*Phalaropus lobatus*	Red-necked Phalarope		LC
Aythya marila	Greater Scaup		LC	*Phalaropus fulicarius*	Red Phalarope		LC
Bucephala clangula	Common Goldeneye		LC	*Podiceps grisegena*	Red-necked Grebe		LC
Cepphus grylle	Black Guillemot		LC	*Podiceps cristatus*	Great Crested Grebe		LC
Chlidonias niger	Black Tern	Annex 1	LC	*Podiceps nigricollis*	Black-necked Grebe		LC
Fulmarus glacialis	Northern Fulmar		LC	*Puffinus puffinus*	Manx Shearwater	Annex 1	LC
Gavia stellata	Red-throated Diver	Annex 1	LC	*Somateria spectabilis*	King Eider		LC
Gavia arctica	Black-throated Diver	Annex 1	LC	*Stercorarius longicaudus*	Long-tailed Jaeger		LC
Gavia immer	Common Loon	Annex 1	LC	*Stercorarius parasiticus*	Arctic Jaeger		LC
Gelochelidon nilotica	Common Gull-billed Tern	Annex 1	LC	*Stercorarius pomarinus*	Pomarine Jaeger		LC
Hydrobates pelagicus	European Storm-petrel	Annex 1	LC	*Stercorarius skua*	Great Skua		LC

Scientific name	English name	Birds Directive Status	Global IUCN Red List Status	Scientific name	English name	Birds Directive Status	Global IUCN Red List Status
Hydrocoloeus minutus	Little Gull		LC	*Sterna hirundo*	Common Tern		LC
Hydroprogne caspia	Caspian Tern	Annex 1	LC	*Sterna paradisaea*	Arctic Tern	Annex 1	LC
Larus argentatus	European Herring Gull		LC	*Sternula albifrons*	Little Tern	Annex 1	LC
Larus canus	Mew Gull		LC	*Thalasseus sandvicensis*	Sandwich Tern*	Annex 1	LC
Hydrobates pelagicus	European Storm-petrel		LC	*Uria aalge*	Common guillimot*	Annex 1	LC
Larus fuscus	Lesser Black-backed Gull		LC	*Xema sabini*	Sabine's Gull		LC
Larus glaucoides	Iceland Gull		LC				

Legend: LC: Least Concern, NT: Near threatened, VU: Vulnerable.

Source: Birdlife International, 2023a; Skov & Piper, 2009.

Table 4.9 Seabirds of IUCN Concern likely to occur in or near the DEWTA Project Area

Species	IUCN Red List Status/European Red List Status/ local population trend	Biology and geographical distribution
Northern fulmar (*Fulmarus glacialis*)	Least Concern Endangered Declining	Listed as LC globally but considered EN at a European level due to ongoing population declines. Northern fulmar (*Fulmarus glacialis*) has a large foraging range and is recorded throughout the North Sea during summer, with higher concentrations in the northern North Sea around Norway in the winter.
Black-legged Kittiwake *(Rissa tridactyla)*	Vulnerable Vulnerable Declining	Listed as VU on the IUCN list, as its population has been decreasing over the past three generations. There are colonies on the Danish, UK and Norwegian coasts. The largest concentrations are found near these breeding areas. In summer, the species is concentrated primarily in the western North Sea. Outside the breeding season, the species occurs throughout the North Sea with varying densities (Bogdanova *et al*., 2011).

Source: Birdlife International 2023b.

4.3.5 Marine Mammals

In the DEWTA project area, pinniped species include the grey seal (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*). The resident cetacean species present in the DEWTA project area are minke whale (*Balaenoptera acutorostrata*), harbour porpoise (*Phocoena phocoena*) and white-beaked dolphin (*Lagenorhynchus albirostris*), which are typical species of the North Sea. Less common species include short-beaked common dolphin (*Delphinus delphis*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), long-finned pilot whale (*Globicephala melas*), orca (*Orcinus orca*) and Risso's dolphin *(Grampus griseus*) (Table 4.10) (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.

Table 4.10 Characteristics of the most represented Marine Mammal Species in the DEWTA Project Area

Species	Global Red List IUCN Status/ European Red List Status/local population trend	Biology and geographical distribution
Grey seal (*Halichoerus grypus*)	Least Concern Least Concern Increasing	**Food:** Their feeding behavior can be demersal or benthic. Ammodytidae (Sandeels), cod (*Gadus morhua*) and saithe (*Pollachius virens*) all account for a typical grey seal (*Halichoerus grypus*) diet, which varies depending on availability. **Habitat:** Present in the North Atlantic continental shelf, in cold temperate waters. Population size is estimated at 315,000 adults. **Breeding and Pupping:** Breeding takes place in the autumn with a clockwise gradient in mean birth date around the UK and European coasts: from August-September in SW Britain to September-

Species	Global Red List IUCN Status/ European Red List Status/local population trend	Biology and geographical distribution
		November in Scotland and Scandinavia and November-December in eastern England and January–March in mainland Europe.
Harbour seal (*Phoca vitulina*)	Least Concern Least Concern Increasing	**Food:** Fish, cephalopods and crustaceans caught at water surface, mid waters and on sea bottom. **Habitat:** Typically, in the coastal waters of continental shelf and slopes. Population size is estimated at 600,000 individuals. **Breeding and Pupping:** Pupping occurs on land from June to July.
Minke whale *(Balaenoptera acutorostrata*)	Least Concern Least Concern Stable	**Food:** Minke whale exploit a variety of prey depending on availability, but usually consume a considerable amount of krill. **Habitat:** The minke whale is found in all oceans, and part of the population is believed to migrate to warmer latitudes every winter. Total population estimates reach 200,000 individuals. **Breeding and Calving:** Mating and calving occurs during the winter. There is limited information available on breeding and calving behaviour and location.
Harbour porpoise (*Phocoena phocoena*)	Least Concern Vulnerable Stable	The species is listed in Appendix II of CITES. **Food:** Wide variety of fish and cephalopods. **Habitat:** Typically found in continental shelf waters in cold temperate to sub-polar waters of the Northern Hemisphere. They frequently visit shallow waters of estuaries, tidal channels and shallow bays. The Atlantic population comprises 700,000 individuals, although it is declining, and the global population is estimated at well over one million individuals. **Breeding and Calving**: The mating and calving season ranges from May to August. Coastal areas of Germany and Denmark are thought to be important calving areas.
White-beaked dolphin (*Lagenorhynchus albirostris*)	Least Concern Least Concern Stable	**Food:** Small pelagic fish, squid and crustaceans. **Habitat:** Typically found in waters less than 200 m deep, lives in cold temperate to subpolar zones. Total Atlantic populations are estimated at more than 100,000. **Breeding and Calving**: Calving season takes place in the summer. Calves are sighted from June to September.

Source: Prepared by ERM with data extracted from: IUCN, 2023 and JNCC, 2003.

The five marine mammal species commonly found in the central North Sea are: harbour porpoise, white-beaked dolphin, minke whale, harbour seal and grey seal (Tougaard, 2016). All marine mammal species are protected by the EU Habitats Directive (Annex II and/or Annex IV or V).

During the Marine Mammal Sighting Reporting program (MMSR), 131 incidental sightings occurred around Danish hydrocarbon installations. The most sighted species were harbour porpoise (41%) and minke whale (31%) (Delefosse *et al*., 2017). During regular activities at the Dan platforms, twenty-four harbour porpoise (*Phocoena phocoena*) and thirteen minke whales (*Balaenoptera acutorostrata*) were sighted between 2013 and 2021, as recorded in TEPDK monitoring records. In addition, three short beaked common dolphins (*Delphinus delphis*), one harbour seal (*Phoca vitulina*), and ten grey seals (*Halichoerus grypus*) were also recorded. Fifteen delphinidae, cetacean and pinniped individuals were sighted but not identified at species level.

Large-scale surveys for cetaceans in the North Sea were carried out in 1994 (SCANS I - Small Cetaceans Abundance in the North Sea), 2005 (SCANS II) and SCANS III (2016). The SCANS III data provides estimates of cetacean abundance in European Atlantic waters in summer 2016 from aerial and shipboard surveys (Hammond *et al.,* 2017). The 2016 SCANS III survey found that the observed distribution of minke whale, harbour porpoise and white-beaked dolphin in 2016 were similar to those observed in SCANS-II in 2005 (Hammond *et al*., 2017). One notable difference was

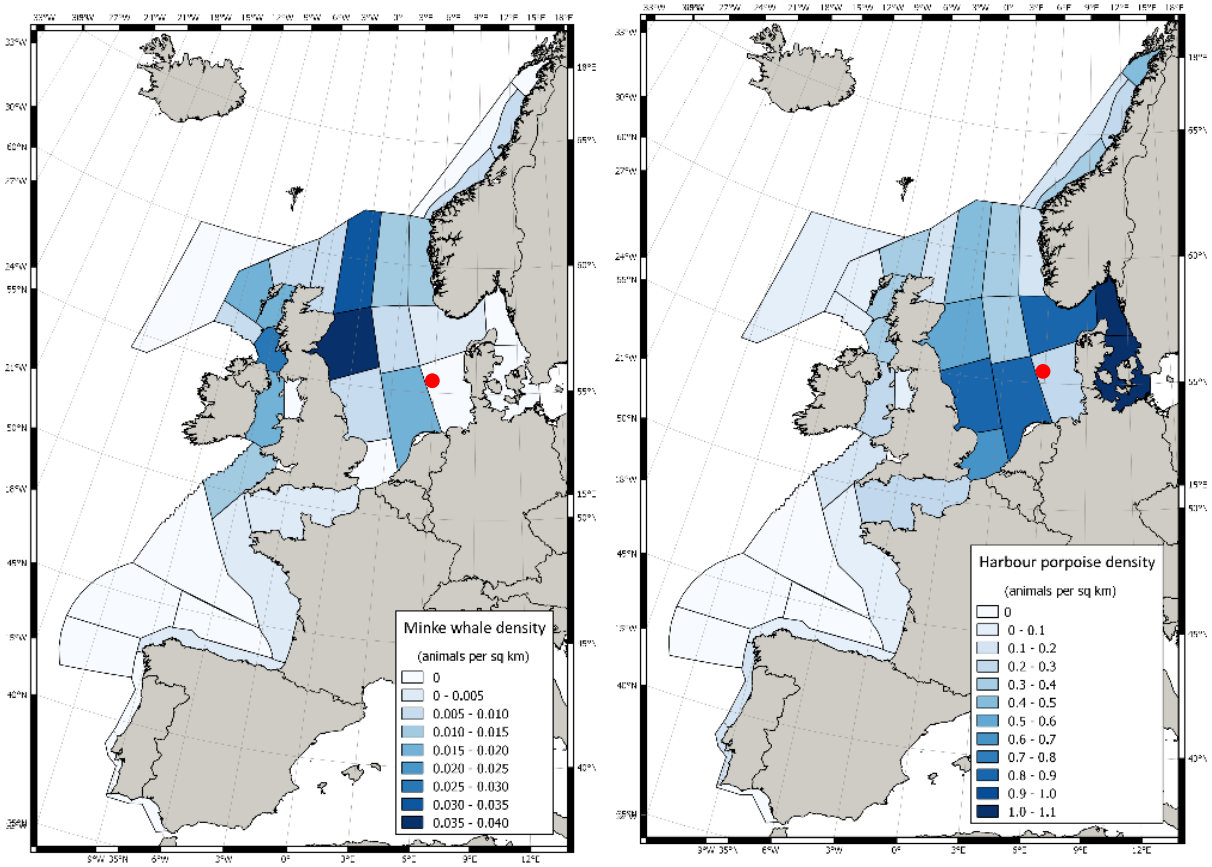
that there were more sightings of harbour porpoise throughout the English Channel (Block C) in 2016 than in previous years. Comparing results from the three surveys has allowed analysis of trends of abundance over the years. In the North Sea, harbour porpoise, white-beaked dolphin and minke whale abundance has not changed since 1990 (Hammond *et al.,* 2017). However, there are regional changes, with recent studies of harbour porpoise (*Phocoena phocoena*) abundance in the German North Sea identifying an overall decline over the last 20 years, with a larger decrease in northern waters and a slight increase in southern waters (Nachtsheim *et al.,* 2021).

Estimated densities and distributions of minke whale, white-beaked dolphin and harbour porpoise are shown in Figure 4.26 and Figure 4.27.

There are very little data regarding seasonality of these species; however, observations between 1980 and 2018 showed that most cetacean species found in the DEWTA project area are more abundant in the North Sea during summer months compared to winter months (Waggitt *et al.*, 2019). Orca and long-finned pilot whale show no seasonality pattern. Harbour porpoise, in particular, have a localised seasonality pattern within the North Sea. Clausen *et al.* (2021) investigated harbour porpoise seasonality for areas surrounding Danish offshore oil and gas structures, including the DEWTA project area. Two distinct activity periods of harbour porpoises around oil and gas platforms were observed. Relatively high densities of harbour porpoise were recorded during July-January around Dan F (within 800 m) compared to stations located further away. Harbour porpoise densities were generally lower during February - June and more evenly distributed across the distance gradient. This is consistent with a similar study conducted in the central North Sea (Gillies *et al.,* 2016).

Additionally, Clausen *et al.* (2021) found seasonal increases in harbour porpoise density 800 m from the Dan F platform compared with 3.2 - 9.6 km, which indicates increased feeding activities around these platforms due to a higher prey abundance. This led to the conclusion that these structures act as artificial reefs or small MPAs where the motivation to forage is higher than the discomfort from elevated noise levels. This is consistent with several other studies, which found that offshore energy structures in the North Sea act as important feeding grounds for marine mammals (Grecian *et al*., 2018; Russel *et al.,* 2014; Todd *et al*., 2009, 2016).

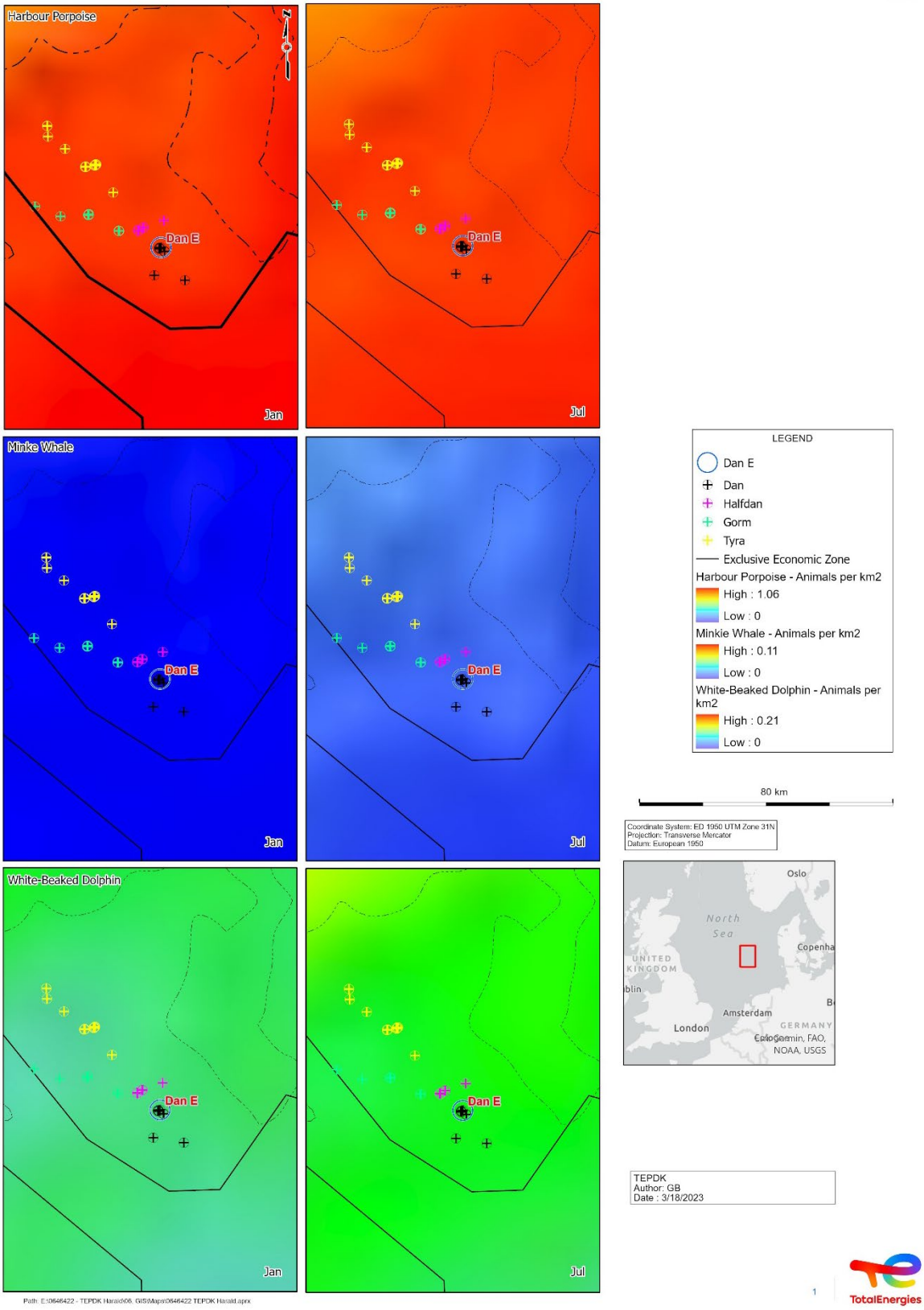
Figure 4.26 Estimated Density in Survey Blocks of (a) Minke Whales (b) Harbour Porpoises



Note: The DEWTA project area is represented by a red point.

Source: Hammond *et al.*, 2017.

Figure 4.27 Density and Distribution of Harbour Porpoise, White-Beaked Dolphin and Minke Whale in the North Sea



Source: Waggitt *et al*., 2019. Updated by ERM, 2023.

4.3.6 Seasonal Sensitivities

Table 4.11 reports the seasonal sensitivity for fish, bird and marine mammal species possibly present in the DEWTA project area.

Table 4.11 Summary of Seasonal Sensitivity for Fish, Birds and Marine Mammals in the DEWTA Project Area

Species	J	F	M	A	M	J	J	A	S	O	N	D	Location of spawning (fish) and breeding (birds and marine mammals) areas
FISH & FISHERIES													
Cod (*Gadus morhua*)	■	■	■	■									Water column
Haddock (*Melanogrammus aeglefinus*)		■	■	■	■								Water column
Whiting (Actinopterygii)		■	■	■	■	■							Water column
Norway pout (*Trisopterus esmarkii*)	■	■	■	■							■	■	Water column
Herring (*Clupea harengus*)	■										■	■	Course or hard benthic substrate
Sprat (*Sprattus sprattus*)					■	■	■	■					Inshore waters
Mackerel (*Scomber scombrus*)					■	■	■	■					Water column
Sandeel (*Hyperoplus* sp.)	■	■									■	■	Sand habitat
Saithe (*Pollachius virens*)	■	■	■	■									Water column
Plaice (*Pleuronectes platessa*)	■	■	■									■	Water column
BIRDS													
Black-legged kittiwake (*Rissa tridactyla)*	■	■	■					■	■	■	■	■	Onshore
Northern fulmar (*Fulmarus glacialis)*	■	■	■	■	■	■	■	■	■	■	■	■	Onshore
Gannet (*Morus bassanus)*	■	■	■	■	■	■	■	■	■	■	■	■	Onshore
Razorbill (*Alca torda)*	■	■	■					■	■	■	■	■	Onshore
Little auk (*Alle alle*)	■	■	■					■	■	■	■	■	Onshore
Black-throated diver (*Gavia arctica*)	■	■	■							■	■	■	Onshore
Red throated diver (*Gavia stellata*)	■	■	■							■	■	■	Onshore
Great skua (*Stercorarius skua*)									■	■	■		Onshore
Guillemot (*Uria aalge*)	■	■	■					■	■	■	■	■	Onshore
MARINE MAMMALS													
Grey seal (*Halichoerus grypus*)									■	■	■	■	Onshore
Harbour seal (*Phoca vitulina*)						■	■						Onshore
Harbour porpoise (*Phocoena phocoena*)				■	■	*	*	■	■				Water column
Minke whale (*Balaenoptera acutorostrata*)	■	■	■							■	■	■	Water column

Species	J	F	M	A	M	J	J	A	S	O	N	D	Location of spawning (fish) and breeding (birds and marine mammals) areas
White-beaked dolphin (*Lagenorhynchus albirostris*)													Water column

Note: *most calves are present during June-July.

Source: TEPDK, 2022a.

4.3.7 Protected and Internationally Recognized Areas

Protected and internationally recognized areas within the North Sea include Natura 2000 sites, OSPAR Marine Protected Areas (OSPAR MPAs), Ramsar sites, Important Bird and Biodiversity Areas (IBAs), UNESCO World Heritage sites and nationally designated areas. There are no protected or internationally recognized areas within the DEWTA project area. The closest one, the Doggerbank SAC, is 26.9 km to the west.

4.3.7.1 Natura 2000 Network Sites

Natura 2000 conservation sites are present in the North Sea and in coastal areas of Germany, the Netherlands and Denmark. The Natura 2000 network protects areas for the conservation of important and vulnerable species and habitats in the EU. The regulations governing Natura 2000 conservation sites do not restrict all anthropogenic activities, but focus on ecologically focused development (European Commission, 2023). Member States have the responsibility to ensure that the Natura 2000 network is managed sustainably.

The network consists of Special Areas of Conservation (SACs) designated by the member states under the Habitats Directive and of Special Protection Areas (SPAs) designated under the Birds Directive. The aim of the network is to ensure the long-term survival of Europe's most valuable and threatened species and habitats.

The Natura 2000 conservation sites in the North Sea relevant to the DEWTA project are presented in Table 4.12 and Figure 4.28. The closest site is approximately 26.9 km to the west of the DEWTA project area, in the German EEZ. This area is named Doggerbank SAC (site code DE1003301). It comprises a submerged sandbank, which is designated as an Annex 1 habitat and has an abundance of marine species. The next nearest Natura 2000 conservation site is the Doggersbank SAC (NL2008001), which shares a boundary with the Doggerbank (DE1003301). It is approximately 56 km southwest of the DEWTA project area. It comprises a submerged sandbank designated as an Annex 1 habitat and has an abundance of marine species.

Table 4.12 Natura 2000 Areas near the DEWTA Project Area

Name	Size (km^2)	Designated Features	Country EEZ	Designation	Location in relation to the DEWTA project
Doggerbank	1,699	**Habitats** 1110 Sandbanks **Species** fulmar (*Fulmarus glacialis*) gannet (*Morus bassanus*) kittiwake (*Rissa tridactyla*)	Germany	SAC	26.9 km to the west

Name	Size (km^2)	Designated Features	Country EEZ	Designation	Location in relation to the DEWTA project
		harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*) lesser black-backed gull (L*arus fuscus*) guillemot (*Uria aalge*)			
Doggersbank	4,735	**Habitats** 1110 Sandbanks **Species** grey seal (*Halichoerus grypus*) harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*)	Netherlands	SAC	56 km to the southwest
Sylter Außenriff	5,314	**Habitats** 1110 Sandbanks 1170 Reefs **Species** black throated diver *(Gavia arctica)* red-throated diver (*Gavia stellata*) common gull (*Larus canus*) great black-backed gull (*Larus marinus*) little gull (*Larus minutus*) gannet (*Morus bassanus*) kittiwake (*Rissa tridactyla*) common tern (*Sterna hirundo*) artic tern (*Sterna paradisaea*) sandwich tern (*Sterna sandvicensis*) shad (*Alosa fallax*) lampern (*Lampetra fluviatilis*) grey seal (*Halichoerus grypus*) common seal (*Phoca vitulina*) common porpoise (*Phocoena phocoena*) lesser black-backed gull (L*arus fuscus*) guillemot (*Uria aalge*)	Germany	SAC	97 km to the southeast
Sydlige Nordsø	2,473	**Habitats** 1110 Sandbanks **Species** razorbill (*Alca torda*) little auk (*Alle alle*) black-throated diver (*Gavia arctica*) red throated diver (*Gavia stellata*) little gull (*Larus minutus*) grey seal (*Halichoerus grypus*) harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*)	Denmark	SPA and SAC	109 km to the southeast
Friese Front	2,882	**Species** Guillemot (*Uria aalge*)	Netherlands	SPA	140 km to the south
Borkum-Riffgrund	625	**Habitats** 1110 Sandbanks 1170 Reefs **Species** *Gavia arctica arctica*	Germany	SAC	174 km to the southeast

Name	Size (km^2)	Designated Features	Country EEZ	Designation	Location in relation to the DEWTA project
		red-throated diver (*Gavia stellata*) common gull (*Larus canus*) great black-backed gull (*Larus marinus*) little gull (*Larus minutus*) gannet (*Morus bassanus*) kittiwake (*Rissa tridactyla*) common tern (*Sterna hirundo*) artic tern (*Sterna paradisaea*) sandwich tern (*Sterna sandvicensis*) shad (*Alosa fallax*) grey seal (*Halichoerus grypus*) common seal (*Phoca vitulina*) common porpoise (*Phocoena phocoena*) lesser black-backed gull (L*arus fuscus*) guillemot (*Uria aalge*)			
Jyske Rev og Lille Fiskebanke	242	**Habitats** 1170 Reefs **Species** harbour porpoise (*Phocoena phocoena*)	Denmark	SAC	175 km to the northeast

Source: EEA, 2023 and EEA Natura2000, 2023. Prepared by ERM, 2023.

Figure 4.28 Natura 2000 Conservation Sites near the DEWTA Project Area

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

4.3.7.2 OSPAR Marine Protected Areas (OSPAR MPA)

OSPAR has designated many Marine Protected Areas (MPA) throughout the North Sea as OSPAR MPAs. Many of these are in the Danish EEZ and surrounding EEZs (Table 4.13).

Table 4.13 OSPAR Marine Protected Areas near the DEWTA Project Area

Name	Size (km^2)	Designated Features	Country EEZ	Designated	Location in relation to the DEWTA project
Doggerbank	1,695	**Species** ocean quahog (*Arctica islandica*) European flat oyster (*Ostrea edulis*) common murre (*Uria aalge*) lesser black-backed gull (*Larus fuscus*) fulmar (*Fulmarus glacialis*) gannet (*Morus bassanus*) kittiwake (*Rissa tridactyla*) spotted ray (*Raja montagui*) harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*) Minke whale (*Balaenoptera acutorostrata*)	Germany	OSPAR MPA	26.9 km to the west
Doggersbank	4,735	**Species** grey seal (*Halichoerus grypus*) harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*)	Netherlands	OSPAR MPA	56 km to the southwest
Sylt. Aussenr.-Oestl.Dt.Bucht	5,596	**Species** shad (*Alosa fallax*) grey seal (*Halichoerus grypus*) common seal (*Phoca vitulina*) common porpoise (*Phocoena phocoena*) lampern (*Lampetra fluviatilis*)	Germany	OSPAR MPA	97 km to the southeast
Sydlige Nordsø	2,473	**Habitats** Subtidal sand **Species** black-throated diver (*Gavia arctica*) red throated diver (*Gavia stellata*) little gull (*Larus minutus*) grey seal (*Halichoerus grypus*) harbour seal (*Phoca vitulina*) harbour porpoise (*Phocoena phocoena*)	Denmark	OSPAR MPA	109 km to the southeast
Dogger Bank	12,340	**Habitats** Subtidal course sediment Subtidal sand Subtidal heterogeneous sediments	UK	OSPAR MPA	117 km to the west

Name	Size (km^2)	Designated Features	Country EEZ	Designated	Location in relation to the DEWTA project
Jyske Rev, Lillefiskerbanke	242	**Habitats** Subtidal heterogeneous sediments	Denmark	OSPAR MPA	150 km to the northeast
Borkum-Riffgrund	626	**Species** shad (*Alosa fallax)* black-throated diver (*Gavia arctica)* red throated diver (*Gavia stellata)* grey seal (*Halichoerus grypus)* common gull (*Larus canus)* Lesser black-backed gull (*Larus fuscus)* great black-backed gull (*Larus marinus)* little gull (*Larus minutus)* gannet (*Morus bassanus)* harbour seal (*Phoca vitulina)* harbour porpoise (*Phocoena phocoena)* kittiwake (*Rissa tridactyla)* common tern (*Sterna hirundo)* artic tern (*Sterna paradisaea)* sandwich tern (*Sterna sandvicensis)* common murre (*Uria aalge)*	Germany	OSPAR MPA	174 km to the southeast
Fulmar	2,439	**Habitats** Subtidal sand Subtidal mud Subtidal heterogeneous sediments **Species** ocean quahog (*Arctica islandica*)	UK	OSPAR MPA	176 km to the northwest

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

4.3.7.3 Nationally Designated Areas

Various protected areas designated at a national level occur in Danish waters and surrounding EEZs. The closest nationally designated areas near the DEWTA project area are presented in Table 4.14. It is noteworthy that the three areas in Denmark have been proposed by the Danish government as part of the Danish Maritime Spatial Plan to become new marine strategy areas (Danish Maritime Authority, 2021).

Table 4.14 Nationally Designated Areas near the DEWTA project Area

Name	Size (km^2)	Country EEZ	Designated	Overlapping	Location in relation to the DEWTA project
Doggerbank	1,695	Germany	Nature Reserve	Natura 2000 and OSPAR MPA Doggerbank	26.9 km to the west
Doggersbank	4,745	Netherlands	Nature Conservation Act	Natura 2000 and OSPAR MPA Doggersbank	56 km to the southwest
Sylter Außenriff – Östliche Deutsche Bucht	5,603	Germany	Nature Reserve	Natura 2000 and OSPAR MPA Sylter Außenriff – Östliche Deutsche Bucht	97 km to the southeast
Nature and environmental protection area (N36)	3,011.7	Denmark	***Proposal for new*** Marine Strategy Area under the Danish MSP (under consultation)	Natura 2000 and OSPAR MPA Sydlige Nordsø	103 km to the east
Nature and environmental protection area (N125)	411.7	Denmark	***Proposal for new*** Marine Strategy Area under the Danish MSP (under consultation)	None	107 km to the northwest
Nature and environmental protection area (N138)	1,101	Denmark	***Proposal for new*** Marine Strategy Area under the Danish MSP (under consultation)	None	124 km to the northeast
Friese Front	2,883	Netherlands	Nature Conservation Act	Natura 2000 Friese Front	140 km to the south
Borkum Riffgrund	625	Germany	Nature Reserve	Natura 2000 and OSPAR MPA Borkum-Riffgrund	174 km to the southeast
Fulmar	2,435	UK	Marine Conservation Zone	OSPAR MPA Fulmar	176 km to the northwest

Source: UNEP-WCMC, 2023. Prepared by ERM, 2023.

4.3.7.4 Ramsar Sites

Ramsar sites are designated under the International Ramsar Convention and relate to the conservation of wetlands of international importance and the sustainable use of their resources under the Ramsar Convention (Ramsar Convention Secretariat, 2013). These sites are therefore typically located in coastal zones. The closest to the DEWTA project area is the Wadden Sea ('Vadehavet'), 182 km to the east, on the Danish coast. The Ramsar sites of the Danish North Sea are also designated as Natura 2000 areas.

4.3.7.5 UNESCO World Heritage Sites

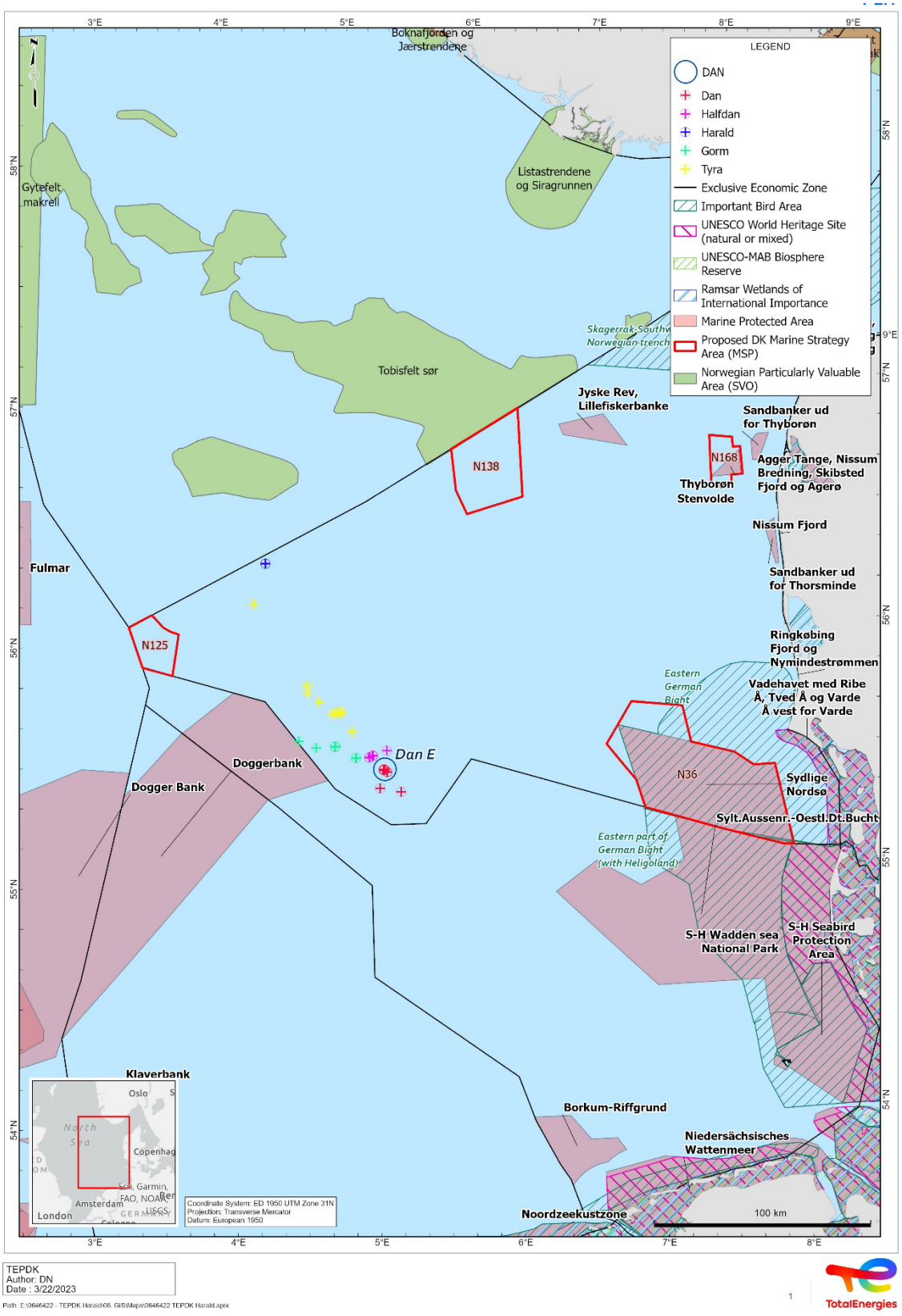
The Wadden Sea is a UNESCO World Heritage site located approximately at 182 km to the east from the DEWTA project area. It is the largest unbroken system of intertidal sand and mud flats in the world. The site covers the Dutch Wadden Sea Conservation Area, the German Wadden Sea National Parks of Lower Saxony and Schleswig-Holstein, and most of the Danish Wadden Sea maritime conservation area. It is a large, temperate, relatively flat coastal wetland environment, formed by the intricate interactions between physical and biological factors that have given rise to a multitude of transitional habitats with tidal channels, sandy shoals, sea-grass meadows, mussel beds, sandbars, mudflats, salt marshes, estuaries, beaches and dunes. The area is home to numerous plant and animal species, including marine mammals such as the harbour seal, grey seal and harbour porpoise. The Wadden Sea is one of the last remaining large-scale, intertidal ecosystems where natural processes continue to function largely undisturbed.

4.3.7.6 Important Bird Areas (IBAs) and Other Recognised Areas

Important Bird and Biodiversity Areas (IBAs) are a subset of Key Biodiversity Areas (KBAs) which are specifically designated sites for conservation of bird populations. Although not legally protected, many IBAs are also designated as SPAs for their bird interest. The criteria for IBAs designation in Europe include bird congregations, species of unfavourable conservation status in Europe and species of favourable conservation status in Europe. The Eastern German Bight is the closest IBA to the DEWTA project area, at 109 km to the east, designated as the Sydlige Nordsø SPA (Natura 2000 site) (Figure 4.29).

The Norwegian SVO (particularly valuable area, in English) Tobisfelt (NS2) is approximately 135 km to the north of the DEWTA project area. This area is recognised for distinctive benthic habitat consisting of coarse sand and fine gravel, and with good oxygen conditions. This habitat is particularly important spawning grounds for sandeel and important feeding grounds for auks and gulls. This area is recognised as having a high biodiversity value however it is not legally protected (Institute of Marine Research, 2021).

Figure 4.29 OSPAR MPAs, IBAs, UNESCO Sites, Ramsar Sites, and Nationally Designated Areas and Other Recognised Areas near the DEWTA Project Area



Source: ERM, 2023.

4.3.8 Invasive Species

The Danish EPA (2017) published the “Action plan against invasive species”. The report indicates that marine alien species can be introduced, eg., through ballast water and fouling from ships. As indicated in Section 2, Denmark has implemented the Ballast Water Management Convention with the Marine Environment Act which requires ships to manage ballast water by minimising and ultimately eliminating potential transfer of invasive species. The Ballast Water Management Convention entered into force on 8 September 2017.

DEPA used a scoring system for the Action Plan where the ‘invasiveness’ of alien species is assessed using classifications. The score calculated from the system determines the damage they cause to biodiversity and related ecosystem services. This evaluates species based on the adverse impacts they cause or may cause. The scores are either high (3), medium (2) or low (1) for each of the six categories: ‘Dispersal potential’, ‘colonisation of high conservation value habitats’, ‘adverse impacts on native species’, ‘alteration of on ecosystem functions’, ‘economic effects and health effects’. All alien species thereby receive a score between 6 and 18, and this score can be used as a management tool. The scoring of the individual parameters for each species was carried out by experts in the various species. For a species to be called invasive, it must have a total score of at least 7, with a score of at least 2 in the categories ‘effect on indigenous species’ and ‘effect on ecosystem functions’.

The Danish Action Plan against invasive species lists 19 invasive marine species assessed to have the greatest adverse impact in Denmark (having total scores of 14-18 for a highly damaging impact on the environment, human health and the economy). As presented in Section 4.3, TEPDK has conducted sediment and biological monitoring campaigns with no clear evidence of invasive benthic species presence. However, no specific monitoring studies have been conducted specifically focusing on invasive species. With respect to these 19 invasive species listed in the Danish Action Plan (DEPA, 2017), only 6 plankton species (*Alexandrium minutum*, *Alexandrium tamarense*, *Chattonella verruculosa*, *Heterosigma akashiwo*, *Karenia mikimotoi*, *Pseudochattonella farcimen*) and the Ctenophore *Mnemiopsis leidyi* are considered possibly present in pelagic waters of the DEWTA project area. All other species are considered unlikely to be present in the DEWTA project area due to their ecological characteristics and the current knowledge of benthic colonization of TEPDK offshore structures. These 12 species are:

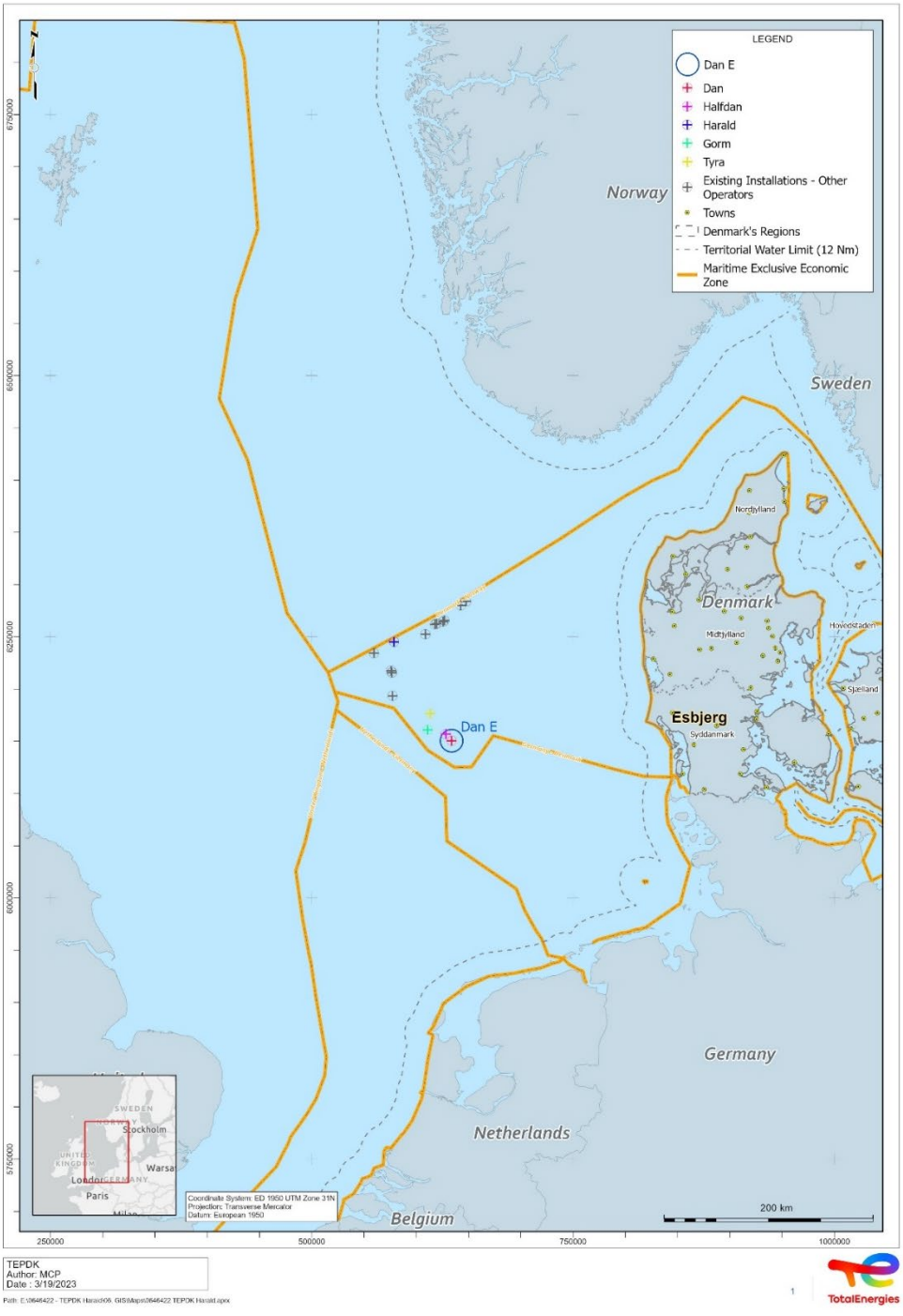
- Plankton: *Prorocentrum mínimum*
- Algae:
  - *Gracilaria vermiculophylla*
  - *Sargassum muticum*, Japweed
  - *Undaria pinnatifida*, Wakame
- Annelid (worms):
  - *Marenzelleria neglecta*, red-gilled mud worm
  - *Marenzelleria viridis*
- Crustacean:
  - *Eriocheir sinensis*, Chinese mitten crab
  - *Paralithodes camtschaticus*, Red king crab
- Fish: *Neogobius melanostomus*, Round goby
- Ctenophore: *Beroe ovata*, Brown comb jellyfish
- Mollusc: *Crassostrea gigas*, Pacific oyster
- Tunicate: *Didemnum vexillum*

4.4 Human Environment

4.4.1 Introduction

The DEWTA project is in the Danish Exclusive Economic Zone (EEZ), close to the EEZ of Norway, the United Kingdom, Germany, the Netherlands and Sweden (Figure 4.30). This section describes Denmark's socio-economic conditions on a national level with specific focus on the Danish North Sea and the Danish western coastline.

Figure 4.30 Location of the DEWTA Project in the North Sea



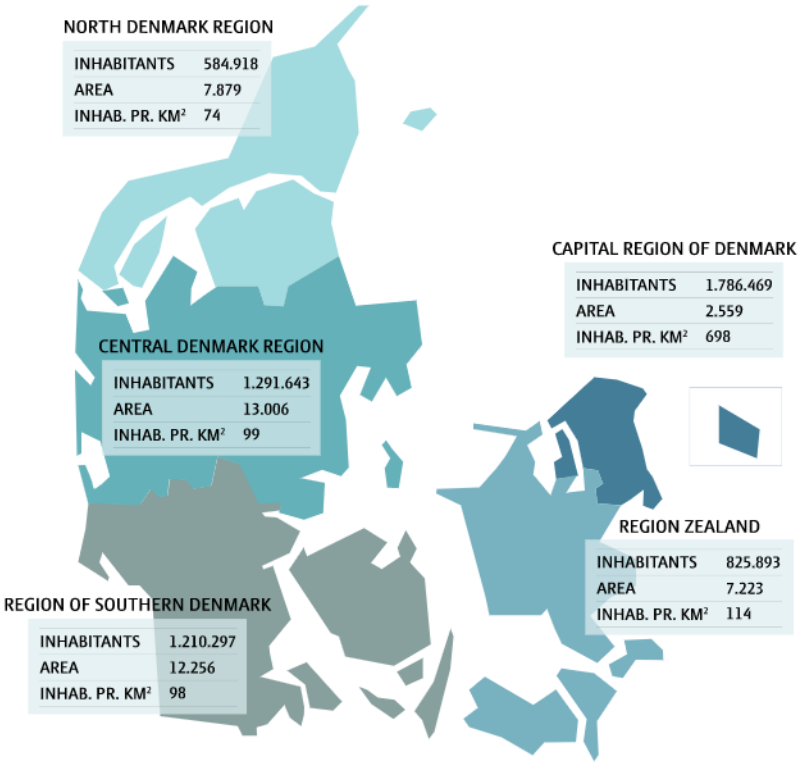
Source: ERM, 2023.

4.4.2 General Context

Denmark is a country of northern Europe bordering the Baltic and the North Sea. The nation is internationally recognized for its highly competitive service-based economy with high employment levels and generous social security system. Commitment to addressing environmental challenges has made Denmark a frontrunner in green growth and ecology (OECD, 2021).

Denmark's governance system is a parliamentary democracy with executive, legislative, and judicial branches. The state of Denmark is organized at three political and administrative levels; the national (government), the regional (five regions) (Figure 4.31) and the municipal level (98 municipalities), each with different tasks and responsibilities (Regioner, 2023). The responsibility of the regions includes regional development in the areas of commerce, environment, raw materials and infrastructure, and health care services (Regioner, 2023).

Figure 4.31 Regions of Denmark



Source: Regioner, 2023.

According to KL (2023), among other responsibilities, municipalities are in charge of the following:

- Industrial and economic development at both a strategic and an operational level, aiming at stimulating growth;
- Labour market involvement regarding the Danish model of flexicurity[28], active labour market policies, and local employment strategies;
- Technology and the environment;
- Managing the economy of the municipalities; and
- Some aspects of health and social care.

[28] The Danish employment system's combination of flexibility and security is often described as a 'golden triangle'. The Danish model, known as the "flexicurity model", combines high mobility between jobs with a comprehensive income safety net for the unemployed and an active labour market policy (Danish Agency for Labour Market and Recruitment, 2023).

According to the World Bank Open Data (2023), the total population of Denmark was 5.86 million in 2021, with a population density of 146 individuals per km^2 and an average household size of 2.1. Men represent 49.7% of the total population while women represent 50.3%. Most of the population lives in urban areas (88%). The population is aging; 64% of the total population are between the ages of 15 and 64 and more residents of Denmark are over age 60 than under age 15. This is attributed to a low birth rate per woman (1.7 births per woman) and a high life expectancy at birth (82 years).

The (project is located in the North Sea, where the closest human receptors are 190 km away on the west coast of Jutland. Jutland is a peninsula covering more than two-thirds of the country's total land area and three of Denmark's five regions; Central (*Midtjylland*), North (*Nordjylland*) and Southern (*Syddanmark*) Regions (Figure 4.31).

4.4.3 Marine Spatial Planning

Denmark's marine waters encompass 105,000 km^2 (EU MSP Platform, 2022), divided as follows:

- Marine internal waters: 3,500 km^2;
- Territorial sea (12 nautical mile zone): 40,000 km^2; and
- Exclusive Economic Zone (EEZ)[29]: 61,500 km^2.

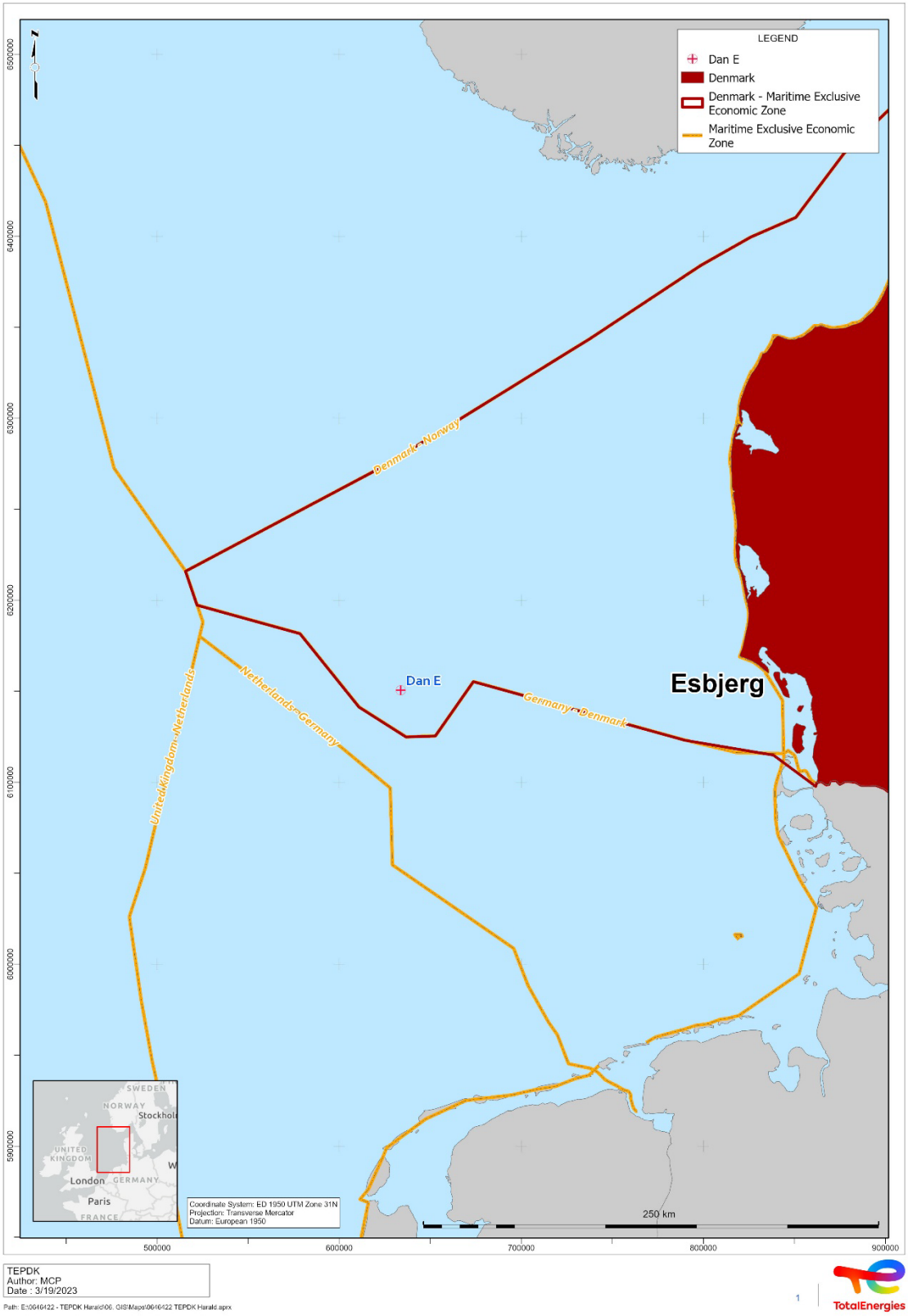
The red line in Figure 4.32 outlines the Danish EEZ.

Primary maritime uses in Denmark are fisheries, cables and pipelines, mineral extraction, oil and gas exploration, shipping, infrastructure, tourism and recreation, offshore renewable energy production, marine protected areas, and aquaculture (EU MSP Platform, 2022).

Denmark currently regulates marine activities through various sectoral acts (refer to *Section 2 – Policy, Legal and Administrative Framework*). The adoption of the Maritime Spatial Planning (MSP) Act by the Danish Parliament in 2016 established an integrated maritime spatial plan for the Danish marine areas to promote economic growth, development of marine areas and the sustainable use of marine resources (Ministry of Business and Growth, 2016). The Act followed the requirements of the EU Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. The Danish maritime spatial plan process began in 2017 and was implemented in March 2021. Sectors considered in the marine spatial plan under the direction of the Danish Maritime Authority (*Søfartsstyrelsen*) include the offshore energy sector, maritime transport, transport infrastructure, fisheries and aquaculture, extraction of raw materials at sea, and the preservation, protection and improvement of the environment, including climate change resilience (EU MSP Platform, 2022).

[29] Sea zone prescribed by the 1982 United Nations Convention on the Law of the Sea over which a state has special rights regarding the exploration and use of marine resources, including energy production from water and wind.

Figure 4.32 Denmark's Exclusive Economic Zone (EEZ)



Source: ERM, 2023.

4.4.4 International Boundaries

The closest international boundaries (EEZ) to the DEWTA project area are provided in Table 4.15.

Table 4.15 International Boundaries (EEZ) near the DEWTA Project Area

Country	Distance to the DEWTA project area (km)
Germany	20
Netherlands	45
Norway	113
United Kingdom	115
Sweden	430

Source: ERM, 2023.

4.4.5 Economy and Employment

4.4.5.1 Economy Overview

Denmark has a prosperous, modern market economy with advanced industry and world-leading firms in pharmaceuticals, maritime shipping, renewable energy, and a high-tech agricultural sector (TheBanks.eu, 2023). The Danish economy exhibits extensive government welfare measures and an equitable distribution of income. Denmark's economy is highly dependent on foreign trade and is a net exporter of food, oil, and gas but depends on imports of raw materials for the manufacturing sector. Denmark is a member of the European Union (EU) but not part of the Eurozone. Its currency is the Danish krone (DKK) (TheBanks.eu, 2023).

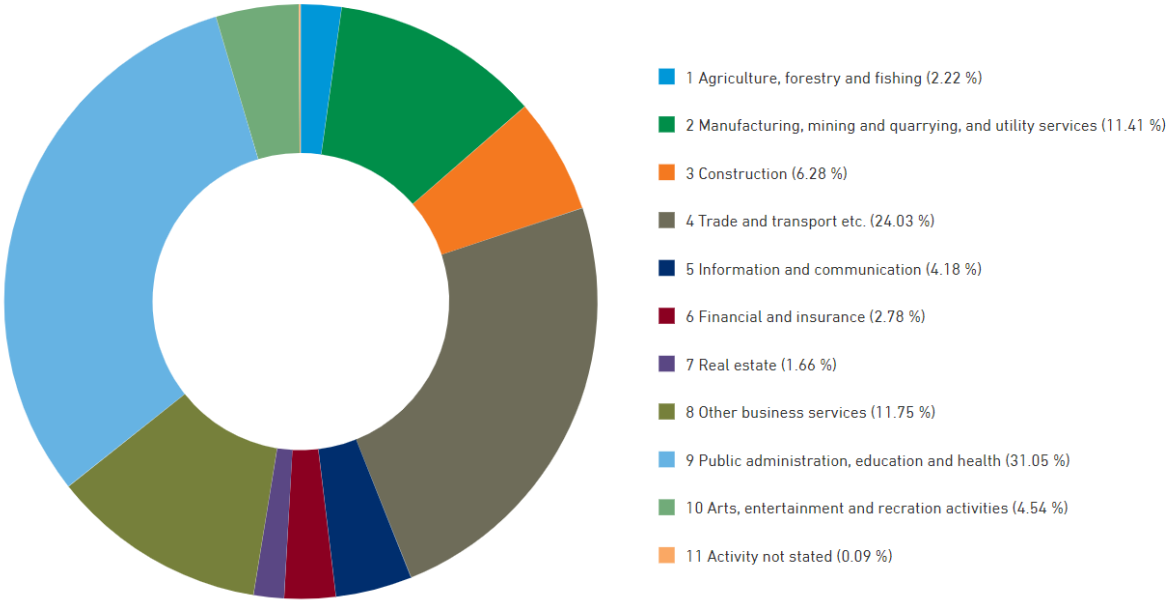
According to the World Bank Open Data (2023), Denmark has experienced slow but constant economic growth over the past years. Although the country experienced a dip in its annual growth rate in 2020 of -2.1%, the most recent report shows a +4.9% annual growth for 2021. Despite the economic contraction in 2020, the total country reported a Gross Domestic Product (GDP) of US$356 billion that year and US$398 billion in 2021.

Oil and gas production in the Danish North Sea, has been, and still is, one of the most essential financial contributors to Danish society (Dansk Offshore, 2023). Oil and gas activities have created security of supply, jobs and secured a state welfare contribution of more than DKK 500 billion. Although the energy transition is in full swing, there are almost 30 years until North Sea production ceases in 2050 as a majority in the Danish Parliament (*Folketing*) has decided.

4.4.5.2 Employment

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) (Figure 4.33). 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).

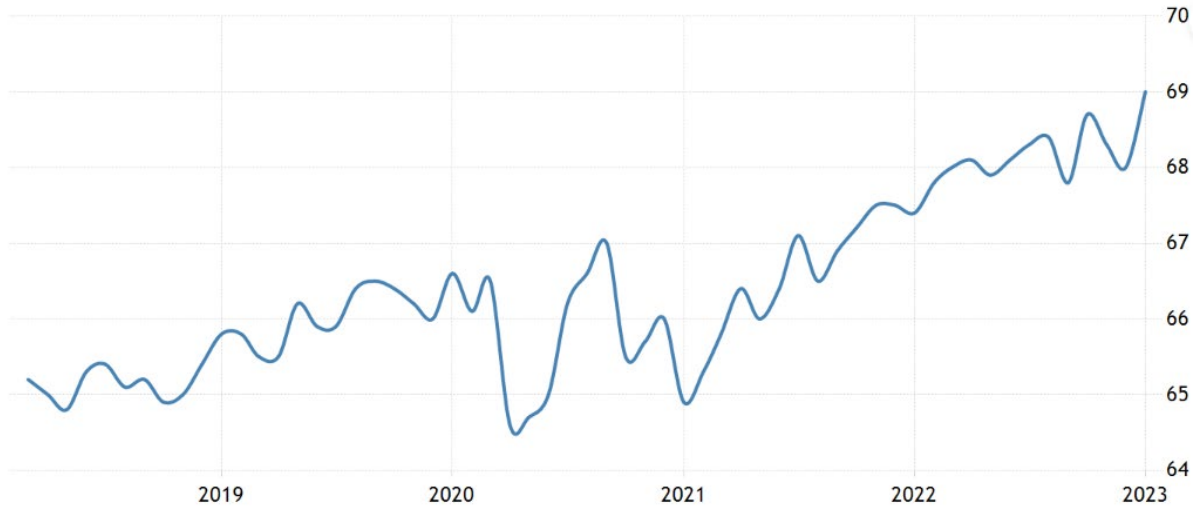
Figure 4.33 Employment per Sector in Denmark by November 2021



Source: Statistics Denmark, 2023.

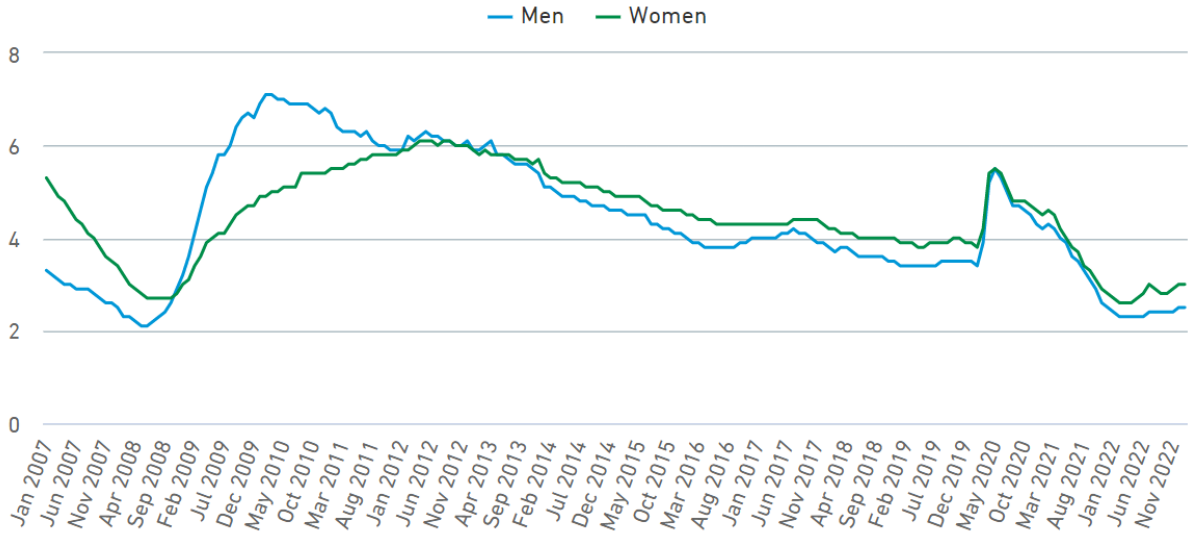
The employment rate in Denmark (Figure 4.34) has increased from less than 65% in early 2020 to about 69% in early 2023. The economic uncertainty associated with the COVID-19 pandemic produced a peak unemployment rate in 2020 (Figure 4.35), which decreased over the following years. The Danish Government offers a series of benefits for unemployed people, including the unemployment benefit from the unemployment insurance fund for up to two years; education and retraining programs, and counselling services to get unemployed people back to work as quickly as possible; and subsistence allowance for people who lose their livelihood due to illness, divorce or unemployment, and who do not qualify under other social welfare schemes such as the pension or the unemployment benefit (Ministry of Foreign Affairs of Denmark, 2023).

Figure 4.34 Denmark Employment Rate (2017-2023) (%)



Source: Trading Economics, 2023.

Figure 4.35 Denmark Percent Unemployment Rate (2007-2022)



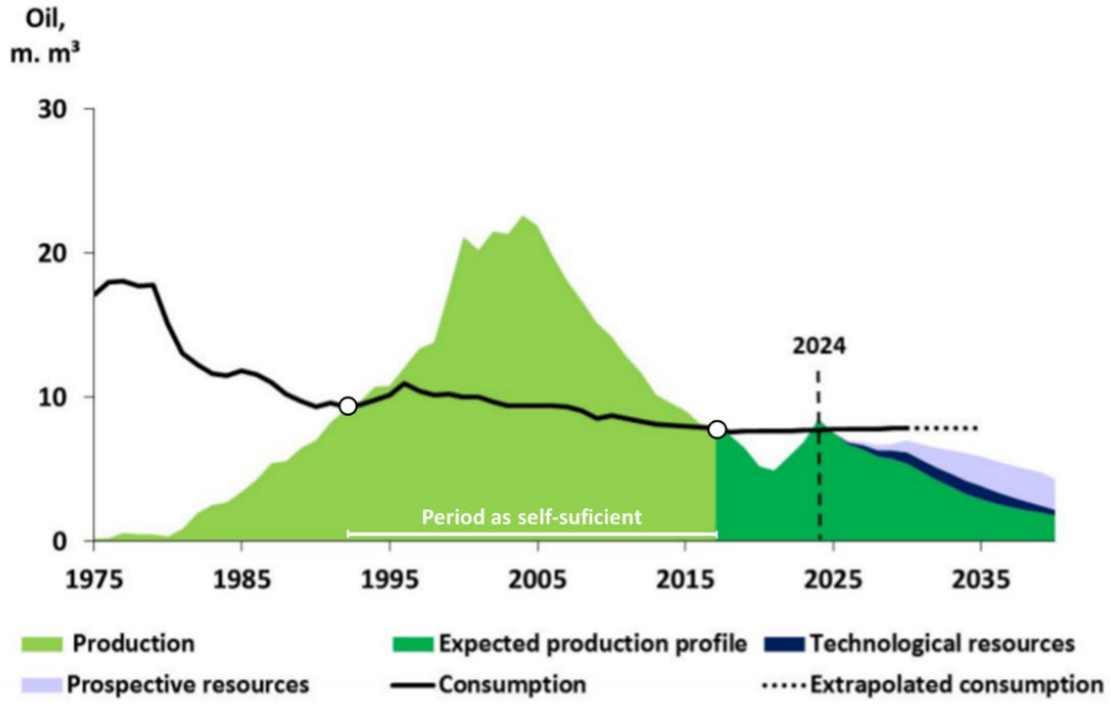
Source: Statistics Denmark, 2023.

4.4.6 Oil and Gas

The history of the Danish oil and gas sector is summarized in Figure 4.36. Oil production in Denmark exceeded consumption in 1991, which made Denmark self-sufficient in oil until 2015 (Danish Energy Agency, 2018). Since then, tax revenue, exports and profits generated by the sector have had a major impact on the Danish economy and helped build the Danish welfare state. TEPDK's presence in Denmark was established with the acquisition of Maersk Oil in 2018 and the operatorship of the Danish Underground Consortium (DUC), which is responsible for 85% of the oil and 97% of the gas production in Denmark.

The Danish society benefits from the tax revenue deriving from North Sea oil and gas production. As an example, the total revenue in 2020 amounted to DKK 0.8 billion (Danish Energy Agency, 2023). In addition, workplaces generated by the oil and gas sector, both onshore and offshore, have a part in creating purchasing power in the Danish society (Danish Energy Agency, 2023).

Figure 4.36 Danish Production and Long-Term Oil Forecast

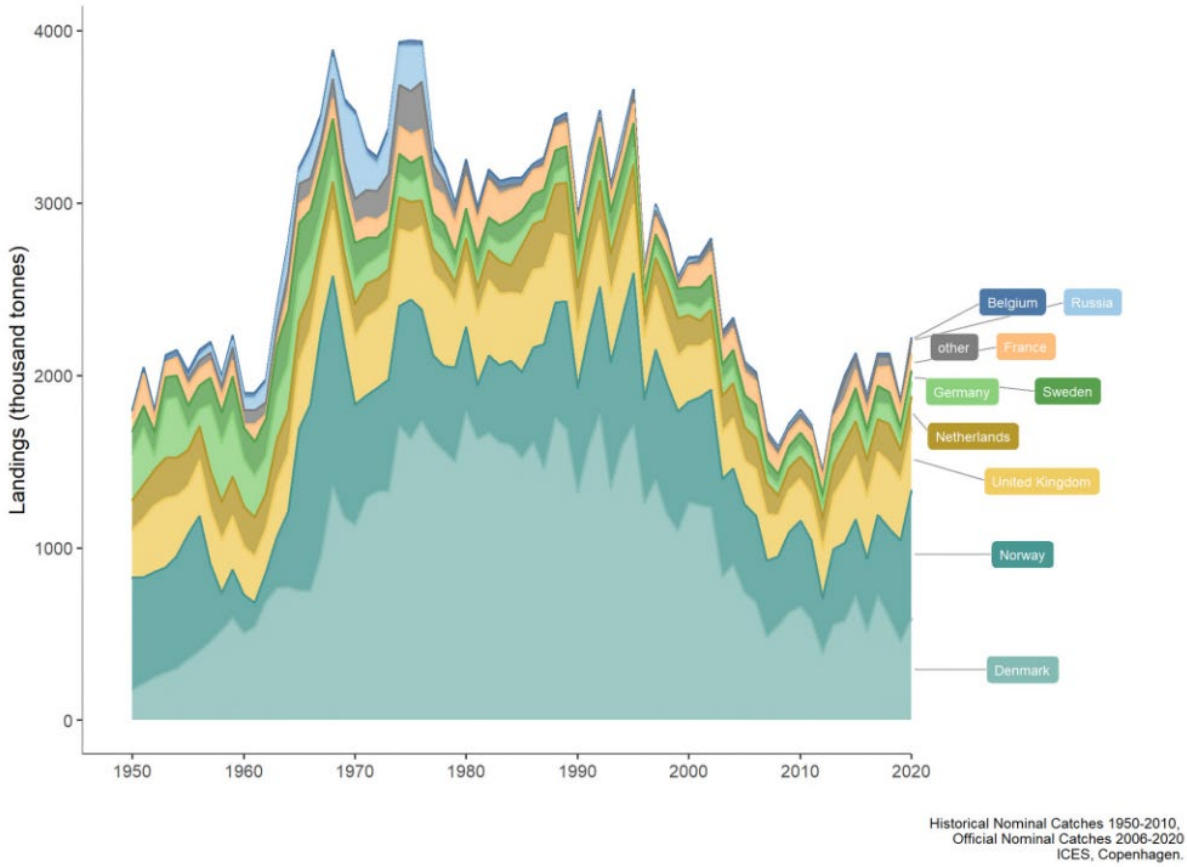


Source: Danish Energy Agency, 2018.

4.4.7 Fisheries

Fishing is an important industry in the North Sea according to ICES (2022). 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. Figure 4.37 illustrates the landings of the main fishing nations in the North Sea, including Denmark, from 1950 to 2020.

Figure 4.37 Landings (thousand tonnes) from the Greater North Sea, 1950-2020, by Country



Note: The nine countries with the highest landings are displayed separately; the remaining countries are aggregated and displayed as 'other'.

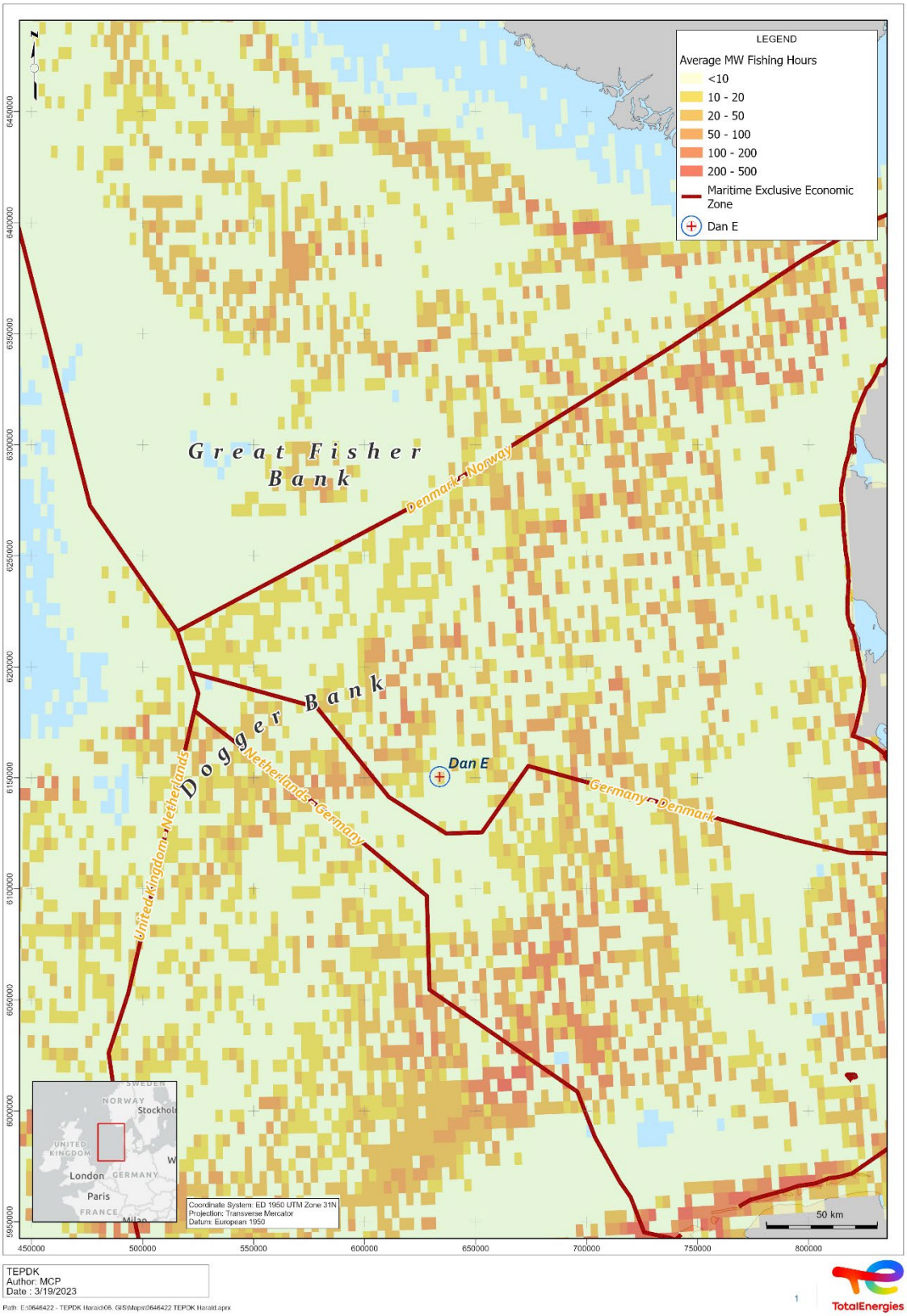
Source: ICES, 2022.

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 4.38).

Figure 4.38 Fishing Efforts in the North Sea (2021)



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

4.4.8 Aquaculture

Denmark has an established aquaculture industry, with farms based on land, along the coast and at sea. According to EMODnet (2023), aquaculture areas are located onshore or close to the coastline, more than 200 km away from the DEWTA project area.

4.4.9 Mining

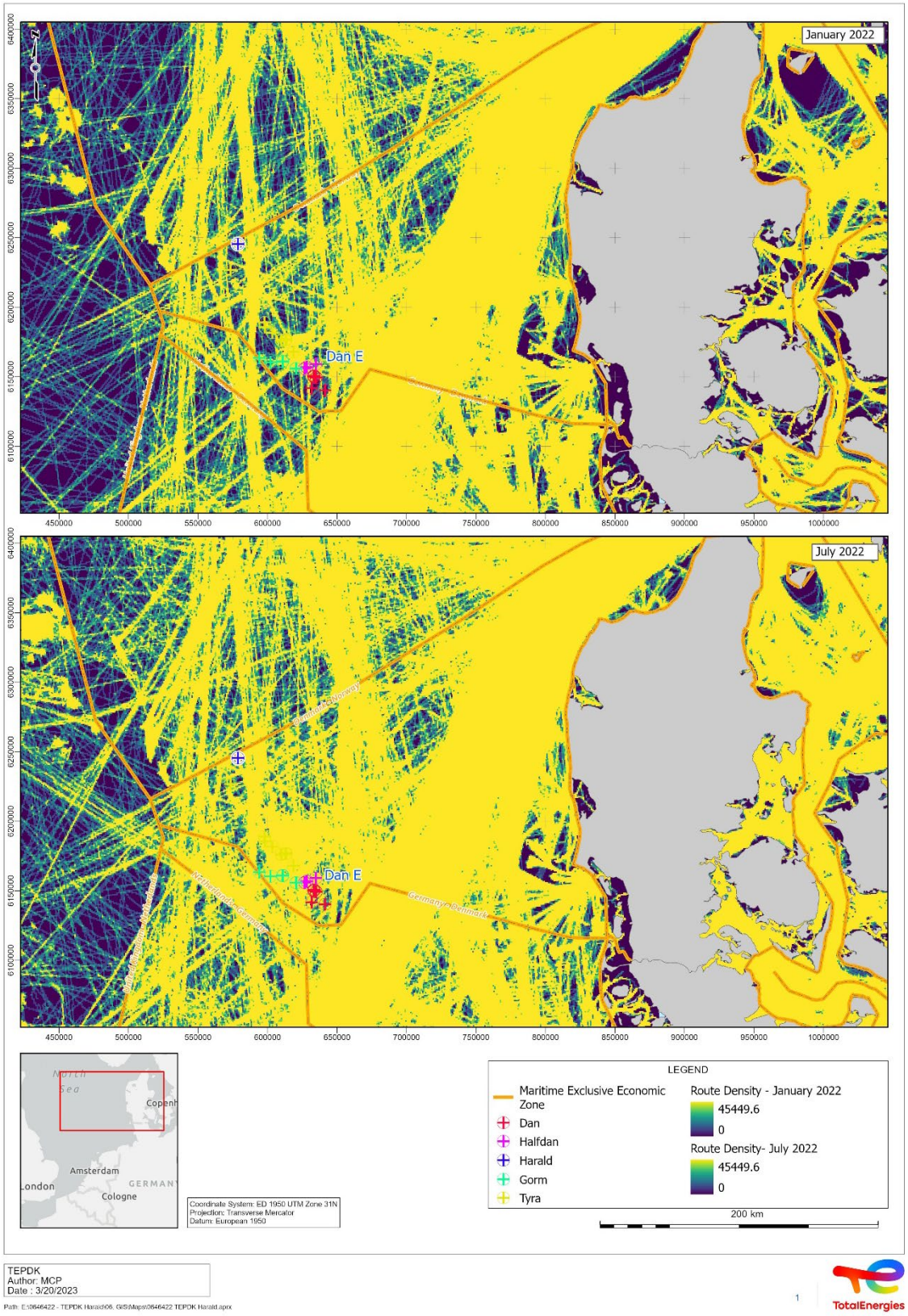
Mineral extraction in Denmark is highly dependent on construction activities and infrastructure projects in the country. Extraction of sand, stone and gravel comes both from land and seabed. According to EMODnet (2023), areas of seabed licensed for exploration or extraction of aggregates in the Danish North Sea are mostly located close to coastline, and at less than 70 km offshore.

4.4.10 Navigation

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 in number and in the same space such as offshore wind farms, aquaculture, marine protected areas, and pipelines.

Figure 4.39 shows vessel traffic maps for January and July 2022 from Automatic Identification System (AIS) data in density map format. This 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 figure represents seasonal variations in maritime traffic in 2022. 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.

Figure 4.39 Maritime Traffic in 2022



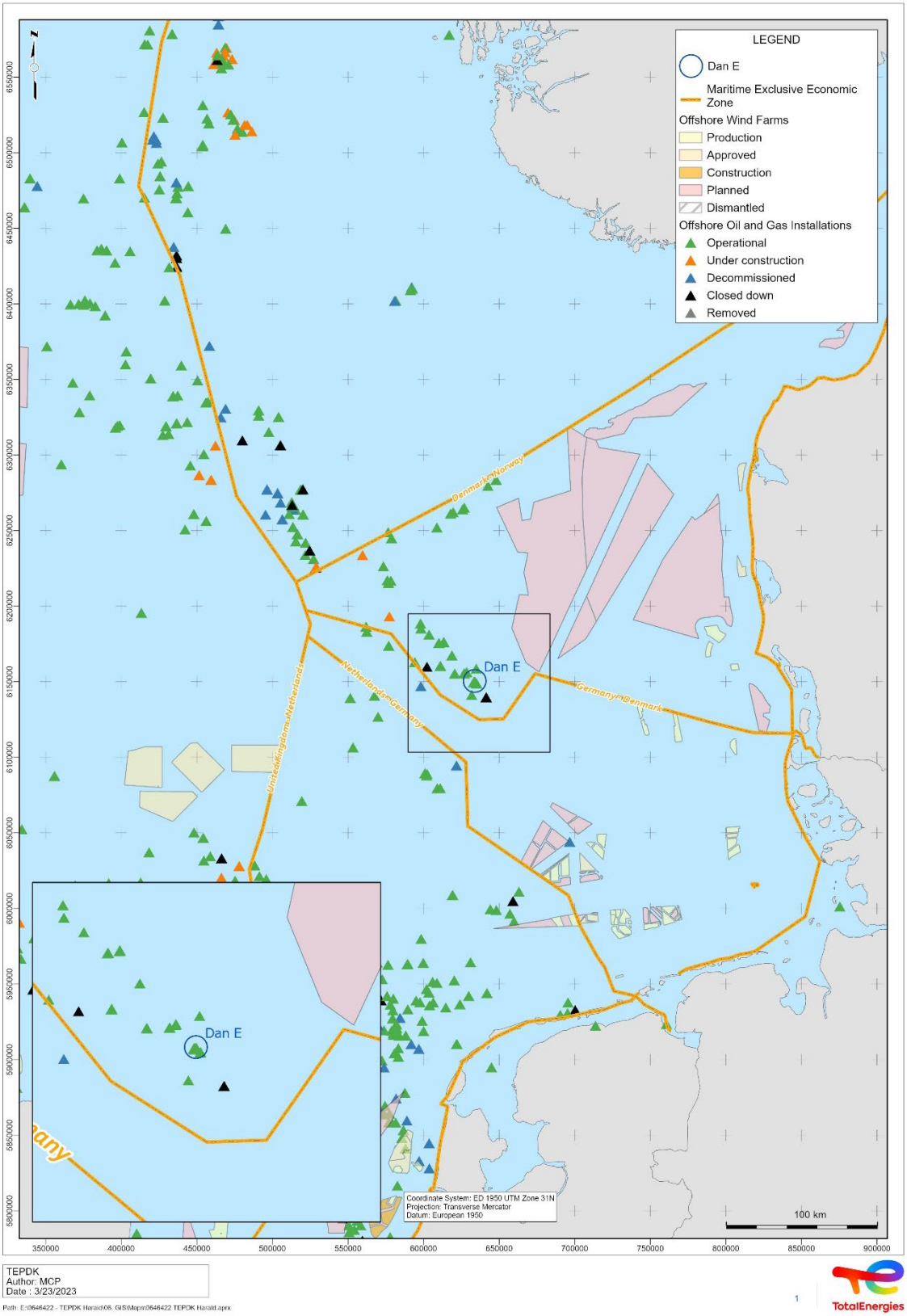
Source: EMODnet, 2023. Prepared by ERM, 2023.

4.4.11 Infrastructure

4.4.11.1 Offshore Energy Installation and License Blocks

Figure 4.40 presents the locations of offshore energy installations and license areas within the North Sea and in relation to the DEWTA project. 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 4.40 Offshore Wind Farm and Oil and Gas Activities in the North Sea

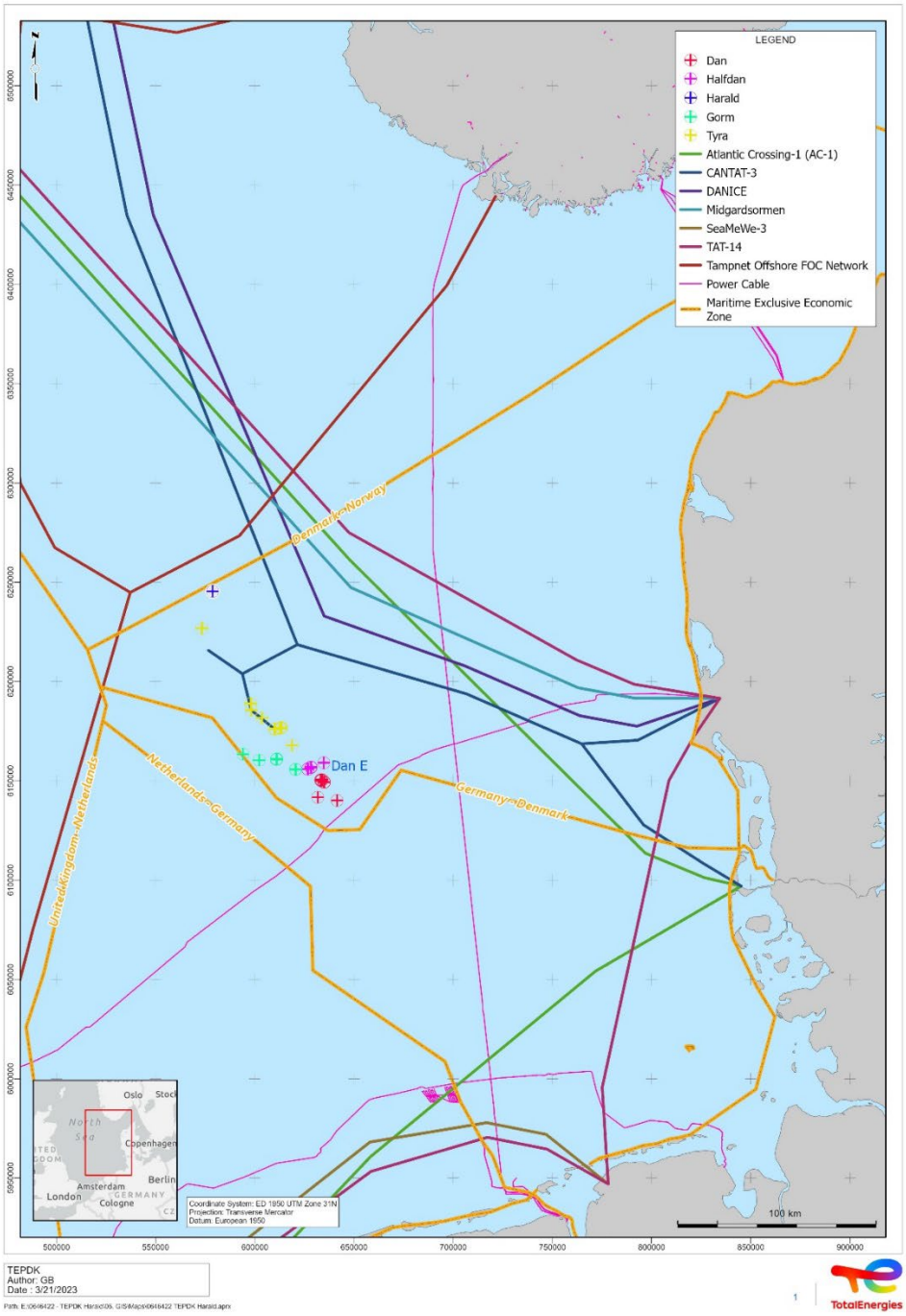


Source: EMODnet, 2023. Prepared by ERM, 2023.

4.4.11.2 Subsea Cables

A subsea cable is a cable laid on the seabed between land-based stations to carry telecommunication signals or power across stretches of ocean and sea. Figure 4.41shows the location of international subsea network cables in the North Sea. There are no third-party subsea cables in the DEWTA project area.

Figure 4.41 Key International Subsea Cables in the North Sea



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

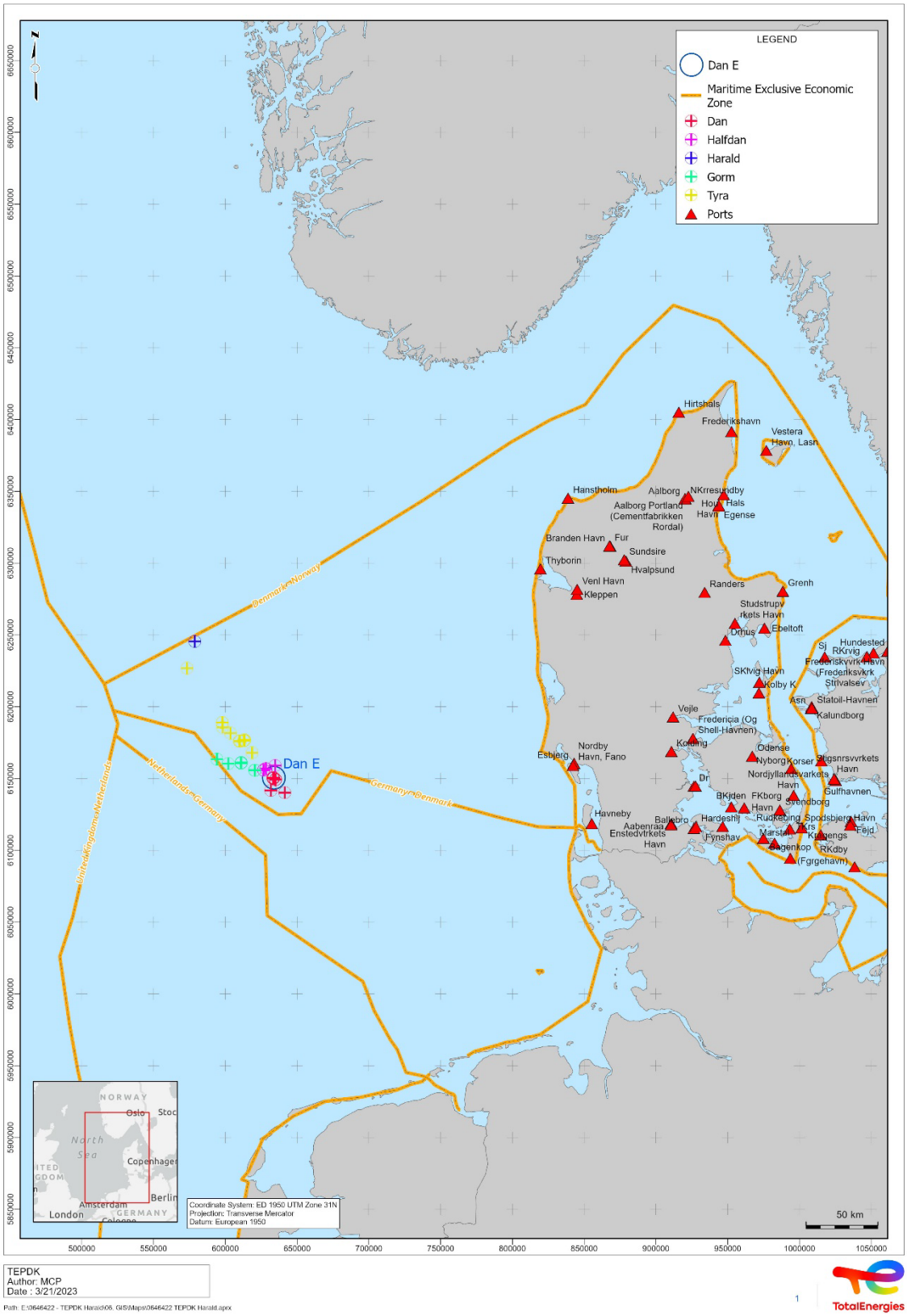
4.4.12 Tourism

No tourism takes place at the DEWTA project area. The nearest tourist sites are located along the Jutland coast and Esbjerg, more than 185 km away (Vadehavskysten, 2023; Visit Denmark, 2023).

4.4.13 Sea Ports

Denmark's ports play an important role in the country's export and import trade (Figure 4.42). The Port of Esbjerg is key in the oil and gas sector in the western region of Denmark (Port of Esbjerg, 2023), and will be the service port for the DEWTA project.

Figure 4.42 Denmark's Seaports and Container Terminals

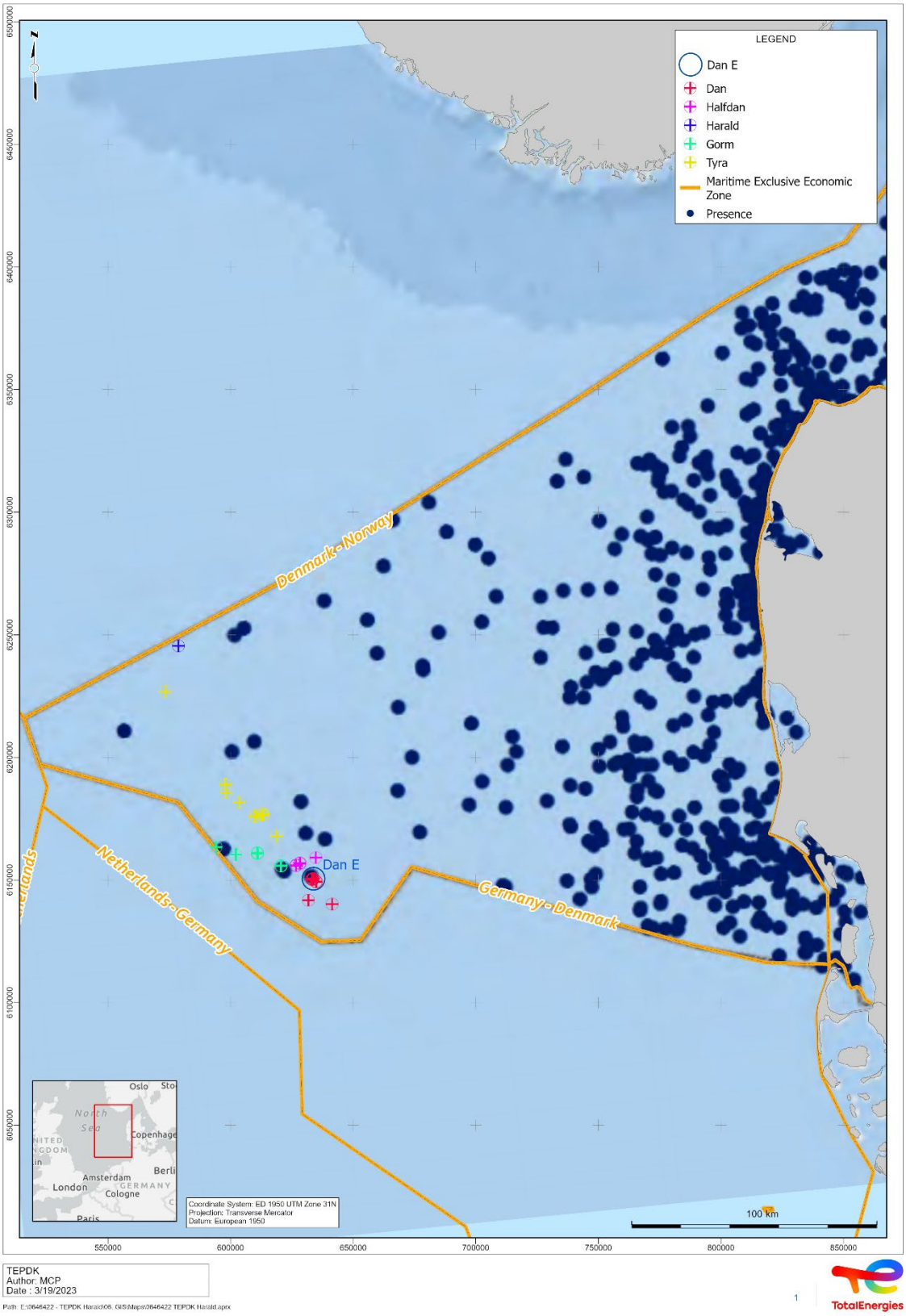


Source: EMODnet, 2023. Prepared by ERM, 2023.

4.4.14 Cultural Heritage

Cultural heritage in the North Sea includes submerged prehistoric sites that were once land, other coastal features such as early fish-traps, shipwrecks, and submerged structures from defending the coast in World Wars I and II. Most of the cultural heritage sites in Denmark are located near the coast. The nearest known cultural heritage site to Dan E is approximately 1.9 km away and is a relatively modern shipwreck, dated 1661-2019 AD, under the name North Sea V (Danish Agency for Culture and Palaces, 2023).

Figure 4.43 Known Shipwrecks in the Danish North Sea

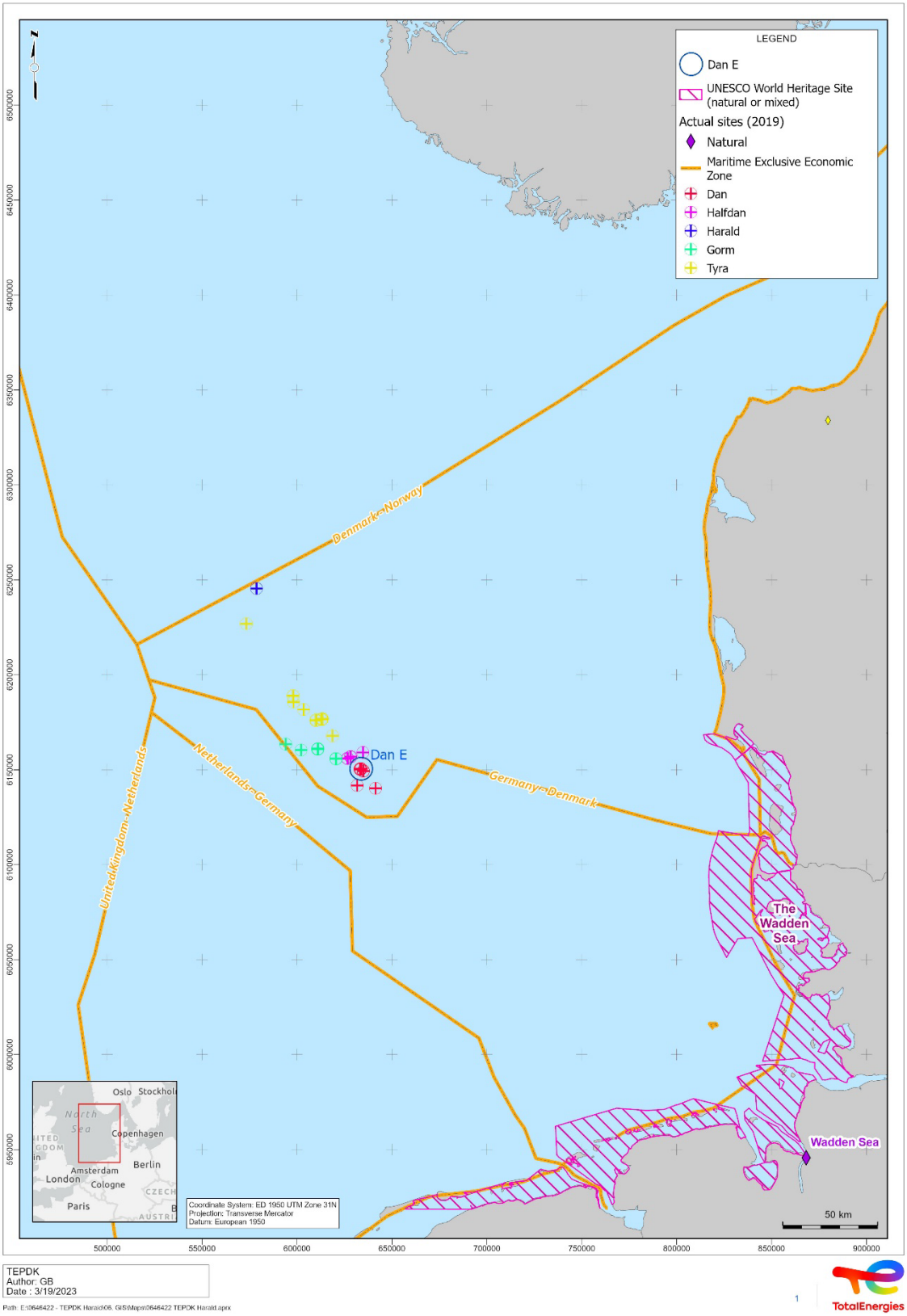


Source: Andersen *et al.*, 2020.

4.4.15 UNESCO World Heritage Sites

There are currently 10 UNESCO World Heritage Sites in Denmark. The Wadden Sea, shared with Germany and the Netherlands, is the only site located in the North Sea (Figure 4.44). The Wadden Sea is the world's largest unbroken intertidal sand and mud flat, 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 (UNESCO, 2023). 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 DEWTA project is approximately 181 km from the northern part of the Wadden Sea National Park.

Figure 4.44 UNESCO World Heritage Sites



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

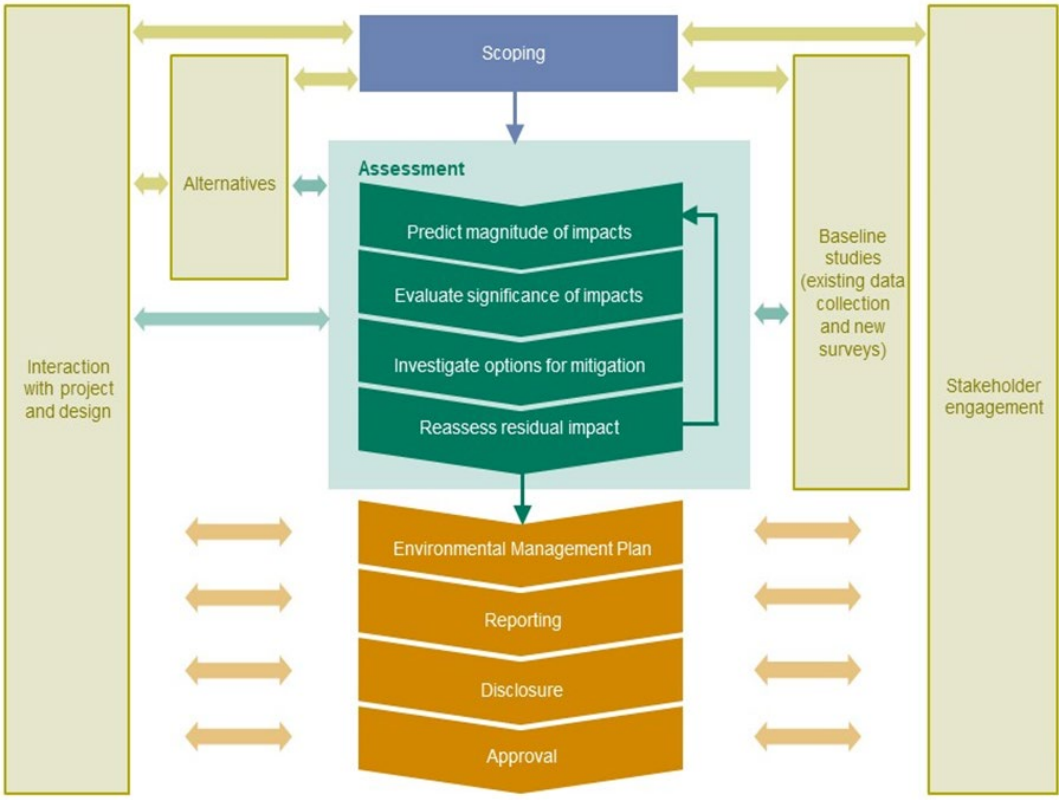
5. IMPACT ASSESSMENT AND MITIGATION

5.1 Introduction

The impact assessment process involved assessing the significance of impacts (identified through the scoping process as presented in Section 5.3) on key receptors as described in the baseline characteristics section (Chapter 4). Impacts have been assessed through an objective exercise to determine what could happen to environmental and social receptors due to the DEWTA project activities.

The overall approach followed is shown in Figure 5.1 while the key steps taken are described in subsequent sections.

Figure 5.1 Overview Impact Assessment (IA) Approach



Source: ERM, 2012.

5.2 Description of Impact Assessment Method

5.2.1 Impact Identification and Characterization

An ‘impact’ is any change to a resource or receptor caused by the presence of a project component or by a project-related activity. Impacts can be negative or positive. Impacts are described in terms of their characteristics, including the impact type and the impact spatial and temporal features (namely extent, duration and scale). Terms used in this report are described in Table 5.1.

Table 5.1 Impact Characteristics

Characteristic	Definition	Terms
Type	A descriptor indicating the relationship of the impact to the project (in terms of cause and effect).	**Direct** - Impacts that result from a direct interaction between the project and a resource/receptor (e.g. between occupation of the seabed and the habitats which are affected). **Indirect** - Impacts that follow on from the direct interactions between the project and its environment due to subsequent interactions within the environment (e.g. viability of a species population due to the loss of part of a habitat from the project occupying the seabed). **Induced** - Impacts due to other activities (which are not part of the project) that happen due to the project. **Cumulative** - Impacts that arise due to an impact and effect from the project interacting with those from another activity to create an additional impact and effect.
Duration	The time period over which a resource / receptor is affected.	**Temporary** - impacts are predicted to be of short duration and intermittent/occasional. **Short term** - Impacts that are predicted to last only for six months or less. **Medium term** - Impacts that are predicted to last more than 6 months to 3 years. **Long term** - Impacts that will continue beyond three years but within 10 years. **Permanent** - Impacts that cause a permanent change in the affected receptor or resource or ecological process, and which endures beyond 10 years.
Extent	The reach of the impact (i.e. physical distance an impact will extend to).	**On-site** - Impacts that are limited to the site area only, i.e. within 500 m of drilling rig/wellhead platform (safety zone). **Local** - Impacts that are limited to the project site. **Regional** - Impacts that affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries, habitat type/ecosystems, i.e. extend to areas outside the project site. **National** - Impacts that affect nationally important environmental resources or affect an area that is nationally important/ or have macro-economic consequences. **Trans-boundary/International** - Impacts that affect internationally important resources such as areas protected by international conventions or impact areas outside of Denmark.
Scale	Quantitative measure of the impact.	The size of the impact (e.g. area damaged or impacted, the fraction of a resource that is lost or affected). No fixed designations, as it is intended to be a numerical value.

This process will consider any control measures that are already embedded as part of the project design when categorizing an impact. Additional mitigation measures aimed at further reducing the significance of impacts will also be proposed where necessary or appropriate. The residual impact will then be assessed after the mitigation has been applied.

5.2.2 Scoping

The first stage of the ESIA process involved identifying the potential impacts of the proposed DEWTA project activities that require further investigation. The scoping phase includes the systematic consideration of the potential for interaction between activities involved in temporary abandonment projects and aspects of the physical, biological and social environment that may be affected.

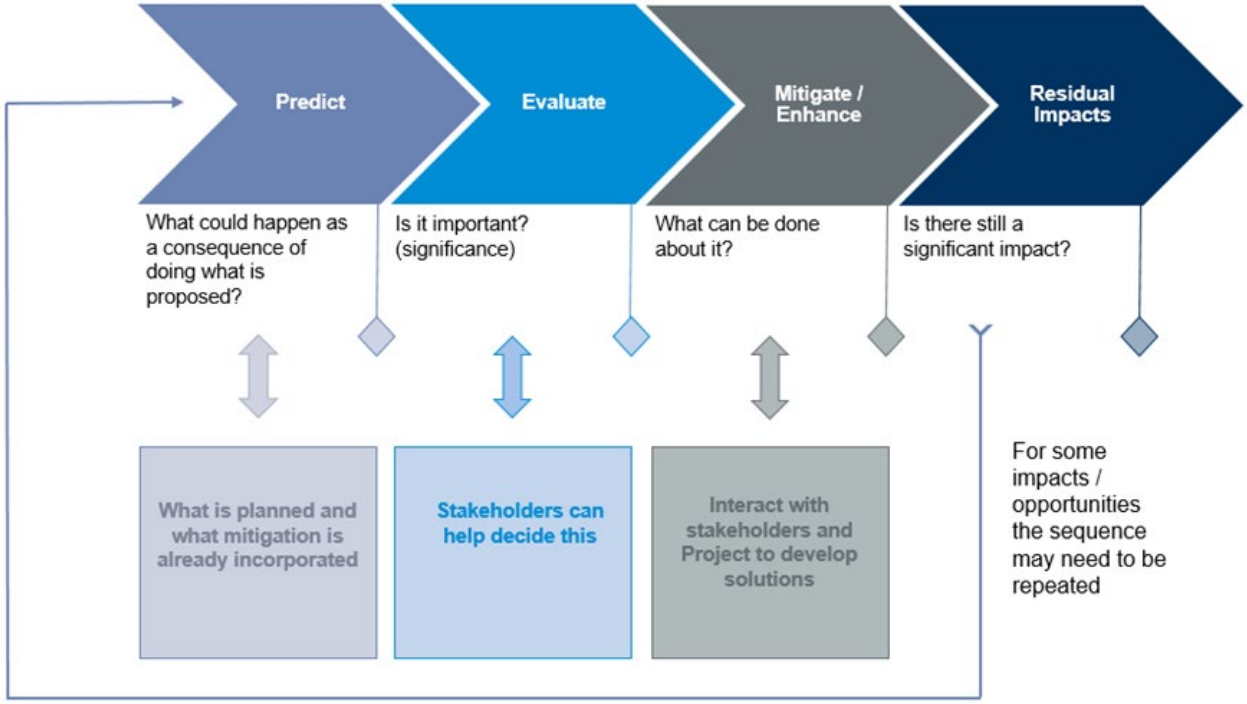
The aim of scoping is to focus the detailed assessment on impacts that may be of significance. The ESIA team completed a review of the DEWTA project and its environment to identify all possible impacts. Those that are expected to be significant were then identified considering the professional judgment of the specialists within the team and knowledge of the project-affected area.

The results of scoping are presented in Section 5.3 of this report.

5.2.3 Impact Assessment and Mitigation

The detailed assessment of impacts proceeds through an iterative process considering four questions (Figure 5.2). Where significant residual impacts remain, further options for mitigation have been considered. Impacts are subsequently re-assessed until they are as low as is technically and financially feasible for the project.

Figure 5.2 Impact Prediction and Evaluation Process



Source: ERM, 2012.

5.2.3.1 Impact Prediction

The ESIA report describes what could happen by predicting the magnitude of impacts and quantifying these to the extent practicable.

The term ‘magnitude’ is used as shorthand to encompass all the dimensions of the predicted impact including:

- The nature of the change (what is affected and how);
- Its size and scale;
- Its geographical extent and distribution;
- Its duration; and
- Where relevant, the likelihood of the impact occurring as a result of accidental or unplanned events.

Magnitude also includes the level of certainty of the occurrence and scale of the impact, expressed as confidence levels. The confidence levels are described in Table 5.2.

Table 5.2 Confidence Rating

Level	Description
Low	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is limited.
Medium	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is reasonable and relatively sound.

Level	Description
High	Amount of information on and/or understanding of the environmental factors that potentially influence the impact is sufficient and sound.

Magnitude therefore describes the actual change that is predicted to occur in the resource or receptor. For example, this change includes matters such as:

- The area and duration over which underwater noise impacts could extend to;
- The extent of impact on a local marine faunal community; or
- The likelihood and consequences from a collision in terms of fatalities.

An overall grading of the magnitude of impacts is provided, considering the dimensions mentioned above. These dimensions will determine whether an impact is of Negligible, Small, Medium or Large magnitude.

This scale is defined differently according to the type of impact depending on the circumstances. For example, for quantifiable impacts such as noise, numerical values are typically used whilst for other topics a more qualitative classification is often necessary.

5.2.3.2 Evaluation of Significance

Planned Events

The next step in the assessment is to take the information on the magnitude of impacts and explain what this means in terms of its importance to society and the environment.

This is to enable decision makers and stakeholders to understand how much weight should be given to the issue. This is referred to as Evaluation of Significance.

For the purposes of this ESIA report, the following definition is used (ERM, 2012):

> *An impact is significant if, in isolation or in combination with other impacts, it should, in the judgment of the ESIA team, be reported in the ESIA report so that it can be taken into account in decision making on whether the project should proceed and, if so, under what conditions.*

This recognizes that evaluation requires an exercise of judgment and that judgments may vary between parties in the process. The evaluation of impacts that is presented in this report is based on the professional judgment and experience of the ESIA team, a combination of marine biologists, marine scientists, social experts, technical risk and safety engineers, technical experts such as modellers, supported by scientific literature, TEPDK project information and previous monitoring studies.

Criteria for assessing the significance of impacts are clearly defined for each topic area and types of impact considering whether the DEWTA project will:

- Cause legal or accepted environmental standards to be exceeded, e.g. vessel wastewater discharges, or make a substantial contribution to the likelihood of exceedance;
- Adversely affect marine and/or protected areas or features, or valuable resources, such as nature conservation areas, rare or protected species, cultural heritage sites, sites of high social value, important sources of ecosystem services; or
- Conflict with established government policy, e.g. to recycle waste, control urban development and protect human rights.

Significance is evaluated considering the magnitude of impact and the value or sensitivity of the affected resource or receptor. Magnitude is defined across the various dimensions described in the previous sub-section.

The value of a resource is judged considering its quality and its importance as represented, e.g. by its local, regional, national or international designation, its importance to the local or wider community, or its economic value.

The assessment of receptors sensitivity, e.g. a faunal community or an industry (e.g. fishing, shipping), considers their anticipated response to the change and their ability to adapt to and manage the effects of the impact.

Magnitude and sensitivity/ vulnerability/ importance are addressed in combination to evaluate whether an impact is significant and if so its degree of significance (Figure 5.3). The specific criteria used to evaluate significance of impacts at a topic level are presented for each topic in Section 5.2.1.

Figure 5.3 Evaluation of Significance

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Source: ERM, 2012.

The definition of the levels of overall significance of impact are separated for receptors (Table 5.3).

Table 5.3 Classification of Overall Significance of Negative Impacts

Overall significance	Impacts on receptors
Negligible	No measurable impacts on the structure or function of the receptor.
Minor	The impact on the structure or function of the receptor is localised and immediate or short-term. When the activity ceases, the impacted area naturally restores to pre-impact status.
Moderate	The impact on the structure or function of the receptor is local or regional and over short to medium-term. The structure or ecosystem function of the receptor may be partially lost. Populations or habitats may be adversely impacted, but the functions of the ecosystem are maintained. When the activity ceases, the impacted area restores to pre-impact status through natural recovery or some degree of intervention.
Major	The impact on the structure or function of the receptor is regional, national or international and medium-to long-term. Populations or habitats and ecosystem function are substantially adversely impacted. The receptor cannot restore to pre-impact status without intervention.

Unplanned/Accidental Events

For accidental events, the likelihood or frequency, and in consequence the severity, are addressed in combination to evaluate whether an impact due to an accidental event is significant. If significant, its degree of significance is subsequently considered. TEPDK's risk matrix (Figure 5.4) was used in evaluating the severity and likelihood of accidental events occurring from the DEWTA project. The severity and likelihood rating descriptions are provided in Table 5.4 and Table 5.5.

Figure 5.4 TEPDK Risk Matrix

Risk Classifications & Definitions from DIR SEC 08 & 02									
		Media Reaction	Local rumour or no media consequence	Local rumour / regional press	Regional press + regional TV national rumour	National press + national TV	International press + international TV	International press + international TV for prolonged period
		Material Loss	<20K €	>20K €	>200K €	>2M €	>10M €	>100M €
		Environment Impact (Definitions from REC-GR-ENV-001)	Minor spill with no environmental impact	Minor pollution with a very limited environmental impact	Moderate pollution with limited environmental consequences	Pollution having significant environmental consequences	Large-scale pollution of ecosystems having a recognized ecological value	Pollution having massive and durable consequences for vast ecosystems having a high ecological value
		Personnel Safety	First aid or medical treatment or restricted work days	Single lost-time injury (LTI) with no disability	Single lost-time injury (LTI) with disability or multiple lost-time injuries	Internal: 1 Fatality &/or several disabilities Public: Disabilities	Internal: >2 Fatalities Public: 1 Fatalities	Internal: >5 fatalities Public: >2 Fatalities
Personnel Safety, Environment Impact, Material Loss & Media Reaction			**Severity of Consequence**					
			Minor	**Moderate**	**Serious**	**Very Serious**	**Catastrophic**	**Disastrous**
			1	**2**	**3**	**4**	**5**	**6**
Expected to occur several times during plant lifetime	**Very Likely** $> 10^{-1}$	**6**	**6**	**12**	**18**	**24**	**30**	**36**
Could occur several times during over plant lifetime	**Likely** 10^{-1} - 10^{-2}	**5**	**5**	**10**	**15**	**20**	**25**	**30**
Could occur once for every 10 to 20 similar plants over 20 to 30 years of plant lifetime	**Unlikely** 10^{-2} - 10^{-3}	**4**	**4**	**8**	**12**	**16**	**20**	**24**
One time per year for at least 1000 units. One time for every 100 to 200 similar plants in the world over 20 to 30 years of plant lifetime. Has already occurred in the company but corrective action has been taken	**Very Unlikely** 10^{-3} - 10^{-4}	**3**	**3**	**6**	**9**	**12**	**15**	**18**
Has already occurred in the industry but corrective action has been taken	**Extremely Unlikely** 10^{-4} - 10^{-5}	**2**	**2**	**4**	**6**	**8**	**10**	**12**
Event physically possible but has never or seldom occurred over a period of 20 à 30 years for a large amount of sites (> few thousands, ex: wagons, process drums,…)	**Remote** 10^{-5}	**1**	**1**	**2**	**3**	**4**	**5**	**6**

Likelihood of Occurrence

Risk Level 1

Risk Level 2

Risk Level 3

Source: TEPDK.

Table 5.4 Severity of Consequence Criteria

Descriptions Severity Rating	Description
1 – Minor	Minor pollution with no environmental impact
2 – Moderate	Minor pollution with a very limited environmental impact
3 – Serious	Moderate pollution with limited environmental consequences
4 – Very Serious	Pollution having significant environmental consequences
5 – Catastrophic	Large-scale pollution of ecosystems having recognized ecological value
6 – Disastrous	Pollution having massive and durable consequences for vast ecosystems having a high ecological value

Table 5.5 Likelihood of Occurrence Criteria

Severity Rating	Description
1 – Remote	Event physically possible but has never or seldom occurred over 20 to 30 years for a large amount of sites (>few thousands)
2 – Extremely Unlikely	Has already occurred in the industry but corrective action has been taken
3 – Very Unlikely	One time per year for at least 1,000 units One time for every 100 to 200 similar plants in the world over 20 to 30 years of plant lifetime Has already occurred in the company but corrective action has been taken
4 – Unlikely	Could occur once for every 10 to 20 similar plants over 20 to 30 years of plant lifetime
5 – Likely	Could occur several times during plant lifetime
6 – Very Likely	Expected to occur several times during plant lifetime

5.2.4 Mitigation

The impact assessment process aims to have decisions on projects made based on their potential impacts on the environment and society. A vital step within the process is therefore the identification of measures that can be taken to mitigate impacts so that these can be incorporated into the DEWTA project. The mitigation measures were developed in discussion with the DEWTA project team so that recommended measures are feasible, realistic and able to fulfil their intended objectives.

5.2.5 Residual Impact

In some cases, it may only be possible to reduce the impact to a certain degree. These impacts are therefore residual in the sense that they remain after mitigation measures have been applied to the intended activity. When an impact could not be completely mitigated, the residual impact has been reassessed and the possibility for further mitigation considered. All residual significant impacts are described in this report with commentary on why further mitigation is not feasible.

5.2.6 Management and Monitoring

A range of different measures to mitigate and manage impacts has been identified through this assessment. The implementation of the mitigation, management and monitoring measures recommended in this assessment have been summarised in an outline Environmental and Social Management Plan (ESMP) for the DEWTA project.

The outline ESMP sets out the measures that are recommended to be put in place by TEPDK to manage the environmental performance of the DEWTA project and is presented in Chapter9.

5.2.7 Cumulative Impacts

A cumulative impact is one that arises from an impact from the proposed project interacting with an impact from another activity to create a greater impact or an additional impact. How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g. already in existence, approved or proposed) and how much data is available to characterize the magnitude of their impacts.

The approach for assessing cumulative impacts and effects due to the project and another activity affecting the same resource/receptor is based on a consideration of the approval/existence status of the 'other' activity and the nature of information available to aid in predicting the magnitude of impact from the other activity. Potential cumulative impacts have also been described where applicable.

5.3 Scoping Outcomes

Potential environmental and social impacts have been identified through a systematic process whereby the DEWTA project activities were considered with respect to their potential to interact with an environmental or social resource or receptor. In addition, mitigation measures were considered at this early stage of the ESIA process and developed and incorporated into the report to avoid or reduce negative impacts and enhance positive impacts. These mitigation measures are outlined in this Chapter and further detailed in the Commitments Register in Chapter 9- Outline Environmental and Social Management Plan.

The impacts from planned activities that were assessed not to be significant by the ESIA team and representatives from TEPDK are briefly discussed in Section 5.3.1 and scoped out of the detailed assessment.

Further assessment of the aspects from planned activities that were identified as potentially significant in Section 5.3.2 was undertaken in Section 5.4.

Accidental events considered during the scoping process address the 'worst case' scenario possible in relation to the DEWTA project activities. The following unplanned/accidental events were considered as potentially significant and assessed in Section 5.6:

- Hydrocarbon/Chemicals Spills (minor/Tier 1): e.g., hose failure during bunkering;
- 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;
- Hydrocarbon Spills (major/Tier 3): well blowout at the seabed; and
- Loss of containment due to dropped objects.

5.3.1 Scoped-Out Environmental/Social Impacts

Table 5.6 presents the environmental and social impacts, which are scoped out and that will not be assessed further.

Table 5.6 Environmental and Social Impacts from Planned Activities Scoped Out as Not Significant

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
A	***ENVIRONMENTAL IMPACTS***			
Impacts on Physical Environment				
1.0	***Impacts on Air Quality due to:***			
1.1	Atmospheric emissions during temporary abandonment from: ■ 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 for personnel transportation	■ Mobilization ■ Well Temporary Abandonment	■ 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.	Atmospheric emissions of pollutants (NOx, SOx and particulates) to the atmosphere from the DEWTA project vessels during mobilization and positioning phase, exhaust emissions from power generation on the rig, and potential venting will not materially affect air quality due to their temporary nature, the well-mixed airshed of the offshore environment and the distance of the DEWTA project activities to designated coastal areas (approximately 185 km). Thus, the impact on air quality from the DEWTA project vessels and the rig **will not be assessed further**.
2.0	***Impacts on Hydrographic Conditions due to:***			
2.1	Presence of the jack-up rig and anchors.	■ Mobilization ■ Well Temporary Abandonment	■ Review seabed survey data to identify areas for rig mobilization and anchoring minimizing effects on surrounding surfaces.	The area impacted by project activities is small and located near the Dan E platform on areas already affected by the existing platform, and previous rig and

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
				drilling activities. The presence of the jack-up rig is temporary (approximately 99 days), the rig won´t be moved during the DEWTA project activities and no modification is expected to the existing conditions. Therefore, this impact **will not be assessed further.**
3.0	***Impacts on Seawater Quality due to:***			
3.1	Drainage discharge from jack-up rig and vessels (bilge water, ballast, etc.)	■ Mobilization ■ Well Temporary Abandonment	■ Manage wastewater discharges in accordance with MARPOL 73/78 Annex I Regulations for the Prevention of Pollution by Oil. ■ TEPDK Chemical Permitting Procedure ■ Monitoring of bilge water and processing of oily water prior to discharge. ■ Separation and treatment system prior to discharge overboard. ■ Implementation of Ballast Water Management Plan. ■ Adhere to International Maritime Organization (IMO) and Danish guidelines on ballast water discharge (the Ballast Water Management Convention). ■ Adhere to IMO and Danish guidelines on biofouling (hull fouling). ■ Adhere to the guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species, approved by the Marine Environment Protection Committee (MEPC). ■ All project vessels have been operating solely in the North Sea and follow the International Maritime Organization (IMO) Ballast Water Management Convention and have ballast water management systems and procedures in place.	Drainage discharges from the jack-up rig and project vessels will be managed in accordance with MARPOL 73/78 – Annex I Regulations for the Prevention of Pollution by Oil. It is not anticipated that any chemicals classified as red will be used in the DEWTA project. The dilution and assimilative capacity of the water would be expected to minimize any adverse impacts from these vessel discharges and no modification is expected to the existing conditions. Thus, the impact on water quality **will not be assessed further.**
3.2	Wastewater discharge (grey and black water, galley waste)	■ Mobilization ■ Well Temporary Abandonment	■ Manage sewage in accordance with MARPOL 73/78 Annex IV Regulations for the Prevention of Pollution by Sewage from Ships.	Sanitary and domestic effluent from the DEWTA project vessels will be managed in accordance with the relevant MARPOL 73/78 requirements. The sanitary (black water) and domestic (grey water) effluent to be generated is expected to be small and insignificant compared with the

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
			■ Vessels shall have an IMO approved sewage treatment plant. ■ Sewage sludge is stored in tanks and delivered / discharged in accordance with MARPOL Annex IV. ■ All TEPDK vessels will send galley waste and garbage to the shore base for disposal.	assimilative capacity of the receiving water body. The dilution and assimilative capacity of the seawater would be expected to minimize any adverse impacts from these temporary vessel discharges and no modification is expected to the existing conditions. Consequently, these impacts **will not be assessed further**.
3.3	Inner completion string removal	■ Well Temporary Abandonment	■ Prepare project specific Waste Management Plan to meet TEPDK-L2-PRO-HSE-0026-E.	Solid wastes will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan. TEPDK policies on waste management and current operational practice at all TEPDK facilities in the Danish North Sea ensure that during the DEWTA project activities, all waste streams are properly managed in compliance with Danish regulations. Consequently, the impact on water quality **will not be assessed further**.
3.4	Jack-up rig positioning, well temporary abandonment, demobilization	■ Mobilization ■ Well Temporary Abandonment	■ Spudcans and anchoring location design optimisation to ensure stability and minimize disturbance to the seabed. ■ Maximize use of areas already affected by previous rig and drilling activities.	The positioning/mobilization of the jack-up rig will be near the existing Dan E platform on already disturbed areas. This activity may cause temporary seabed sediment-bound contaminant resuspension into the water column. The spudcan penetration/removal is commonly performed at low and controlled speed to ensure the accuracy and guarantee the stability of the rig. The potential sediment resuspension is therefore very limited in space and will depend on the actual penetration of the spudcan into the seabed (data from previous rig-moves indicate a spudcan penetration <4 m) and hydrodynamic conditions. Most of the seabed material will be compressed or pushed to the side of the spudcan positions and only minimal surface layers of sediments may be resuspended briefly and locally. Anchors used by the jack-up rig will have a limited and temporary footprint. As indicated in Section 4.2.6 the metal and hydrocarbon concentrations analysed had an EnS score close to 100 and were low compared to indicators for Good Environmental Status. The heavy metal concentrations in the sediment samples are below all targets for Good Environmental Status, only Ba may be present in concentrations which are above the potential effect level. This is likely caused by past drilling activities (DHI, 2020). Considering the short duration of the impact, the limited amount of sediment resuspended,

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
				and the localized area of influence of the plume, this project activity will not cause any significant dispersion of sediment-bound pollutants posing a danger to the environment. Since no modification is expected to the existing conditions, this impact **will not be assessed further**.
4.0	***Impacts on Seabed and Sediment Quality due to:***			
4.1	Jack-up rig positioning, well temporary abandonment, demobilization	■ Mobilization ■ Well temporary abandonment	■ Spudcans and anchoring location design optimisation to ensure stability and minimize disturbance to the seabed. ■ Maximize use of areas already affected by previous rig and drilling activities.	The positioning/mobilization of the jack-up rig will be near the existing Dan E platform on already disturbed areas. This activity may cause temporary seabed sediment-bound contaminant resuspension into the water column. This will be limited to the penetration of the three spudcans of the jack-up rig legs over approximately 99 days. Assuming a typical footprint for a harsh environment jack-up rig of 201 m^2 per spudcan, a total area of 603 m^2 will be impacted during the DEWTA project activities. Once the jack-up rig demobilizes, craters left by the spudcans will fill in with sediment naturally and the seabed will return to normal conditions. The spudcan penetration/removal is commonly performed at low and controlled speed to ensure the accuracy and guarantee the stability of the rig. The potential resuspension of sediments into the water column is therefore limited and will depend on the actual penetration of the spudcan into the seabed (data from previous rig-moves indicate a spudcan penetration <4 m) and hydrodynamic conditions. Most of the seabed material will be compressed or pushed to the side of the spudcan positions and only minimal surface layers of sediments may be resuspended briefly and locally. Anchors used by the jack-up rig will have a limited and temporary footprint. Since no modification is expected to the existing conditions, this impact **will not be assessed further**.

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
Impacts on Marine Biodiversity and Protected Species				
5.0	***Impact to Marine Mammals, Fish and Plankton due to:***			
5.1	Underwater noise emissions from: ■ the mobilization of jack-up rigs and power generation on the rig. ■ the operation of support and supply vessels. ■ casing milling (or PWC)	■ Mobilization ■ Well temporary abandonment	■ Implement TEPDK's General Emissions Monitoring Plan during all project activities. ■ Implement TEPDK's Logistics and Services Operation Management Systems to optimize supply and support operations/ logistics to minimize operation time. ■ Equipment will be selected according to the best available technologies in terms of minimization of underwater noise emissions.	The project area is already subject to intermittent noise emissions from vessels and other activities as Dan E is near (0.5 km) to the operating Dan F platform (see Figure 3.2). Research on underwater noise from a jack-up exploration rig in the Dogger Bank, North Sea, shows that underwater noise levels were unlikely to cause auditory injury for marine mammals (Todd et al., 2020). The noise produced during the DEWTA project activities is typically broadband noise, with some low tonal peaks and is not impulsive noise such as seismic or piling. Potential overlapping with the DAN Field associated underwater noise will be limited to 99 days of project duration. It is therefore not expected to have a significant direct or cumulative impact on sensitive receptors. Noise during milling (or perforation in case of PWC), will occur downhole in the rock formation below the seabed (approximately 3,400 ft below the seabed) resulting in insignificant underwater noise emission levels in the water column, thus it **will not be assessed further**.
5.2	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	■ 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;	All WBM (2,100 mT) will be retained and returned to shore for processing and disposal. However, about 10% of WBM, as a conservative case scenario (210 mT), is considered to be discharged into the sea. The clean inhibited seawater (3,600 bbl) will be discharged to sea, however the total amount of chemicals contained in the inhibited seawater is 3 mT and is 1% of the total amount of chemicals discharged for the DEWTA project. Used cement discharge will be less than 20% (49.7 mT in case of milling and 51.4 mT in case of PWC). The volumes discharged during the DEWTA project activities are insignificant. The DEWTA project will use only green and yellow classified substances. Any potential impacts on marine mammals, fish and plankton are confined to the local environment near the platforms and vessels due to low dissipated concentrations. Most cetacean species, which can be found in the DEWTA project area, are more abundant in the North Sea

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
			■ Minimize spent water-based mud discharge to sea.	during summer months compared to winter months (Waggitt et al., 2019). As the project is scheduled for Q4 2023, a lower abundance is expected. The duration and frequency of exposure to project related discharges is expected to be low. The discharge will be intermittent and short term during the project duration of 99 days. Modelling simulation for this type of discharges show that the impact is localized. Therefore, this impact **will not be assessed further**.
6.0	***Impacts on Benthic Communities due to:***			
6.1	Jack-up rig positioning, well temporary abandonment and demobilization	■ Mobilization ■ Well temporary abandonment	■ Refer to item No. 4.1.	The rig will be a three-legged jack-up and will be onsite for approximately 99 days, hence it could impact benthic communities. The positioning and demobilization of the spudcans will affect an area near Dan E previously affected by past rig and drilling activities. Once in position, there will be no further disturbance to the sediment and seabed from the presence of the jack-up rig. On demobilization of the jack-up rig, jacking up the spudcans and legs will have a similar impact to positioning of the rig and once offsite, the benthic communities will be able to recolonize naturally in the seabed sediment. Since no sensitive and threatened benthic communities/habitats are present near the Dan E platform, the impact is localized and the benthic communities will recover, this impact **will not be assessed further.**
6.2	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	■ 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;	No discharges from the DEWTA project activities are foreseen on the seabed. Chemicals selected for flushing with inhibited seawater and for cementing will be ranked as green and PLONOR listed or yellow. It is anticipated that any chemicals classified as red will not be used in the DEWTA project. WBM and used cement discharges may smother benthic organisms near the discharge location. Smothering impacts will be intermittent over the short-term duration of project activities and recovery to near normal conditions is expected to occur once the activities for well temporary abandonment stop. Benthic fauna are also tolerant of smothering due to the seabed currents constantly moving seabed sediments. According to the baseline (Sections 4.3.2 and 4.3.7), no sensitive

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
			■ 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.	and threatened benthic communities/habitats (e.g. under Habitat I of Habitat Directive such as “Reef, 1170” or “Sandbanks 1110”) are present near the Dan E platform. Thus, this impact **will not be assessed further.**
7.0	***Impacts on Seabirds due to:***			
7.1	Helicopters	■ Mobilization ■ Well temporary abandonment	■ Use existing helicopter contractor and procedures for transport to the jack-up rig at Dan E.	Helicopters will be used during the DEWTA project activities while the jack-up rig is in place for personnel transportation. Helicopters passing through and near coastal areas are unlikely to be a new source of disturbance, therefore this activity **will not be assessed further.**
7.2	Disturbance from the artificial lighting from the jack-up rig and vessels.	■ Mobilization ■ Well temporary abandonment	■ To the extent feasible reduce lighting spill through shielding, directional alignment and other techniques. Reduce horizon glow using downward facing luminaries and paying attention to reflecting surfaces. ■ Lighting on vessels at night will be kept to a minimum for safe operations.	The artificial lighting from the jack-up rig and presence and movement of vessels may disturb seabirds and cause behavioural changes. Birds attracted to the light may collide with the infrastructure and be injured. The closest Natura 2000 conservation site to the DEWTA project area is 26.9 km to the west. Considering the existing platforms near the DEWTA project area and relatively small scale of the project, it represents a negligible and localized impact; thus the impact to seabirds **will not be assessed further.**
8.0	***Impacts on Protected Areas, Critical and Sensitive Habitats due to:***			
8.1	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	■ 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;	The rig will be near Dan E and 26.9 km from the closest Natura 2000 protected area (Special Area of Conservation SAC Doggerbank DE1003301). Chemical selected for flushing with inhibited seawater will be ranked as green and PLONOR listed and yellow. Up to approximately 3,600 bbl of inhibited seawater will be discharged during project activities. WBM and swarf will not be discharged under normal operations but retained and returned to shore for processing and disposal. However, a discharge into the environment of approximately 10% of WBM (210 mT) is considered as a conservative case scenario.

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
			■ 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.	Used cement associated with well temporary abandonment may be discharged to the sea and may only affect a limited area close to Dan E. Impacts to Protected Areas, Critical and Sensitive Habitats **will not be assessed further.**
8.2	Introduction of invasive species from ballast water exchange from jack-up rig and supply vessels	■ Mobilization ■ Well temporary abandonment	■ Refer to item No. 3.1.	Ballast water is taken on-board to maintain safe operation and manoeuvring of vessels. Depending on the location where ballast is taken on-board, it may contain harmful microorganisms, marine organisms from other locations (potentially invasive species) and contaminated sediments in suspension. Ballast exchange is expected to occur at least 200 nautical miles from the nearest land and in water at least 200 m deep, as per the BWM Convention. All DEWTA project vessels have been operating solely in the North Sea. These vessels are unlikely to present a source of non-native / invasive species in vessel fouling during the proposed DEWTA project activities. Based on the implementation of the planned control measures, the impact will not be significant and **will not be assessed further.**

B	***SOCIO-ECONOMIC IMPACTS AND BENEFITS***			
9.0	***Impacts to Local Economy and Employment due to:***			
9.1	Temporary economic impacts from taxes and fees during the Project	■ Mobilization Well temporary abandonment	■ Follow TEPDK's standards and international best practice ■ Implement Local Content / In-country Value development during planning.	The government will receive revenue through taxation such as personal income tax and duties on imported services paid by employees, contractors and supporting services to the project. The scale and extent of these benefits is expected to be small in relation to existing taxes and revenues generated. The benefits to the temporary economic positive impacts from payment of taxes and fees are acknowledged but **will not be assessed further**.
9.2	Temporary economic impacts from procurement and worker spending	■ Mobilization ■ Well temporary abandonment	■ Follow TEPDK's standards and international best practice ■ Implement Local Content / In-country Value development during planning.	An important economic impact of the DEWTA project will come from the procurement of goods and services by the project and the induced economic effects of spending by workers. The scale and extent of these benefits is expected to be small given the nature of the DEWTA project. The benefits to temporary economic positive impacts from procurement and worker spending are acknowledged but **will not be assessed further**.
9.3	Direct and indirect employment opportunities	■ Mobilization ■ Well temporary abandonment	■ Follow TEPDK's standards and international best practice. ■ Implement Local Content / In-country Value development during planning. ■ Engage, whenever possible, local people in employment opportunities and work with suppliers to enable capacity building, procurement, employment and contracting opportunities in the communities, as part of maximizing the positive benefits.	There will be positive impacts on employment and income from the supply of labour and services offshore during the DEWTA project phases. There will also be positive impacts on employment and income from shore-based operations. The scale and extent of these benefits is expected to be small during the DEWTA project duration of approximately 99 days. Direct and indirect employment opportunities are expected to have a **positive** benefit, but the scale and/or extent of the benefit will be relatively small and therefore **will not be assessed further**.
10.0	***Impacts on Working Rights and Working Conditions due to:***			
10.1	Impacts on Workers' Rights	■ Mobilization ■ Well temporary abandonment	■ Implement TEPDK's environmental standards and international best practice. ■ The safety organization defined by law and established on manned facilities and vessels will be responsible for addressing and handling HSE grievances in connection with the work.	Typically, workers' rights issues include fair treatment, non-discrimination, and equal opportunity of workers, fair remuneration (normal and overtime) and working or living conditions, freedom of association and collective bargain and prohibitions of the use of forced and child labour. The DEWTA project assumes working shifts of 12 hours for two weeks followed by a two-week break. It is

			■ The safety organization is open to the entire workforce. ■ It is TEPDK's responsibility to resolve any issues raised which pertain to work on TEPDK-operated installations as per the TEPDK Stakeholder and Local Impact Management Procedure.	assumed that accommodation will consist of living quarters on the jack-up rig. Medical personnel will be provided both offshore and onshore. Denmark's legislation duly transposes EU Directives and grants strong safeguards for workers' accommodation and facilities. Denmark's robust legal system ensures that both working rights and living conditions are strongly protected, and laws are enforced. Thus, this issue is unlikely to be significant and **will not be assessed further**.
11.0	***Impacts on Community Health, Safety and Security due to:***			
11.1	Noise emissions from vessel and helicopters for maintenance/crew shifts during the different Project phases	■ Mobilization ■ Well temporary abandonment	■ All aspects of mobilization, operation, demobilization should be considered, e.g. distance of mobilization, low consumption, environmental and safety performance. ■ Implement TEPDK's General Emissions Monitoring Plan during all project activities. ■ Implement TEPDK's Logistics and Services Operation Management Systems to optimize supply and support operations/ logistics to minimize operation time. ■ Implement TEPDK Stakeholder and Local Impact Management ■ Adhere to EU directives in relation to public participation	Noise emissions from helicopters and vessel movements passing through and near coastal areas may also be a source of disturbance to coastal communities due to the airborne noise generated. Vessels will follow the existing entrance and exit routes and maritime regulations (speed limit) of the Esbjerg port; helicopter use will be managed within the existing helicopter flight timetable. In addition, TEPDK has enacted a flight management plan as an embedded measure to reduce the noise impacts. Thus, this issue is unlikely to be significant and **will not be assessed further.**
12.0	***Impacts on Social License to Operate due to:***			
12.1	Potential public opinion opposition to the project.	■ Mobilization ■ Well temporary abandonment	■ Adhere to EU directives in relation to public participation. ■ Follow TEPDK's Stakeholder and Local Impact Management.	Communities are likely to be aware of oil and gas operations conducted in the area. Moreover, the DEWTA project will be a mitigation of risks at existing wells at the Dan E platform. Thus, this issue is unlikely to be significant and **will not be assessed further.** TEPDK however recognizes that increased public awareness of the risks associated with global climate change has led to growing opposition to oil and gas projects at a national level. GHG emissions are assessed further in Section 5.3.2 and 5.4. Public opinion on climate change due to TEPDK operations may become significant and will be assessed in the updated TEPDK Stakeholder Engagement Plan.
13.0	***Impacts on Cultural Heritage due to:***			

13.1	■ Presence of the jack-up rig and anchors ■ Visual impacts on coastal designated sites	■ Mobilization ■ Well temporary abandonment	■ Review seabed survey data to identify and avoid potential cultural heritage sites or objects. ■ If further site surveys identify cultural heritage sites or objects in the area, these will be managed in line with Danish legislation to appropriately assess and handle the site or object. The Danish Agency for Culture will be informed.	The area potentially impacted by the DEWTA project activities is small and does not contain any known cultural heritage sites, as it is already located adjacent to the Dan E platform. The closest coastal designated site is 182 km from the project (Wadden Sea National Park). Due to the distance, no visual impacts are expected so this impact **will not be assessed further.**
14.0	***Impacts on Tourism due to:***			
14.1	■ Presence of safety zones restricting access to the project area ■ Visual impacts on onshore and near-shore tourist sites	■ Mobilization ■ Well temporary abandonment	■ Adhere to EU directives in relation to public participation. ■ Follow TEPDK's Stakeholder and Local Impact Management. ■ Issue Notice to Mariners for any new operations and the presence of temporary and permanent safety zones.	There are no known tourism activities that take place within the Project area, so the presence of safety zones will not be assessed further. Due to the distance to onshore and near-shore tourist areas, no visual impacts are expected so this impact **will not be assessed further.**
15.0	***Impacts on Navigation and Fishing due to:***			
15.1	■ Presence of restricted safety zones and vessel movements impacting on navigation ■ Loss of access for fishing in temporary and permanent safety zones. ■ Risks of disruption of fishing activities or damage to fishing gear from support vessels. ■ Indirect impacts due to changes to target species.	■ Mobilization ■ Well temporary abandonment	■ TEPDK shall continue to liaise with fishing organizations to inform them of the project activities and identify potentially affected fishers. ■ TEPDK is committed to constructive dialogue and pro-active engagement with all stakeholders, including non-governmental organizations (NGOs) and surrounding communities. ■ Issue Notice to Mariners for any new operations and the presence of temporary and permanent safety zones.	Well abandonment activities will be temporary and carried out from a jack-up rig positioned adjacent to the existing Dan E platform. The DEWTA project will not cause an increase of the existing safety zone and support vessels will follow the existing routes. The permanent safety zone of 500 m around Dan E will continue to be maintained as per current practice. This impact **will not be assessed further.**

5.3.2 Scoped-in Environmental/Social Impacts

Table 5.7 presents the environmental and social impacts scoped in and to be assessed further.

Table 5.7 Environmental and Social Impacts from Planned Activities to be Assessed Further

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
A	***ENVIRONMENTAL IMPACTS***			
Impacts on the Physical Environment				
1.0	***Impacts on Climate Change due to (Section 5.4.2.1):***			
1.1	GHG emissions 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 for personnel transportation	■ Mobilization ■ Well temporary abandonment	■ Enforce all vessels of ≥400 gross tonnage 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 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.	GHG emissions from the jack-up rig and the DEWTA project vessels during mobilization, well temporary abandonment and demobilization will not make a significant contribution to climate change as activities will be intermittent over approximately 99 days. Due to the sensitivity of climate change in Denmark and globally, all impacts on the contribution to climate change **will be assessed further in Section 5.4.2.1**
2.0	***Impacts on Seawater Quality due to (Section 5.4.2.2)***			
2.1	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	■ 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	Chemicals selected for flushing with inhibited seawater and for cementing will be ranked as green and PLONOR listed or yellow. Up to approximately 3,600 bbl of inhibited seawater and up to 49.7 mT in case of milling and 51.4 mT in case of PWC of used cement will be discharged during temporary abandonment activities.

Item No.	Sources of Impact	Phase	Control and Mitigation Measures	Assessment
			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.	Used milling WBM and swarf will be retained and returned to shore for processing and disposal, i.e. WBM and swarf will not be discharged under normal operations. However, a discharge into the environment of approximately 10% of WBM is considered as a conservative case scenario (210 mT). It is not anticipated that any chemicals classified as red will be used in the Dan E Well temporary abandonment Project. As mentioned in Section 3.5.7, discharges of inhibited seawater and used cement are expected to be similar to the amounts for the milling technique. All debris resulting from washing the annular space will be collected and send for onshore treatment. The impacts on seawater quality **will be assessed further in Section 5.4.2.2**
3.0	***Impacts on Seabed and Sediment Quality and from (Section 5.4.2.3):***			
3.1	Discharge of used cement, WBM and inhibited seawater during well temporary abandonment	■ Well temporary abandonment	■ Refer to item No. 2.1	No discharge from the DEWTA project activities is foreseen on the seabed. Chemicals selected for flushing with inhibited seawater and for cementing will be ranked as green and PLONOR listed or yellow. Up to approximately 3,600 bbl of inhibited seawater and up to 49.7 mT in case of milling and 51.4 mT in case of PWC of used cement will be discharged during temporary abandonment activities. The milled solids (swarf) are removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal, i.e. WBM and swarf will not be discharged under normal operations. However, a discharge into the environment of approximately 10% of WBM (210 mT), as a conservative case scenario, is included in the list of chemicals discharged. It is anticipated that any chemicals classified as red will not be used in the DEWTA project. Since there could be a potential impact on sediment quality, it **will be assessed further in Section 5.4.2.3**

5.4 Impact Assessment

5.4.1 Introduction

The impact assessment includes the following potential receptors:

- Physical environment:
  - Climate change (Section 5.4.2.1);
  - Seawater quality (Section 5.4.2.2); and
  - Seabed and sediment quality (Section 5.4.2.3).

The following analysis has been performed for each receptor:

- Estimation of the potential impact during mobilization (Phase 1) and well temporary abandonment (Phase 2) of the Project. In particular, the impact has been evaluated according to the method described in Section 5.2. The impact has been estimated considering the type of impact, the magnitude of the potential impact and the sensitivity of the receptor and the confidence level of the assessment. The evaluation of the magnitude and the receptor sensitive provide an overall estimation of the impact;
- Identification of the control measure available to reduce and minimize the estimated impact;
- Evaluation of the residual impact and identification of further mitigation measures to reduce the impact;
- Evaluation of cumulative impacts from the project interacting with those from another activity to create an additional impact and effect.

The evaluation of transboundary effects is based on the outcomes of the present ESIA and are assessed in detail in Section 6.

5.4.2 Impact on the Physical Environment

5.4.2.1 Impact on Climate Change

Sources of Impact

Greenhouse Gas (GHG) emissions that will be released into the atmosphere from the DEWTA project activities include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which have the potential to contribute to climate change.

Project activities that contribute to climate change include the following:

- Phase 1 – Mobilization:
  - GHG emissions due to mobilization and demobilization of support vessels and the jack-up rig (Table 5.7, item 1.1),
- Phase 2 – Well temporary abandonment:
  - GHG emissions due to power generation on the jack-up rig, and operation of support and supply vessels, and helicopters for personnel transportation (Table 5.7, item 1.1).

Assessment Approach and Criteria

The significance of impacts due to GHG emissions from the rig mobilization, vessel activity and well temporary abandonment has been assessed using the approach and method described in Section 5.2. The criteria used to define the magnitude and sensitivity for climate change are presented in Table 5.8 and Table 5.9.

Table 5.8 Magnitude Criteria for Contribution to Climate Change

Magnitude	Definition
Negligible	■ Immeasurable, undetectable or within the range of normal natural variation.
Small	■ Slight contribution to GHG emissions given the temporary nature of the activities or the use of technologies with low rates of emission.
Medium	■ Contribution to GHG emissions with potential effect at a local/medium scale.
Large	■ Significant contribution to GHG emissions with potential effects at a large scale.

Table 5.9 Receptor/ Resource Sensitivity Criteria for Climate Change

Sensitivity	Definition
Low	■ The country where the project is located, is unaware of the consequences of climate change. No GHG reduction commitments have been taken so far.
Medium	■ The country where the project is located, has developed a climate policy and efforts to reach initial GHG reduction targets are ongoing.
High	■ The country where the project is located has developed a strict climate policy and ambitious GHG reduction targets have been set.

Evaluation of Impact – Phases 1 (mobilization) and 2 (well temporary abandonment)

GHG Emissions due to Project activities

GHG emissions will be intermittent over 99 days, from the following activities:

- the jack-up rig mobilization and demobilization with support vessels,
- power generation on the jack-up rig,
- operation of support and supply vessels (excluding mobilisation as covered with the jack-up rig) and
- helicopter support.

In 2022, TEPDK undertook a GHG emission calculation for similar activities and timeframes as those of the DEWTA project. An overall GHG emission value of 6 kt CO_2eq was estimated considering the emissions from routine activities as part of drilling operations during 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, 2023i). TEPDK carried out 118 days[30] of work overs[31] at the DAN E field. Danish CO_2 total emissions in 2021 accounted for 40.48 Mt CO_2eq. (EDGAR, 2023a). It is therefore estimated that the emissions from the DEWTA project activities will represents approximately 0.015% of annual emissions for Denmark in 2021. Although all emissions will directly contribute to climate change, considering the low percentage contribution to the total Danish emissions, the impact magnitude is assessed as **Negligible**.

The sensitivity of receptors has been assessed as **High** given that the Danish Government has recently defined ambitious greenhouse gas reduction targets and there is a global pressure for the need to reduce greenhouse gases entering the atmosphere. Thus, considering the embedded control measures listed below, the significance of potential impacts on climate change is assessed as **Negligible**.

[30] wells_february_2022_january_2023.xlsx (live.com)

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

Control Measures

Control measures in-place to reduce potential impacts on climate change during project activities include:

- All vessels of ≥400 gross tonnage involved in the project shall possess valid International Air Pollution Prevention (IAPP) certificate (MARPOL Annex VI/6);
- All aspects of mobilization, operation, demobilization should be considered, 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 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.

Mitigation Measures

There are no further mitigation measures recommended to reduce impacts on climate change.

Significance of Residual Impact

Impacts on climate change due to GHG emissions during project activities will be unavoidable. However, the correct implementation of the control measures will potentially reduce the expected emissions as much as possible. Therefore, residual impact remains as of **Negligible Significance** (Table 5.10).

Table 5.10 Significance of Impact of DEWTA Project Phases 1 and 2 on Climate Change

Category	Impact before Mitigation	Residual Impact
Type of Impact	Direct	Direct
Magnitude of Impact	Negligible	Negligible
Sensitivity of Receptor	High	High
Significance	**Negligible**	**Negligible**
Confidence Level	High	High

Therefore, the cumulative risk is assessed as **Negligible**.

5.4.2.2 Impact on Seawater Quality

Sources of Impact

Project activities that may have a significant impact on seawater quality include the following:

- Phase 2 – Well temporary abandonment (Table 5.7, item 2.1)

Assessment Approach and Criteria

The significance of impacts has been assessed using the approach and method described in Section 5.2. The criteria used to define the magnitude and sensitivity for seabed disturbance are presented in Table 5.11 and Table 5.12.

Table 5.11 Magnitude Criteria for Seawater Quality

Magnitude	Definition
Negligible	■ Immeasurable, undetectable or within the range of normal natural variation.
Small	■ Slight change in water quality expected over a limited volume with water quality returning to background levels within a few meters and / or ■ Discharges are well within benchmark effluent discharge limits.
Medium	■ Temporary or localized change in water quality with water quality returning to background levels thereafter and / or ■ Occasional exceedance of benchmark effluent discharge limits.
Large	■ Change in water quality over a large volume that lasts over several months with quality likely to cause secondary impacts on marine ecology; and/or ■ Routine exceedance of benchmark effluent discharge limits.

Table 5.12 Sensitivity Criteria for Seawater Quality

Sensitivity	Definition
Low	■ Existing water quality is good and the ecological resources that it supports are not sensitive to a change in water quality.
Medium	■ Existing water quality already shows some signs of stress and/ or supports ecological resources that could be sensitive to a change in water quality.
High	■ Existing water quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological or health impacts are likely).

Evaluation of Impact – Phase 2 Well temporary abandonment

Discharge of used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02)

Discharges during well temporary abandonment can impact water quality due to high suspended solid loads, reduced light transmittance, increased oxygen demand and contamination due to chemical constituents of the discharged material.

Amounts and types of chemical use and their discharge to sea are only permitted after authorization from the Danish Environment Protection Agency (DEPA). Ten percent of WBM during casing milling, less than 20% of used cement during cementing activities and up to 100% of inhibited seawater during well flushing may be discharged.

The specific name, amount and colour classification of chemicals (Table 3.5) is identified in the permit application for their use and discharge, which also includes a review of the impact assessment for the amount sought. The fluids will contain green or yellow chemicals that are covered under TEPDK's annual discharge permit, e.g. 2023 discharge permit (DEPA, 2022). Chemical classification and the implementation of OSPAR are reported in Section 2.2.3.4.

Inhibited Seawater Use and Discharge

Chemical discharge may occur when the wells (DE-01 and DE-02) are flushed with inhibited seawater (see Section 3.3.5.2). Up to approximately 3,600 bbl of inhibited seawater containing various yellow and green chemicals including corrosion inhibitors will be discharged during the well temporary abandonment activities; therefore, all fluid chemicals used for the well temporary abandonment activities need to be covered under TEPDK's 2023 discharge permit (DEPA, 2022).

The total of amount of chemicals contained in the inhibited seawater is 3 mT and is 1% of the total amount of chemicals discharged for the DEWTA project.

Any water returns in the closed system will be sampled using a centrifugal tester and any hydrocarbon contamination concentration above 30 mg/l will be contained and send back on shore for disposal. Any water with a hydrocarbon contamination concentration below 30 mg/l will be discharged.

Cement Use and Discharge

Chemical discharge may occur when cementing jobs are complete. However, there is no planned discharges of cement. All cement mixed is planned to be pumped and used, and the design of the well is planned to accommodate this (i.e. no “overflow” of cement).

Approximately 130 mT of cement 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. Slight variations in down-hole or casing diameters can however have implications for the calculated volumes due to well length dimension. The specific cement volume is then mixed from raw ingredients on the jack-up 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. Based on TEPDK’s experience, less than 20% of used cement (i.e. 49.7 mT in case of milling and 51.4 mT in case of PWC) may be discharged to the environment at the sea surface due to any excess cement remaining in the pit, or due to line cleaning so equipment does not become blocked. Unmixed raw ingredients, not used during the well activities, are retained on the jack-up rig and are returned to shore. Cement slurry used for the cement plugs comprise a Class G cement with additives (e.g., retarder and fluid loss reducer to make the cement gas tight) and Microbond HT to enhance the properties for plugging.

TEPDK commissioned a recent modelling exercise in collaboration with the NORCE Norwegian Research Centre for another TEPDK project 33 km north-west of Dan E to better understand the potential impacts of cement discharge. NORCE (2022) presented the outcomes of cement discharge modelling for approximately 15 mT of inhibited water, containing chemicals, barite and Class G cement. Environmental Impact Factor (EIF) calculations were performed using DREAM (Dose related Risk and Effect Assessment Model) to simulate a discharge of chemicals and particulates. The model calculates the fate of different concentrations of the components of a discharge and calculates the environmental risk using the Predicted Environmental Concentration (PEC) as modelled in DREAM and comparing it to the Predicted No Effect Concentration (PNEC). Theoretically, the calculated EIF (PEC/PNEC) reflects the volume of seawater/area of sediment in which PEC exceeds PNEC, and therefore the volume where harmful effects could occur due to the discharge to sea. The EIF is a measure of the potential environmental risk intended as the potential damage on marine organisms from a discharge to sea.

Based on the results of the model, it can be assumed that the used cement discharge for wells DE-01 and DE-02 has the highest risk in the water column 16-20 hours after the discharge. From the PEC calculation, the risk in the water column shows a temporary impact of up to 5-6 km in the direction of the main current (NW to NE as commonly observed in the TEPDK licence areas). Based on the DREAM model, the risk remains in the water column from the suspended particulates and the chemicals 24-36 hours after the discharge.

WBM Discharge

Approximately 2,100 mT of WBM will be used as milling fluid during milling operations for the two wells. WBM will circulate in the well bore and will return onboard the jack-up rig where the mud solid control equipment (typically shale shakers, centrifuges, or cyclone separators) will remove the milled solids (swarf) from the WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal, i.e. WBM and swarf will not be discharged under normal operations. However, a discharge into the environment of approximately 10% of the WBM (210 mT), as a conservative case scenario, is included in the list of chemicals discharged.

The WBMs are a specially formulated mixture of natural clays, polymers, weighting agents and/or other materials suspended in a fluid medium. The constituents and additives of the discharged muds may potentially have ecotoxicological effects on the water column and sediments. Typically, the major ingredients that comprise over 90% of the total mass of the WBMs are fresh or seawater, barium sulphate (barite), bentonite clay, liquid viscosifiers and caustic soda. Other substances are added to gain

the desired density and properties. When WBM is discharged to the sea, the larger particles and flocculated solids, representing approximately 90% of the mass of the mud solids, form a plume that settles quickly on the seabed. The remaining 10% of the mass of the mud solids consisting of fine-grained unflocculated clay-sized particles and a portion of the soluble components of the mud form another plume in the upper water column that drifts with prevailing currents away from the platform and is diluted rapidly in the receiving waters. In well-mixed ocean waters, muds are diluted 100-fold within 10 m of the discharge and by 1,000-fold within 100 m of the platform and after a transport time of approximately 10 minutes. Because of the rapid dilution of the drilling mud and cuttings plume in the water column, harm to communities of water column plants and animals is unlikely and has never been demonstrated (Neff, 2005).

Impact on Seawater Quality

The project activities will be approximately 99 days with discharges occurring intermittently over short periods (short-term). The impacts on seawater quality will be localized and limited to the areas adjacent to the discharge point. The impact magnitude is therefore assessed as **Small**.

Following the cessation of the temporary abandonment activities, suspended solids in the seawater column are expected to rapidly return to background levels. The natural dispersion capacity of water, assisted by currents and the mixing capacity of the water body, is expected to minimise potentially adverse impacts.

Seawater quality in the DEWTA project area is good and within the range reported for the North Sea (Sündermann & Pohlmann, 2011). The seawater is also well mixed, both horizontally, caused by tidal mixing, and vertically due to seasonal changes in winter (Sündermann & Pohlmann, 2011). As the existing water quality is good and the ecological resources that it supports are insensitive to a temporary change in water quality, the sensitivity was assessed as **Low**.

Therefore, considering the embedded control measures listed below, the potential impact on water quality is evaluated to be of **Negligible Significance**.

Control Measures

Control measures in-place to reduce potential impacts on seawater quality include:

- Implement TEPDK's Chemical Management Plan. Chemical products shall be carefully selected as specified in Section 3.6.1.3 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.

Mitigation Measures

There are no further mitigation measures recommended to reduce potential impacts on seawater quality.

Significance of Residual Impact

Residual impacts on seawater quality will be unavoidable due to the nature of the temporary abandonment activities but will be localized to the area surrounding the wells. Therefore, in combination with the short-term duration of the activity, residual impact remains as of **Negligible Significance** (Table 5.13).

Table 5.13 Significance of Impact of Discharges on Seawater Quality

Category	Impact before Mitigation	Residual Impact
Type of Impact	Direct	Direct
Magnitude of Impact	Small	Small
Sensitivity of Receptor	Low	Low
Significance	**Negligible**	**Negligible**
Confidence Level	High	High

5.4.2.3 Impact on Seabed and Sediment Quality

Sources of Impact

The DEWTA project activities that may have a significant impact on seabed and sediment quality include the following:

- Phase 2 – Well temporary abandonment (Table 5.7, item 3.1)

Assessment Approach and Criteria

The significance of impacts has been assessed using the approach and method described in Section 5.2. The criteria used to define the magnitude and sensitivity for seabed disturbance are presented in Table 5.14 and Table 5.15.

Table 5.14 Magnitude Criteria for Seabed and Sediment Quality

Magnitude	Definition
Negligible	■ Immeasurable, undetectable or within the range of normal natural variation.
Small	■ Minimal disturbance to the seabed and to sediment quality
Medium	■ Localized and/ or short-term disturbance to the seabed and to sediment quality.
Large	■ Widespread and/ or long-term disturbance or permanent change to the seabed and to sediment quality.

Table 5.15 Sensitivity Criteria for Seabed and Sediment Quality

Sensitivity	Definition
Low	■ Existing seabed sediment quality is good and the ecological resources that it supports are insensitive to disturbance.
Medium	■ Existing seabed sediment quality shows some signs of stress and/ or supports ecological resources that could be sensitive to change in quality or physical disturbance (secondary ecological impacts are possible).
High	■ Seabed sediment quality is already under stress and/ or the ecological resources it supports are very sensitive to change (secondary ecological impacts are likely).

Evaluation of Impact – Phase 2 Well temporary abandonment

Discharge of used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02)

As presented earlier in Section 5.4.2.2, discharges during well temporary abandonment can impact water quality due to high suspended solid loads, reduced light transmittance, increased oxygen demand and contamination due to chemical constituents of the discharged material.

Amounts and types of chemical use and their discharge to sea are only permitted after authorization from DEPA. Ten percent of the WBM during casing milling, less than 20% of used cement during cementing activities and up to 100% of inhibited seawater after well flushing may be discharged.

The specific name, amount and colour classification of chemicals (Table 3.5) is informed in the permit application for their use and discharge, which also includes a review of the impact assessment for the amount sought. The fluids will contain green or yellow chemicals that are covered under TEPDK's annual discharge permit, e.g. 2023 discharge permit (DEPA, 2022). Chemical classification and the implementation of OSPAR are reported in Section 2.2.3.4.

Inhibited Seawater Use and Discharge

Chemical discharge may occur when the wells (DE-01 and DE-02) are flushed with inhibited seawater (see Section 3.3.5.2). Up to approximately 3,600 bbl of inhibited seawater containing various yellow and green chemicals including corrosion inhibitors will be discharged during the well temporary abandonment activities; therefore, all fluid chemicals used for the well temporary abandonment activities need to be covered under TEPDK's 2023 discharge permit (DEPA, 2022).

The total of amount of chemicals contained in the inhibited seawater is 3 mT and is 1% of the total amount of chemicals discharged for the DEWTA project.

Any water returns in the closed system will be sampled using a centrifugal tester and any hydrocarbon contamination concentration above 30 mg/l will be contained and send back on shore for disposal. Any water with a hydrocarbon contamination concentration below 30 mg/l will be discharged.

Inhibited seawater mainly contains seawater with added chemicals such as oxygen and H_2S scavengers, and corrosion inhibitors. No settling of suspended particles from discharged inhibited seawater on the seabed is expected.

Cement Use and Discharge

Chemical discharge may occur when cementing jobs are complete. However, there is no planned discharges of cement. All cement mixed is planned to be pumped and used, and the design of the well is planned to accommodate this (i.e. no "overflow" of cement).

Approximately 130 mT of cement 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. Slight variations in down-hole or casing diameters can however have implications for the calculated volumes due to well length dimension. The specific cement volume is then mixed from raw ingredients on the jack-up 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. Based on TEPDK's experience, less than 20% of used cement (i.e. 49.7 mT in case of milling and 51.4 mT in case of PWC) may be discharged to the environment at the sea surface due to any excess cement remaining in the pit, or due to line cleaning so equipment does not become blocked. Unmixed raw ingredients, not used during the well activities, are retained on the jack-up rig and are returned to shore. Cement slurry used for the cement plugs comprise a Class G cement with additives (e.g., retarder and fluid loss reducer to make the cement gas tight) and Microbond HT to enhance the properties for plugging.

TEPDK commissioned a recent modelling exercise in collaboration with the NORCE Norwegian Research Centre for another TEPDK project 33 km north-west of Dan E to better understand the potential impacts of cement discharge. NORCE (2022) presented the outcomes of cement discharge modelling for approximately 15 mT of inhibited water, containing chemicals, barite and Class G cement. Environmental Impact Factor (EIF) calculations were performed using DREAM (Dose related Risk and Effect Assessment Model) to simulate a discharge of chemicals and particulates. The model calculates the fate of different concentrations of the components of a discharge and calculates the environmental risk using the Predicted Environmental Concentration (PEC) as modelled in DREAM and comparing it to the Predicted No Effect Concentration (PNEC). Theoretically, the calculated EIF (PEC/PNEC) reflects the volume of seawater/area of sediment in which PEC exceeds PNEC, and therefore the volume where harmful effects could occur due to the discharge to sea. The EIF is a measure of the potential

environmental risk intended as the potential damage on marine organisms from a discharge to sea. Based on the results of the model, it can be assumed that the used cement discharge for wells DE-01 and DE-02 planned for the DEWTA project has no risk to the sediment (EIF = 0). Results from the simulation showed an area of influence of approximately 2-3 km just north of the discharge point with a change in grain size, sediment thickness and oxygen concentration in the sediment. The model shows sediment deposition is below 0.1 kg/m^2 up to 2.5 km from the discharge point and decreases to very low values (<0.01 kg/m^2) beyond 2.5 km from the discharge point.

WBM Discharge

As presented earlier in Section 5.4.2.2, the milled solids (swarf) are removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal, i.e. WBM and swarf will not be discharged under normal operations. However, a discharge into the environment of approximately 10% of the WBM (210 mT), as a conservative case scenario, is included in the list of chemicals discharged. When WBM is discharged to the sea, the larger particles and flocculated solids, representing approximately 90% of the mass of the mud solids, form a plume that settles quickly on the seabed. The remaining 10% of the mass of the mud solids consisting of fine-grained unflocculated clay-sized particles and a portion of the soluble components of the mud form another plume in the upper water column that drifts with prevailing currents away from the platform and is diluted rapidly in the receiving waters.

Impact on Sediment Quality

Discharges may influence the benthic habitat and physical seabed properties. With WBM and used cement discharged at the sea surface, deposited materials will disperse as a particle plume that is expected to settle in the local environment. The specific extent always depends on operational parameters (e.g., discharge density, produced volumes, particle size) of the WBM discharged. Deposition thickness is much lower when discharges happen on the sea surface compared to discharges on the seabed. Inhibited seawater mainly contains seawater with some added inhibitors (see Table “Chemicals use and discharge”) and no solid materials are expected. Therefore, settling of suspended particles from discharged inhibited seawater on the seabed is unlikely.

Apart from modifications to the benthic substrate composition, WBM and used cement discharges may smother benthic organisms near the discharge location. Smothering impacts will be intermittent over the short-term duration of project activities and recovery to near normal conditions is expected to occur once the activities for well temporary abandonment stop. Benthic fauna are also tolerant of smothering, as the seabed currents are constantly moving seabed sediments.

Considering the expected significantly small extent of impacts due to the well temporary abandonment activities at Dan E, the magnitude of impact is considered **Small**.

As discussed in Section 4.2.6, the predominant sediment type at the DAN Field is sand and fine muds. Considering the offshore location, the absence of significant seabed sediment quality alterations and the distance from sensitive ecological features, the sensitivity is classified as **Low**.

Therefore, considering the embedded control measures listed below, the impact to the seabed is evaluated to be of **Negligible Significance** (Table 5.16).

Control Measures

Control measures in-place to reduce potential impacts on the seabed and on sediment quality include:

- 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 in production and injection water;
- 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.

Mitigation Measures

There are no further mitigation measures recommended to reduce potential impacts on the seabed and sediment quality.

Significance of Residual Impacts

The significance of the residual impact on the seabed is reduced as much as possible by the project control measures and therefore, in combination with the short-term duration of the activity, the significance of the residual impact on sediment quality and the seabed remains as **Negligible** (Table 5.16).

Table 5.16 Significance of Impact of Discharges on Sediment Quality and the Seabed

Category	Impact before Mitigation	Residual Impact
Type of Impact	Direct	Direct
Magnitude of Impact	Small	Small
Sensitivity of Receptor	Low	Low
Significance	**Negligible**	**Negligible**
Confidence Level	High	High

5.5 Cumulative Impacts

Cumulative impacts are the additional impacts that may be generated due to a combination of developments or activities near the DEWTA project area, that when added to the impacts of the proposed DEWTA project, cause a greater impact. Such impacts may arise due to spatial overlap (e.g. overlap in the spatial extent of air or water quality changes) or temporal overlap (e.g. noise impacts caused by construction activities at the same time from various sources).

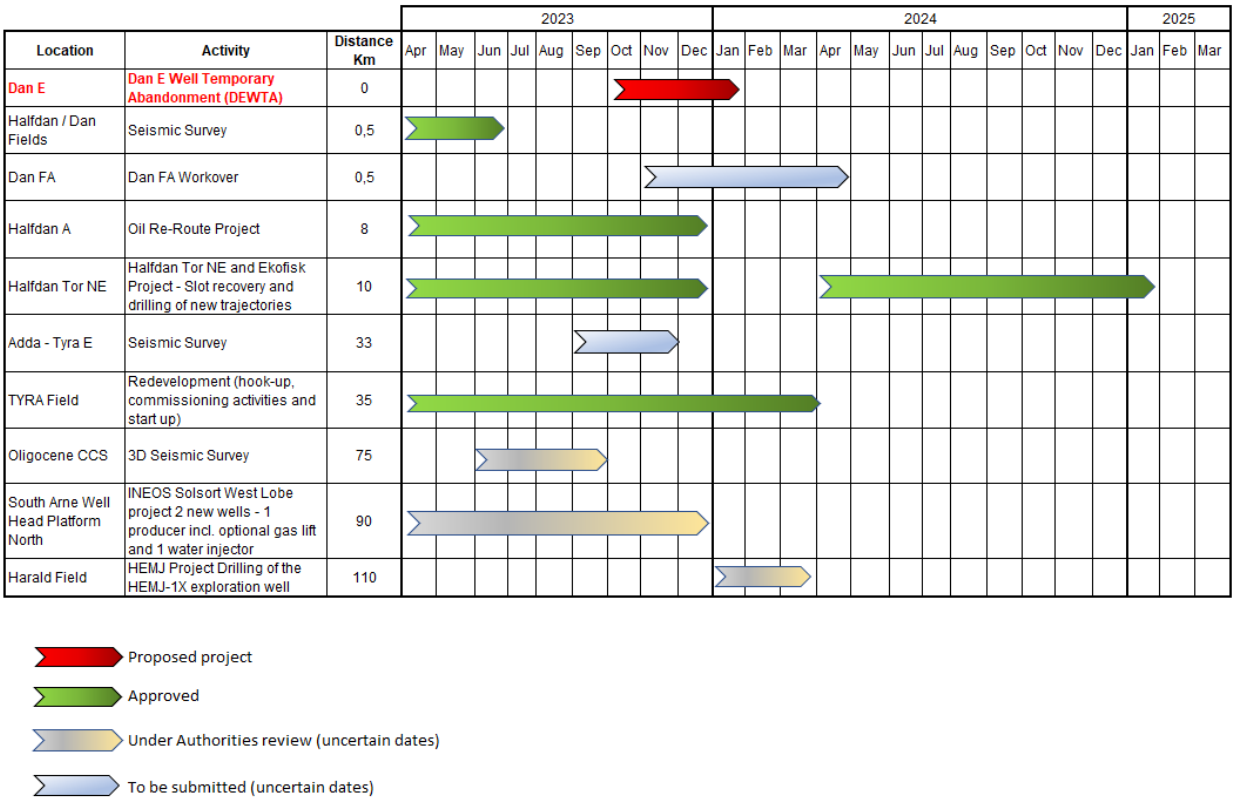
How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g., already in existence, approved or proposed) and how much data is available to characterise the magnitude of their impacts.

The approach for assessing cumulative impacts and effects due to the DEWTA project and another activity affecting the same resource/receptor is based on a consideration of the approval/existence status of the ‘other’ activity and the nature of information available to aid in predicting the magnitude of impact from the other activity.

Table 5.17 shows concurrent activities in the Danish EEZ with the DEWTA project.

Table 5.17 Schedule of Relevant Activities in the Danish EEZ

Location	Activity	Distance Km
Dan E	Dan E Well Temporary Abandonment (DEWTA)	0
Halfdan / Dan Fields	Seismic Survey	0,5
Dan FA	Dan FA Workover	0,5
Halfdan A	Oil Re-Route Project	8
Halfdan Tor NE	Halfdan Tor NE and Ekofisk Project - Slot recovery and drilling of new trajectories	10
Adda - Tyra E	Seismic Survey	33
TYRA Field	Redevelopment (hook-up, commissioning activities and start up)	35
Oligocene CCS	3D Seismic Survey	75
South Arne Well Head Platform North	INEOS Solsort West Lobe project 2 new wells - 1 producer incl. optional gas lift and 1 water injector	90
Harald Field	HEMJ Project Drilling of the HEMJ-1X exploration well	110



Source: TEPDK, 2023. Modified by ERM, 2023.

Cumulative impacts may occur if DEWTA project activities take place at the same time as other activities in the DAN Field, leading to increased vessel movements. There are no seismic or drilling activities associated with the DEWTA project.

The TYRA Field redevelopment currently involves hook-up and commissioning activities that include installation of a J-tube on an existing underwater structure, burial of integrated cables in the seabed, installation of mechanical protection (rock placement) and installation of an underwater pipe section. The outstanding work will include vessel movements but excludes additional discharges, drilling or pile driving. Underwater noise from vessels is low intensity, broadband noise that is confined to the areas around the vessels. No cumulative spatial overlap between TYRA Field activities and the DEWTA project activities is expected (distance >30 km). Same can be concluded for the Adda Tyra E seismic survey.

As part of normal working practice, the Halfdan Tor NE and Ekofisk project (slot recovery and drilling of new trajectories) and Dan FA Workover will involve a jack-up rig and supporting vessels. There is no overlap between the Dan FA Workover or the Halfdan Tor NE and Ekofisk project with DEWTA, as the jack-up rig will be mobilized from one TEPDK project to the other. The overlap showing in the schedule (Table 5.17) is due to the uncertainty as to when one project involving the jack-up rig finishes and the next one starts.

Additional noise generated by the DEWTA project may overlap with existing noise emissions from the existing DAN Field activities. The generation of underwater noise from the DEWTA project will be limited to the additional 99 days of a range of noise sources from support vessel movements, rig mobilisation/demobilisation and drilling. 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. Additional emissions from the project activities will increase the total emissions from the DAN Field. GHG emissions for the DEWTA project are estimated to be approximately 6 kt CO2eq. However, these additional emissions are temporary and limited. Further the emissions from the DEWTA project activities will represent approximately 0.015% of

annual emissions for Denmark in 2021. Therefore, the cumulative risk related to GHG emissions is assessed as Negligible.

Considering the small quantities discharged and distances to other platforms, no cumulative impacts on seawater quality and seabed and sediment quality are expected. The Dan E platform was shut down in 2018, no discharges are currently occurring from this platform.

Overall, no significant cumulative impacts are 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).

With reference to other offshore projects, TEPDK has no knowledge of other offshore wind farm projects development in the area that are likely to have cumulative impact with the proposed activities.

5.6 Impacts from Unplanned/Accidental Events

As stated in Section 5.2.3.2, the likelihood or frequency, and consequence severity for unplanned/accidental events are addressed in combination to evaluate whether an impact due to an unplanned/accidental event is significant and, if so, its degree of significance. In consideration of the evaluation criteria, a risk evaluation for spills was conducted for impacts on environmental and social receptors in accordance with TEPDK's Risk Matrix.

5.6.1 Sources of Impact

Accidental events that could potentially occur during the DEWTA project activities include the following:

- Hydrocarbon/Chemicals Spills (minor/Tier 1): e.g., hose failure during bunkering;
- Hydrocarbon Spills (Tier 2): e.g. spill from vessel collision with the jack-up rig or platforms and vessel to vessel / helicopter to platform;
- Hydrocarbon Spills (major/Tier 3): well blowout;
- Loss of containment due to dropped objects.

Unplanned/accidental events during the DEWTA project activities may impact environmental and human receptors, depending on the severity of the impact, which is dependent on various factors including:

- The nature of the event (i.e. type of hazard – hazardous material release, physical impact, etc.);
- The magnitude of the event (e.g. volume of oil/ chemical spilled); and
- The sensitivity of the environment at the accident location/ impact site.

5.6.2 Assessment Approach and Criteria

The approach adopted in the assessment of potential impacts from unplanned/accidental events considers the likelihood of such an event occurring. Should it occur, its potential consequence on the physical, biological, and social environment is subsequently considered. The criteria to assess impacts from unplanned/accidental events are presented in Section 5.2.3.2. The significance was evaluated based on a "worst-case" scenario for this ESIA report.

5.6.3 Evaluation of Impacts

5.6.3.1 Hydrocarbon/Chemicals Spills (minor/Tier 1)

Minor (Tier 1) spills may occur during all DEWTA project activities during transfer, storage and use of the materials, such as:

- Fuel (e.g., hose failure during bunkering);
- Lube oil/ hydraulic oil (from cranes and other equipment);

- Chemicals (e.g., cementing and mud chemicals).

In general, oil spilled into the marine environment undergoes physico-chemical changes. The nature of the change depends on the type and volume of oil spilled and the prevailing weather and sea conditions. Typically, evaporation and dispersion act to remove oil from the sea surface (ITOPF, 2011).

Spilled oil containing light hydrocarbon fractions (e.g., diesel or condensate) tend to evaporate quickly compared to heavier (crude) spills. The evaporation process is enhanced by warm air temperatures and moderate winds producing considerable changes in density, viscosity and volume of the spill (ITOPF, 2011).

Lube/ hydraulic oils, upon release into the sea, spread rapidly to form a thin surface film. These oils evaporate more slowly than diesel even in warm ambient sea conditions. These materials are also persistent and can remain on the sea surface for long periods of time. Hydraulic oil typically causes toxic effects on marine life when freshly spilled. Upon release into the sea, oil will spread rapidly to form a thin surface sheen and will undergo rapid evaporation in warm sea conditions. The remaining substances typically consist of highly refined synthetic hydrocarbon with low toxicity to marine life and negligible aromatics content (ITOPF, 2011). Inventory of these materials is expected to be low throughout the DEWTA project.

Impacts of chemical spills may be through direct contamination to the marine environment, or indirectly from a by-product of a chemical reaction. Impacts may affect the marine environment or affect the local economy (i.e. loss of fisheries resources). Should any spills occur at sea, the action of tidal current, oceanic currents and turbulent diffusion cause dilution of the chemical concentrations within a relatively short period (ITOPF, 2012). Chemicals will be stored in small quantities during the DEWTA project.

Standard in-place controls and procedures will be applied to prevent and manage any spills (e.g., quick disconnect couplings for transfer hoses, routine maintenance and inspection of storage facilities, containment/ recovery systems, an oil/chemical spill contingency and response plan).

However, particular concern would be the impacts from such an incident reaching the shoreline and marine protected areas, which have more sensitive areas (e.g. Important Bird and Biodiversity Areas, Special Protection Areas, Natura 2000 conservation sites, fisheries and tourism, refer to Chapter 4) that would be vulnerable to oil/chemical slicks. The closest sensitive area to the DEWTA project area is the Natura 2000/OSPAR MPA Doggerbank, 26.9 km to the west within the German EEZ. Other sensitive areas are located more than 50 km away.

Even with the application of the latest industry standards and consideration of the highest standards of safety, accidental events may still occur due to human error, equipment failure and other procedural aspects. Spills can be caused by many factors and occurrences have been reported worldwide (BOEM, 2016; ITOPF, 2023). A Tier 1 spill is an operational-type spill that may occur at or near a company's own facilities due to its own activities (IPIECA, 2015). Tier 1 spills are generally small and can impact a local area but may be dealt with by the individual operator (IPIECA, 2015). Therefore, the overall spill risk value for the environment has been evaluated as '**Medium Risk**' (Table 5.18).

Table 5.18 Significance of Impacts due to Tier 1 Spills

Category	Impact before Mitigation
Consequence severity	Minor pollution with a very limited environmental impact; i.e. Moderate (2)
Likelihood or Frequency	Could occur several times during plant lifetime; i.e. Likely (5)
Risk Value	**Medium Risk (Risk Level 2)**

5.6.3.2 Hydrocarbon Spills (Tier 2) from Vessel Collisions / Vessel to Vessel and Helicopter to Platform

Local and international shipping will not transit the DEWTA project area as the project is located inside the Dan E 500 m exclusion zone. The additional movement and presence of vessels during the DEWTA

project activities may create a collision hazard with other shipping and fishing vessels during all DEWTA project phases. The establishment of a 500-m operational exclusion zone around the rig during the DEWTA Project activities reduces considerably the risk of collisions at sea. This is an essential safety measure to protect human life and is enforced throughout the world; therefore, fishing and other non-TEPDK vessels will not be able to enter the safety zones at any time. In addition, according to the Offshore Safety Act, consolidated Act no.125, responsibility for complying with the provision of not entering to a safety zone remains with the navigating vessels. Marine users will be notified daily by the Notices to Mariners of the operations carried out by the DEWTA project activities.

Even with the application of the latest industry standards and consideration of the highest standards of safety, vessel and helicopter collision may still occur but with all the measures in place (i.e., Notice to Mariners for any new operations and presence of safety zones and TEPDK Logistics performance measures), the likelihood of a vessel/helicopter collision and subsequent spill occurring is evaluated as 'Extremely Unlikely'. The consequences of a spill are expected to be 'Serious' (worst case for a diesel spill), though the consequence will be dependent on the type of vessel/helicopter, hydrocarbons, its cargo, and the severity of the collision event.

Therefore, the impact from vessel/helicopter collision has been evaluated as '**Low Risk**' (Table 5.19)**.**

Table 5.19 Significance of Impact due to Vessel/Helicopter Collision (Tier 2 Spill)

Category	Impact before Mitigation
Consequence severity	Moderate pollution with limited environmental consequences; i.e. Serious (3)
Likelihood or Frequency	Has already occurred in the industry but corrective action has been taken; i.e. Extremely Unlikely (2)
Risk Value	**Low Risk (Risk Level 3)**

5.6.3.3 Hydrocarbon Spills (Major/Tier 3): Well Blowout

A well blowout is an uncontrolled release of formation fluids from a well, which may occur during well temporary abandonment activities. In a worst case, a well blowout could take many days or months to bring under control.

The impact of a well blowout on the marine environment is largely dependent on the quantity and physical state of the hydrocarbons released, which will occur as a jet release of two-phase material (gas and liquids). Gaseous components will be released to the atmosphere while liquid components will form a slick on the sea surface.

In 2022, TEPDK contracted Oil Spill Response Ltd (OSRL) to conduct a dedicated oil spill modelling for a representative well blowout event considering low production volumes and a 98% water cut, during well temporary abandonment activities at a Dagmar well, approximately 33 km to the northwest of Dan E. The modelling was used to assess if the impacts would potentially have a major significance on protected and recognised areas, including the closest sensitive area Natura 2000 and OSPAR MPA Doggerbank within the German EEZ, approximately 5 km southwest of the Dagmar platform (and 26.9 km west of the DEWTA project area). The 2022 OSRL Dagmar oil spill modelling results have been used to assess the potential impacts from a blowout at Dan E given the similarities between the two projects (Dagmar and the DEWTA) that are:

- well temporary abandonment activities;
- depleted wells characterised by presence of light/medium hydrocarbons (39.8 API at Dagmar and 29.4 API at Dan E);
- high water cut (more than 90% water cut).

Key results from the Dagmar modelling are therefore summarized in Table 5.21. The model was based on a release duration of 90 days (i.e. the time estimated to drill a relief well) and a release rate of 450 barrels per day.

One release scenario was simulated to evaluate the movement and fate of oil from July to September. OSRL (2022) defined thresholds based on industry best practice (OSPAR, Norwegian Oil Industry Association, TEPDK guidelines). Thresholds define the point below which data are no longer informative. For example, when surface emulsion thickness is less than 0.04 µm, the oil is no longer visible to the naked eye so may be considered insignificant to a response. Table 5.20 outlines the thresholds used in this study.

Table 5.20 Thresholds used by OSRL in the Spill Modelling

Threshold	Value	Description
Surface	0.04 µm	The Bonn Agreement Oil Appearance Code defines five oil layer thicknesses based on their optic effects and true colours. 0.04 µm is the minimum thickness that can be seen with the naked eye.
Water Column	5 ppb	Provided by TEPDK
	25 ppb	This threshold is used to identify when the most sensitive marine life begins to be affected. It is based on guidelines from the Norwegian Oil Industry Association concerning the effects of acute oil pollution on fish eggs and larvae (OLF, 2007).
	70.5 ppb	Entrained hydrocarbon (oil droplets in the water column) exposure level, OSPAR (2014) predicted no effect concentration (PNEC).
Shoreline	0.1 l/m^2	Lower threshold for light oiling from the ITOPF document “Recognition of oil on shorelines” (2011).

Source: OSRL, 2022.

Table 5.21 Well Blowout Oil Spill Modelling Summary for the Nearby Dagmar Well Temporary Abandonment (Surface and Shoreline Results)

Country	Probability and Minimum Arrival Time of Surface Spill to reach EEZ and Thickness of Spill Layers	Probability and Minimum Arrival Time of Surface Spill to reach Shoreline and Estimated Concentrations
Denmark	Spill originates in Danish waters. Probability 100% Minimum Arrival Time: 0 days, 0 hours *Localised rainbow sheens (0.3 to 5 µm thickness)* *Sheens (0.04 to 0.3 µm thickness)*	Probability: 55% Minimum Arrival Time: 15 days, 2 hours *Mostly light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness), except for a small area of moderate oiling (1-10 l/m^2 or 1-10 mm thickness) in the northern tip of Denmark*
Germany	Probability: 100% Minimum Arrival Time: 0 days, 1 hour *Localised rainbow sheens (0.3 to 5 µm thickness)* *Sheens (0.04 to 0.3 µm thickness)*	Probability: 0% Minimum Arrival Time: 0 days, 0 hours *No oiling*
Netherlands	Probability: 97% Minimum Arrival Time: 1 day, 7 hours *Localised rainbow sheens (0.3 to 5 µm thickness)* *Sheens (0.04 to 0.3 µm thickness)*	Probability: 0% Minimum Arrival Time: 0 days, 0 hours *No oiling*
Norway	Probability: 100% Minimum Arrival Time: 4 days, 10 hours *Mostly sheens (0.04 to 0.3 µm thickness)*	Probability: 73% Minimum Arrival Time: 21 days, 5 hours *Light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness)*
Sweden	Probability: 100% Minimum Arrival Time: 17 days, 11 hours	Probability: 48% Minimum Arrival Time: 19 days, 2 hours

	Mostly sheens (0.04 to 0.3 µm thickness)	*Light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness)*
UK	Probability: 28% Minimum Arrival Time: 19 days, 23 hours *Sheens (0.04 to 0.3 µm thickness)*	Probability: 0% Minimum Arrival Time: 0 days, 0 hours *No oiling*

Source: OSRL, 2022.

The scenario modelled for the well temporary abandonment activities at Dagmar showed that the waters of Germany, the Netherlands, Norway and Sweden (and the UK with 28% probability) were all expected to be impacted by the spill scenario but the thickness of the spill was predominantly sheen (layer thickness from 0.04 µm to 0.3 µm) and rainbow sheen (layer thickness from 0.3 µm to 5 µm) and were expected to readily disperse (Figure 5.5). The threshold of 70 ppb of entrained hydrocarbons in the water column (OSPAR predicted no effect concentration) was not reached. The hydrocarbon concentrations were below 25 ppb within the Natura 2000/OSPAR MPA Doggerbank, or any other affected area (Figure 5.6). The 25 ppb threshold is used to identify when the most sensitive marine life begins to be affected (OLF, 2007). In addition, the probability of oil reaching the shoreline was 55% in Denmark, 73% in Norway and 48% in Sweden, with shoreline impacts of light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness) in all cases, except for a small area in the northern tip of Denmark with moderate oiling (1-10 l/m^2 or 1-10 mm thickness). No heavy oiling is expected in any country (Figure 5.7). Based on these results, minor pollution with a very limited environmental impact was expected from a blowout event in the Dagmar oil spill modelling, and therefore on the DEWTA project, corresponding to the moderate severity level (category 2 out of 6) as per TEPDK's Risk Matrix.

Regarding the Tier 3 oil spill likelihood, the DEWTA project activities are considered equivalent to well workover operations and thus a well blowout frequency during normal workover activities is 3×10^{-4} per operation as defined by IOGP (2019) for the North Sea Standard. Overall, the probability of a well blowout is therefore very unlikely (category 3 of 6) as per TEPDK's Risk Matrix.

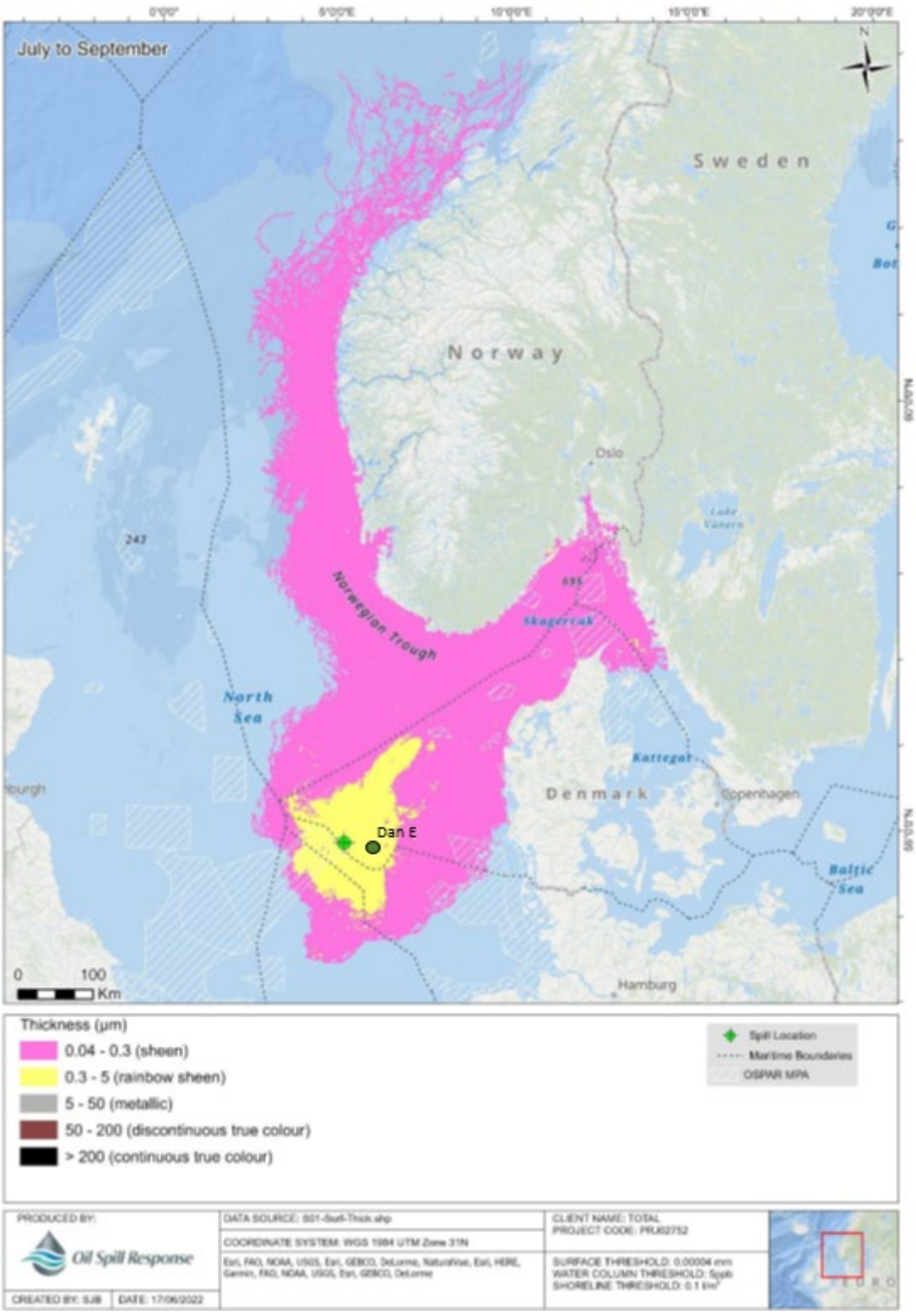
Therefore, risks associated with a blowout event that could occur during the DEWTA project activities are within the 'acceptable risk level' of TEPDK's Risk Matrix. The overall risk is assessed to be of '**Low Risk**' (Table 5.22)**.**

TEPDK holds an existing Oil/Chemical Spill Contingency Plan (TEPDK-L2-PRO-HSE-0016-E) developed for managing spills from all its offshore activities and is designed to limit the consequence in case of a major spill. TEPDK also holds a Blowout Contingency Plan (BOCP) (TEPDK-L2-PRO-WLS-0043-E).

Table 5.22 Significance of Impact due to Well Blowout (Tier 3)

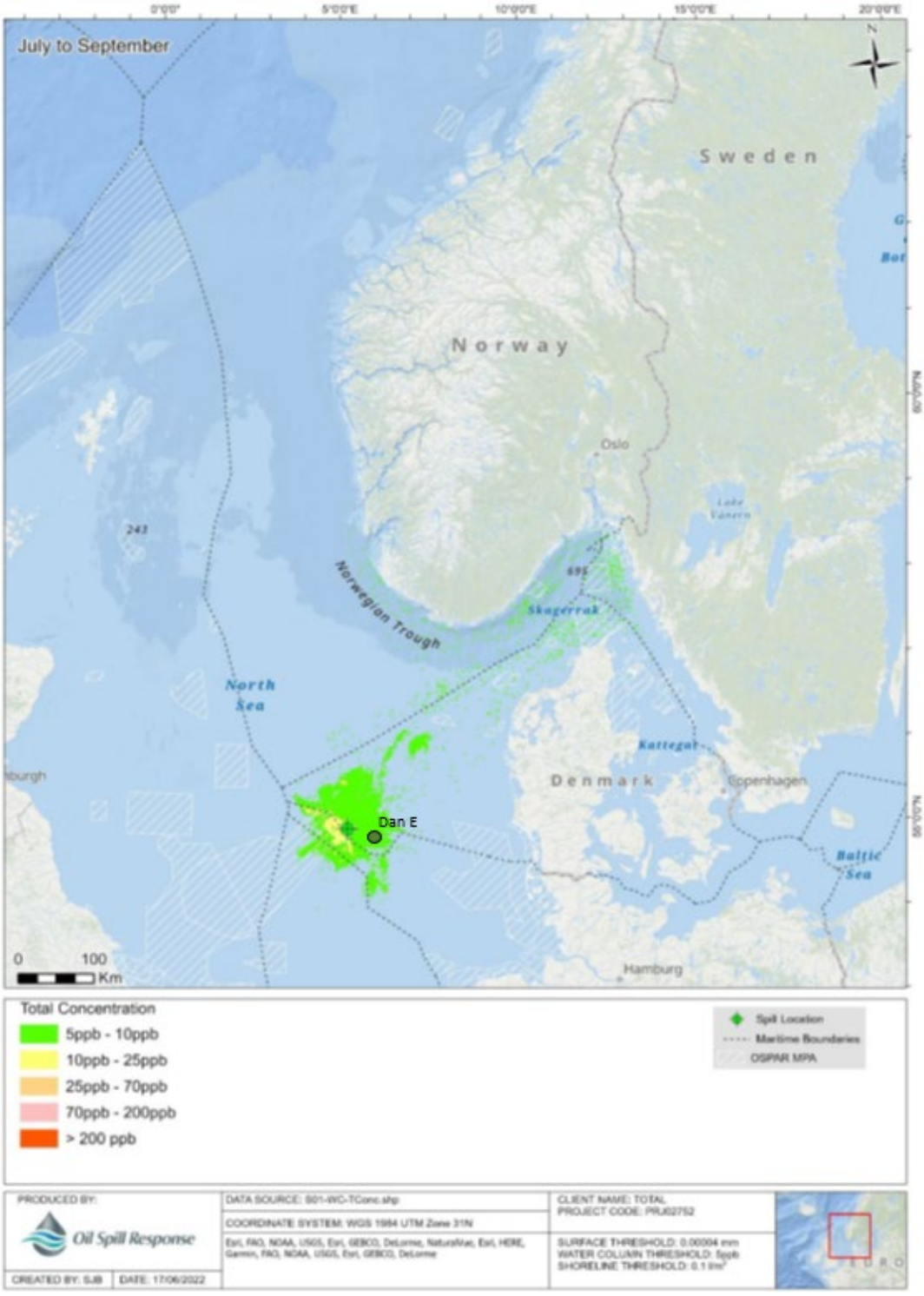
Category	Impact before Mitigation
Consequence severity	Minor pollution with a very limited environmental impact, i.e. Moderate (2)
Likelihood or Frequency	One time per year for at least 1 000 units or one time for every 100 to 200 similar plants in the world over 20 to 30 years of plant lifetime; i.e. Very Unlikely (3)
Risk Value	**Low Risk (Risk Level 3)**

Figure 5.5 Surface Maximum Time-Average Emulsion Thickness for a Well Blowout at Nearby Dagmar Well



Source: OSRL, 2022. Modified by ERM, 2023.

Figure 5.6 Hydrocarbon Concentrations in the Water Column for a Well Blowout at Nearby Dagmar Well



Source: OSRL, 2022. Modified by ERM, 2023.

Figure 5.7 Shoreline Oiling from a Well Blowout at Nearby Dagmar Well

Source: OSRL, 2022. Modified by ERM, 2023.

5.6.3.4 Loss of Containment due to Dropped Objects

Objects accidentally dropped from the rig and project vessels may include hazardous substances or small-to-large objects, which may cause, in case of loss of containment (rupture of an equipment, flowline, tank), impacts on sensitive receptors and worker health and safety. Even with the application of the latest industry standards and consideration of the highest standards of safety, accidental events may still occur due to human error, equipment failure and other procedural aspects. The likelihood or frequency is therefore considered 'Unlikely'. The consequences of a dropped object are expected to be 'Moderate'. The overall impact is therefore assessed to be of '**Low Risk**' (Table 5.23)**.**

Table 5.23 Significance of Impact due to Dropped Objects

Category	Impact before Mitigation
Consequence severity	Minor pollution with a very limited environmental impact; i.e. Moderate (2)
Likelihood or Frequency	Could occur once for every 10 to 20 similar plants over 20 to 30 years of plant life; i.e. Unlikely (4)
Risk Value	**Low Risk (Risk Level 3)**

5.6.4 Control/ Mitigation Measures

A range of operational controls and mitigation measures will be implemented to reduce the likelihood and assist the management of unplanned/accidental events.

5.6.4.1 Hydrocarbon/Chemical Spills (minor/Tier 1)

Applicable control and mitigation measures are:

- 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 500 m exclusion zone around the jack-up 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 the DEWTA project vessels comply with requirements of the International Convention for the Safety of Life at Sea, 1974 (SOLAS) 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);
- Adherence 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 DEWTA project activities.

5.6.4.2 Hydrocarbons Spills (Tier 2): Vessel/Helicopter Collisions

Applicable control and mitigation measures are:

- 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 so that any leaks are managed in a timely manner.

5.6.4.3 Hydrocarbon Spills (Major/Tier 3): Well Blowout

Control and mitigation measures for a well blowout are:

- Implement TEPDK Blowout Contingency Plan (BOCP) (TEPDK-L2-PRO-WLS-0043-E);
- Confirm that the 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 km of the proposed well location;
- Maintain stakeholder engagement which includes neighbouring countries and impacted communities to ensure that impacts arising from oil spills are managed effectively;
- Issue Notice to Mariners.

All equipment installed to prevent the occurrence of accidental events/ spills will be maintained regularly and checked. Response procedures in place will be evaluated to determine that should such an event occur; procedures will be effective in preventing hydrocarbon slicks from reaching the shoreline or marine protected areas.

5.6.4.4 Loss of Containment due to Dropped Objects

Applicable control and mitigation measures are:

- Frequent checks that items and equipment are stored and secured safely on the jack-up rig and on board each vessel;
- Control crane operations (Standard Operating Procedures and Permit to Work Systems); and
- Recover (where practicable) objects which are accidentally dropped into the sea.

5.6.5 Significance of Residual Impacts

After implementing the control and mitigation measures, the likelihood of unplanned events occurring during the DEWTA project, and the resulting impact is considered to have been reduced to **As Low As Reasonably Practicable (ALARP**).

5.7 Summary of Impact Significance

This impact assessment has been conducted to meet TotalEnergies' guidelines for conducting ESIA[32] processes and addresses the Environmental Assessment Regulations in Denmark and international good practice for ESIA reports, as described by the International Finance Corporation[33].

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.

[32] GS EP ENV 120 Environmental impact assessment of E&P activities 2019.

[33] https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/ehs-guidelines.

The outcome of the assessment process has identified that planned activities will have **Negligible** impacts before and after mitigation. Table 5.24 summarizes the significance of impacts before and after mitigation measures are implemented for planned activities and relevant issues.

Table 5.24 Summary of Impact Assessment Significance Ratings – Planned Impacts

Receptor	Impact Mechanism	Phase	Type of Impact	Before Mitigation				Residual Impact (Post Mitigation)			
				Magnitude of Impact	Sensitivity of Receptor	Impact Significance	Confidence Level	Magnitude of Impact	Sensitivity of Receptor	Impact Significance	Confidence Level
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 temporary abandonment	■ Mobilization ■ Well temporary abandonment	Direct	Negligible	High	Negligible	High	Negligible	High	Negligible	High
Seawater Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Well temporary abandonment	Direct	Small	Low	Negligible	High	Small	Low	Negligible	High
Seabed, Sediment Quality	Discharge of used cement, inhibited seawater and WBM during well temporary abandonment	Well temporary abandonment	Direct	Small	Low	Negligible	High	Small	Low	Negligible	High

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 5.25. 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 5.25 Summary of Impact Assessment Significance Ratings – Unplanned Impacts

Impact Source	Impact Prior to Mitigation	Residual Impact Significance (Post Mitigation)
Hydrocarbon/Chemicals Spills (minor/Tier 1)	Medium Risk	ALARP
Hydrocarbon 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

6. 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), Netherlands (45 km), Norway (113 km) and the UK (115 km). The Swedish maritime borders are more than 400 km from the DEWTA project.

6.1 Planned Activities

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.

6.2 Unplanned/Accidental Events

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.

The modelled well blowout scenario conducted by OSRL (2022) for a similar well temporary abandonment project at the Dagmar platform (approximately 33 km to the northwest), showed that the surface waters of the neighbouring EEZs can be impacted with sheens and rainbow sheens (less than 5 µm thickness). Seawater column impacts above the OSPAR thresholds of 70 ppb are not expected on neighbouring waters including the closest sensitivity Natura 2000/OSPAR MPA Doggerbank. In addition, the probability of oil reaching the shoreline was 55% in Denmark, 73% in Norway and 48% in Sweden, with shoreline impacts of light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness) in all cases, except for a small area in the northern tip of Denmark with moderate oiling (1-10 l/m^2 or 1-10 mm thickness). No heavy oiling is expected in any country.

7. NATURA 2000 SITES 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[34]. When effects are likely to be significant then an appropriate assessment (Stage 2) of the adverse impacts on the integrity of the site in question would be required. Site integrity is defined as "*the coherence of its structure and function across its whole area that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

The key conservation objectives under the Habitats Directive[35]: are:

- Annex II species '*Animal and plant species of community interest whose conservation requires the designation of Special Areas of Conservation'*: core areas of their habitat are designated as sites of Community importance (SCIs) and included in the Natura 2000 network. Once these sites are managed in accordance with the ecological needs of the species they are listed as SACs,
- Annex IV species '*Animal and plant species of community interest in need of strict protection*': a strict protection regime must be applied across their entire natural range within the EU, both within and outside Natura 2000 sites. Under the Danish Legislation:

  - Executive Order BEK No. 2091 of 12/11/2021 'On the designation and administration of international nature protection areas and the protection of certain species' and its Articles 6, 7 and 10,

  - Executive Order BEK No. 1050 of 27/06/2022 'On the administration of international nature protection areas and the protection of certain species by prospecting, exploration and extraction of hydrocarbons, underground storage, pipelines, etc. offshore' and its Annex 2, provide that the following animal species (included in Annex IV(a) of the Habitat Directive) cannot be '*(1) … deliberately disturbed in their natural range, in particular during periods of breeding, nesting, wintering or migration' or the proposed Project must not '(2) … damage or destroy breeding or resting places in the natural range …*':

    - All cetacean species including *Phocoena phocoena* (Harbour porpoise): present in the North Sea and assessed in this Natura 2000 Assessment Chapter for the DEWTA project),
    - *Lutra lutra* (Otter): terrestrial and freshwater (thus is not relevant for the DEWTA project),
    - *Coregonus oxyrhynchus* (synonym of *C. oxyrinchus*; Houting, known as Snæbel in Denmark[36]): it is an anadromous fish whose populations are protected under Annex IV in certain sectors of the North Sea including seven coastal and freshwater Danish European sites close to Esbjerg and included in the Wadden Sea National Park. These sites are at more than 185 km from the DEWTA project thus not assessed in this Natura 2000 Assessment Chapter for the DEWTA project.
- Habitats: Annex I 'Natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation': the most important habitats potentially present in the offshore areas of the North Sea are:

  - 1110 Sandbanks which are slightly covered by seawater all the time,
  - 1170 Reefs,
  - 1180 Submarine structures made by leaking gases.

[34] 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*.

[35] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:01992L0043-20130701

[36] https://eunis.eea.europa.eu/species/484

7.1 Planned Activities

As presented in Table 4.13 and Figure 4.28 of Chapter 4 (Baseline Characteristics), the closest Natura 2000 site to the DEWTA project area (i.e. the Doggerbank SAC (site code 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 (Chapter 3). Due to the distance between the DEWTA project and any Danish Natura 2000 sites, it is unlikely that the P&A activities will impact the habitat types within these areas. Species such as the harbour porpoises, Grey and Harbour seals and some marine birds, which are designated features for some of the Danish Natura 2000 sites, may be found in the area around the DEWTA project. However, the potential impacts from the DEWTA activities impacting any Natura 2000 sites must first and foremost be the German DE 1003-301 Doggerbank area.

The qualifying features of the Doggerbank SAC (site code DE1003301) are the following (Section 4.3.2.3):

- Habitats under Annex I of the Habitats Directive:
  - 1110 sandbanks
- Species under Annex II of the Habitats Directive:
  - harbour seal (*Phoca vitulina*)
- Species under Annex II and Annex IV of the Habitats Directives and Annex 2 of BEK nr 1050 of 27/06/2022 :
  - harbour porpoise (*Phocoena phocoena*)
- Birds under Annex I of the Birds Directive:
  - guillemot (*Uria aalge*)
- Migratory or Congregatory Birds:
  - lesser black-backed gull (*Larus fuscus*)
  - fulmar (*Fulmarus glacialis*)
  - gannet (*Morus bassanus*)
  - kittiwake (*Rissa tridactyla*).

Based on the outcomes of the scoping process Paragraph 5.3) and the Impact Assessment (Paragraph 5.4), potential impacts of the DEWTA project to be considered are those related to a temporary alteration of seawater and sediment quality associated to the discharge of used cement, inhibited seawater and WBM.

Considering the applicable embedded control measures, the potential impact on water and sediment quality is evaluated to be of Negligible Significance and with a small impact magnitude (discharges occurring intermittently over short periods and impacts localized and limited to the areas adjacent to the discharge point). As described in Sections 5.4.2.2 and 5.4.2.3, residual impacts on seawater and marine sediment quality due to these discharges are of negligible significance due to the low discharged volumes, the rapid dilution rates.

The associated potential impacts on Natura 2000 designated species and Annex IV species can be therefore assessed as insignificant. The species that could be present in the areas adjacent to DEWTA project could be exposed to short-term and small magnitude alteration of chemical quality. All chemicals used by TEPDK will be permitted by DEPA and will be either "Green" (PLONOR) or "Yellow". The use of permitted chemicals will be monitored regularly and included in the annual reports on the use and discharge of chemicals to be submitted to DEPA. Considering the negligible impacts on the abiotic components due to these discharges, impacts on the biological environment are also considered as

insignificant. In addition, no significant cumulative impacts are expected to occur due to the DEWTA project and its interaction with other surrounding current and forthcoming projects, and no cumulative impacts will significantly affect any Natura 2000 site (Section 5.5).

Likewise, any disturbance and/or displacement of species due to underwater noise emissions from the jack-up rig and support and supply vessels (non-impulsive noise) will be temporary and localised. As presented in the “Scoped out table” (Table 5.6). Impact to marine mammals due to underwater noise emissions from the mobilization of jack-up rigs, power generation on the rig and from the operation of support and supply vessels has been assessed to be local and short term and thus scoped out as insignificant. The underwater noise produced during the DEWTA project activities is typically broadband noise, with some low tonal peaks and is not impulsive noise such as seismic or piling. Potential overlapping with the DAN Field associated underwater noise will be limited to 99 days of project duration. It is therefore not expected to have a significant direct or cumulative impact on sensitive receptors. Based on this assessment and the distance from the P&A activities to the nearest Natura 2000 site (26.9 km to the west) underwater noise from the DEWTA activities will have insignificant impact on the conservation objectives of the habitat types and species in the Natura 2000 sites.

As indicated above, all cetacean species in the North Sea are listed in Annex IV of the EU habitats directive (Council Directive 92/43/EEC of 21 May 1992). The resident cetacean species present in the DEWTA project area are minke whale (*Balaenoptera acutorostrata*), harbour porpoise (*Phocoena phocoena*) and white-beaked dolphin (*Lagenorhynchus albirostris*), which are typical species of the North Sea. Less common species include short-beaked common dolphin (*Delphinus delphis*), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), long-finned pilot whale (Globicephala melas), orca (Orcinus orca) and Risso’s dolphin (*Grampus griseus*) (Table 4.10) (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 DEWTA activities will not cause any capture or killing of Annex IV species. It is not expected that the area is a breeding or rearing site for either the harbour porpoise, the white-beaked dolphin or the minke whale. The different threshold levels for temporary threshold shifts (TTS) and permanent threshold shifts (PTS) for the three cetacean species), are not expected to be exceeded: Todd et al. (2020) indicated that marine mammals, such as harbour porpoise (*Phocoena phocoena*) forage regularly near offshore oil and gas rigs and platforms, and predicted that animals experience different noise regimes while traversing the water column and can potentially detect the higher-frequency components of drilling noise to a distance of 70 m from the source; however, while levels were unlikely to cause auditory injury, effects on echolocation behaviour are described as unknown. The DEWTA project short term duration (99 days) will not cause any significant effect to the overall conservation status of cetacean species. Temporary displacement effect could occur. Potential impacts on the behaviour are only expected for a relative short distance from the DEWTA project, and a limited number of animals may potentially be impacted for a short period of time. It is therefore assessed that the ecological functionality of the distribution areas and the breeding sites is not significantly negatively affected.

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 project it is assessed that a full Appropriate Assessment (Stage 2) is deemed as not necessary.

7.1.1 Unplanned/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 conditions as the DEWTA project, only sheens and rainbow sheens (less than 5 µm thickness) would be present in neighbouring surface waters. Seawater column impacts above the OSPAR thresholds of 70 ppb would not be expected in neighbouring waters.

In addition, the probability of oil reaching the shoreline was 55% in Denmark, 73% in Norway and 48% in Sweden, with shoreline impacts of light oiling (0.1-1 l/m^2 or 0.1-1 mm thickness) in all cases, except for a small area in the northern tip of Denmark with moderate oiling (1-10 l/m^2 or 1-10 mm thickness). No heavy oiling is expected in any country. Minor pollution with a very limited environmental impact would be expected from a well blowout, corresponding to the moderate severity level (category 2 out of 6) as per TEPDK's Risk Matrix.

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; therefore, for the DEWTA project it is assessed that a full Appropriate Assessment (Stage 2) is not necessary.

8. MARINE STRATEGY FRAMEWORK DIRECTIVE

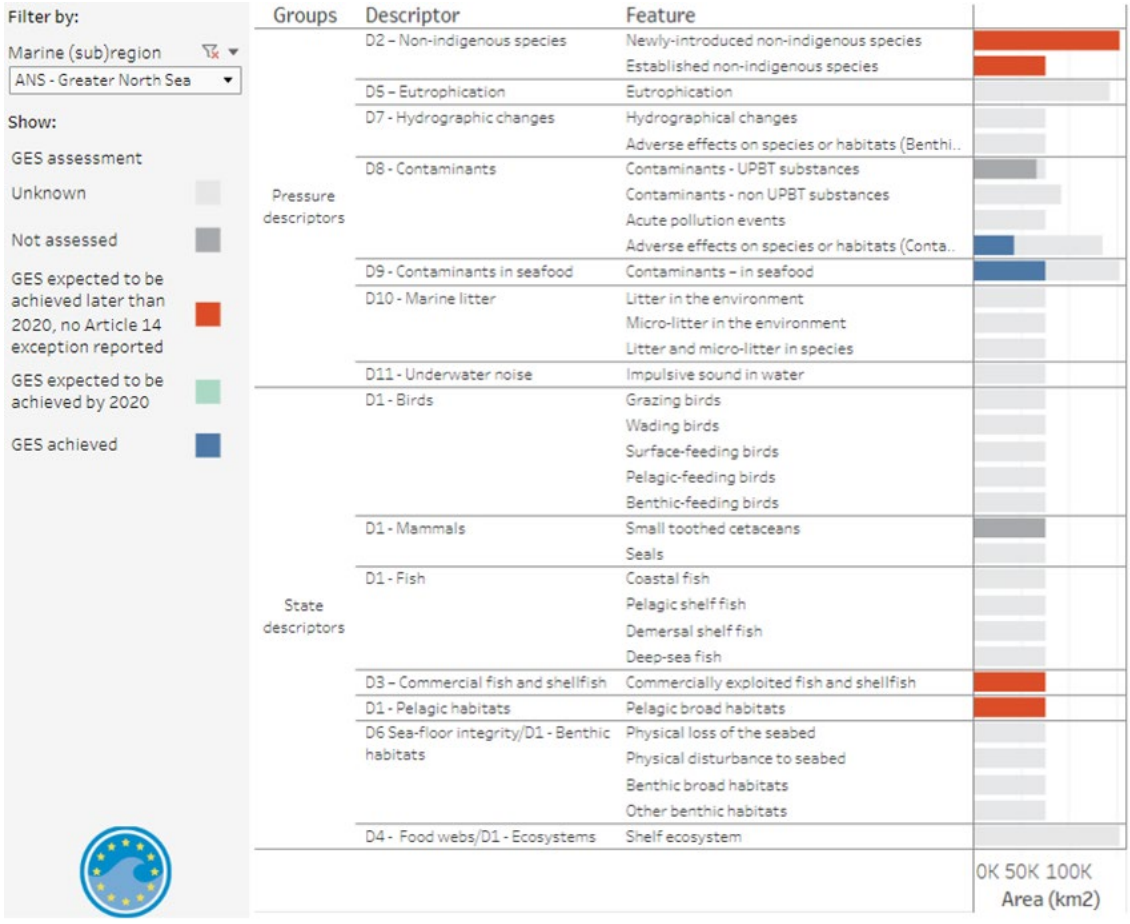
The aim of the Marine Strategy Framework Directive (MSFD) (Havstrategidirektiv) is to achieve “good environmental status” (GES) of the EU marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is a directive that is implemented in Danish law through the Marine Strategy Act and is developed by the Danish Agency of Water and Nature Management, now the Environmental Protection Agency, which is currently under the jurisdiction of the Ministry of Environment and Food. It encompasses Danish Sea zones such as waterbeds, seabed territories and exclusive economic areas. The MSFD outlines eleven descriptors used to assess the good environmental status of the marine environment. The assessment of the potential impacts from the DEWTA project on these eleven descriptors and the 68 environmental targets in the Danish Marine Strategy II is presented in Table 8.2. The assessment is based on the impacts described in Sections 5.3, 5.4 and 5.6, relevant for the DEWTA project activities.

8.1.1 Current Environmental Status

OSPAR (2022) communicated that evidence from monitoring and reporting indicates that the overall effect of OSPAR measures and their implementation by Contracting Parties has been to significantly improve the overall quality status of the Greater North Sea where there are high levels of oil and gas activity.

A summary of the GES assessment for each MSFD descriptor conducted by Denmark in the Greater North Sea area is published in the WISE Portal and presented in Figure 8.1. The GES assessment shows if the GES has been achieved, not yet achieved or is unknown or not assessed, for each assessed feature.

Figure 8.1 GES Assessment in the Greater North Sea Area



Source: WISE Marine Portal, 2023.

Table 8.1 summarises the state of each MSFD descriptor in the North Sea presented in the “Danish Marine Strategy II – Part 1” report (Ministry of Environment and Food Denmark, 2019 and 2020). Targets are not defined for all descriptors. The remaining targets are defined as trends that describe a positive development or descriptive target.

Table 8.1 Extracted Summary of Environmental Status of MSFD Descriptors

Descriptor		Status for the North Sea	
		Group	**Status**
D1	Biodiversity (birds)	■ Herbivorous and foraging in water column	■ Stable or increasing
		■ Wading and foraging in the water surface	■ Less than 75% of species are stable or increasing
		■ Overwintering	■ Majority of species are stable, increasing or fluctuating
D1	Biodiversity (marine mammals)	■ Harbour seal	■ GES
		■ Grey Seal	■ Increasing population (no GES in 2013)

Descriptor		Status for the North Sea	
		Group	**Status**
		■ Harbour porpoise	■ Stable population with favourable conservation status
D1	Biodiversity (fish that are not exploited commercially)	■ 14 species assessed	■ Less than 25% have good status ■ Population density- below 50% have good status
D1	Biodiversity (pelagic habitat)	■ Phytoplankton biomass	■ Steady decline (but slight increase in 2012)
		■ Zooplankton	■ Insufficient data to assess development
D2	Non-indigenous species	■ Insufficient data, but likely that GES has not been achieved	
D3	Commercially exploited fish stocks	■ 22 selected stocks of fish, crustaceans and shellfish	■ Ten stocks have GES ■ Eight stocks not good status
D4	Marine food webs	■ Despite assessment of individual sub-elements in the food web, it is currently not possible to assess when the food web as a whole will be in good environmental status. However, it is expected that the balance in the marine food web will improve as environmental targets for pressure factors and status under the other topics/descriptors are achieved	
D5	Eutrophication	■ Open marine areas far from the coast	■ GES
		■ Open marine areas close to the coast	■ GES not achieved yet
D6	Sea floor integrity	■ No set threshold values for GES, but analysis indicates that there is not good status for the sea floor in relation to disturbance and similarly in relation to loss for certain habitat types ■ There is not sufficient knowledge to assess when good environmental status will be achieved	
D7	Hydrographical changes	■ Threshold values have not yet been set and there is not sufficient knowledge to assess when good environmental status will be achieved	
D8	Contaminants (concentrations and species health)	■ PFOS and Benzo(a)pyrene	■ GES
		■ Mercury or the group of brominated flame retardants	■ GES not achieved
D8	Contaminants (acute pollution events)	■ GES cannot be assessed for acute pollution events in the North Sea, as there are large annual variations over the period for oil and chemicals spills from oil and gas installation not possible to derive a trend over the years.	
D9	Contaminants in seafood for human consumption	■ concentrations of the heavy metals lead, cadmium, mercury, as well as benzo(a)pyrene in seafood for human consumption	■ GES
		■ Concentrations of dioxins and PCB	■ Above the maximum residue values have been found in mackerel, cod liver and salmon.
D10	Marine litter	■ No set threshold values, there is no scientific basis for assessing quantitatively when good environmental status will be achieved	

Descriptor		Status for the North Sea	
		Group	Status
D11	Underwater noise	■ No set threshold values for levels of underwater noise compatible with good environmental status	

Source: Ministry of Environment and Food Denmark, 2019 and 2020.

DHI (2020) conducted a baseline monitoring of the seabed around and along existing and new pipeline alignments between the Dan and Halfdan fields. The survey near Dan E was carried out at two stations (Dan F-W5000 and Dan F-W750) (Figure 8.2). The DHI (2020) monitoring concluded that, the survey results provided a comprehensive dataset and a solid baseline for the survey area.

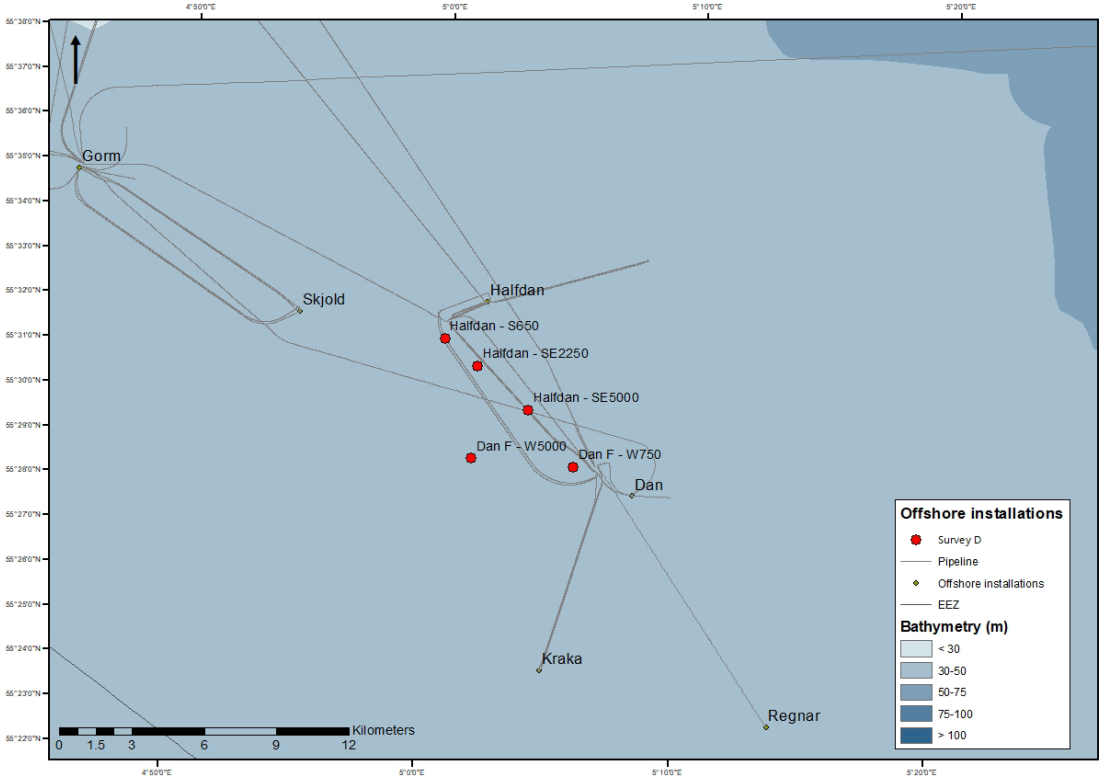
Regarding the benthic community, 85 taxa were identified to species level and 14 Phyla were identified comprising a wide variety of species classified as crustaceans, molluscs, annelids and echinoderms. The most abundant species observed along the pipelines were polychaeta (bristle worms) followed by crustacean (shellfish) and bivalvia (mussels) (DHI, 2020).

Heavy metal concentrations in the sediment samples were well below all targets for GES, although Barium (Ba) may be present in concentrations above the potential effect level, which is likely caused by drilling activities. , All organic compound samples meet the GES criteria. The environmental status (EnS) score for each pipeline survey area was high and consistent between surveys.

Overall, the heavy metal and hydrocarbon concentrations had an EnS close to 100 and were low compared to indicators for GES and low compared to potentially toxic levels, with one exception (i.e., Ba).

The 2020 DHI survey results showed that the TEPDK offshore license areas have not been significantly affected by past construction and drilling activities. Ba presence in sediments near oil or gas platforms and drilling rigs is well documented (Haanes *et al*., 2023; Celis-Hernandez *et al.,* 2018; Lepland and Mortensen, 2008; Lepland *et al.,* 2000) and neither barite ($BaSO_4$) nor dissolved Ba in seawater are considered to be toxic to marine organisms (Neff, 2002; Neff *et al*., 1995).

Figure 8.2 2020 DHI Environmental Monitoring Stations Near Dan E



Source: DHI, 2020.

8.1.2 Assessment of Potential Impacts based on MSFD Descriptors

The assessment of potential impacts based on relevant MSFD descriptors due to the DEWTA project activities is presented in Table 8.2.

Table 8.2 Potential Impacts based on relevant MSFD Descriptors

Descriptors Based on the MSFD	Target		Source of Impact	Overall Impact Assessment	Impacts to Environmental Targets	Location of Baseline Assessment
Descriptor 1 - Biodiversity: The quality and occurrence of habitats and the distribution and abundance of species are in line with prevailing physiographic, geographic and climatic conditions.	Birds	1.2 Populations and habitats for birds are conserved and protected in accordance with objectives under the Birds Directive.	Helicopter path; Artificial lighting.	Seabird disturbance: ■ Helicopters passing through and near coastal areas are unlikely to be a new source of disturbance (see activity 7.1 in Table 5.6) ■ No significant impact on seabird disturbance from artificial lighting from vessels (see activity 7.2 in Table 5.6) **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement or the maintenance of good environmental status for Descriptor 1	Section 4.3.4 Section 4.3.5 Section 4.3.3 Section 4.3.1
	Marine Mammals	1.8 Harbour porpoise, harbour seal and grey seal achieve favourable conservation status in accordance with the timeline laid down in the Habitats Directive	Underwater noise from: ■ Jack-up rig; ■ Operation of support and supply vessels; Discharge: ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02) Waste: ■ Liquid (WBM during milling) and solid waste (swarf from milling); ■ From inner completion string removal.	Underwater noise: ■ No significant impact on sensitive receptors from vessels (temporary, broadband noise, no impulsive noise) (see activity 5.1 in Table 5.6) Interference of marine activities: ■ Project activities within existing safety exclusion zone (see activity 15.1 in Table 5.6) Discharges: ■ No significant impacts on the water quality and therefore on sensitive receptors (see activity 5.2 in Table 5.6) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (see activity 5.2 in Table 5.6) Waste: ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6) ■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6) **No or negligible impact**		
	Fish	1.12 * The Ministry of Environment and Food establishes a national indicator to evaluate the status of Danish fish that are not exploited commercially, and the opportunities to further develop regional indicators are investigated.	Indicators are established by the Ministry of Environment and Food. See target 3.1.	See target 3.1.		
	Plankton	1.13 The abundance of plankton follows the long-term average.	Seabed disturbance from jack up rig positioning (spud cans); Underwater noise from: ■ Jackup rig; ■ Operation of support and supply vessels. Discharge: ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02). Waste: ■ Liquid (WBM during milling) and solid waste (swarf from milling); ■ From completion string removal.	The project activities could decrease light availability and cause a reduction in phytoplankton production. Any impact will be temporary and based on the abundance, productivity and size of planktonic populations and their high reproductive rate, plankton is expected to recover after disturbance. Underwater noise: ■ No significant impact on sensitive receptors from vessels (temporary, broadband noise, no impulsive noise) (see activity 5.1 in Table 5.6) Discharges: ■ No significant impacts on the water quality and therefore on sensitive receptors (see activity 5.2 in Table 5.6) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (see activity 5.2 in Table 5.6) Waste: ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6)		

Descriptors Based on the MSFD	Target	Source of Impact	Overall Impact Assessment	Impacts to Environmental Targets	Location of Baseline Assessment
			■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6) **No or negligible impact**		
Descriptor 2 – Non-indigenous species: Introduced by human activities are at levels that do not adversely alter the ecosystems.	2.1 The number of new non-indigenous species introduced through ballast water, ship fouling and other relevant human activities is decreasing. 2.2 The distribution of certain invasive species is, as far as possible, at a level so that significant adverse effects are stable or decreasing.	Non-native / invasive marine species introduced from ballast water or ship fouling may colonize subsea structures and out-compete native marine species and upset local food chains and ecosystem balance.	Vessels operating solely in North Sea and following IMO Ballast Water Management Convention are an unlikely source of invasive species (see activity 8.2 in Table 5.6). TEPDK has conducted sediment and biological monitoring campaigns with no clear evidence of invasive benthic species presence. **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 2	Section 4.3.8
Descriptor 3 - Commercial fish and shellfish: Populations of commercially exploited fish and shellfish exhibit a population age and size that is indicative of a healthy stock.	3.1 The number of commercially exploited fished stocks regulated pursuant to the MSY principles in the Common Fisheries Policy is increasing. 3.2 Within the framework of the Common Fisheries Policy, fish mortality (F) is at levels that can ensure a maximum sustainable yield (Fmsy). 3.3 Within the framework of the Common Fisheries Policy, spawning biomass (B) exceeds the level that can ensure a maximum sustainable yield (MSY Btrigger).	<u>Underwater noise from:</u> ■ Jack-up rig; ■ Operation of support and supply vessels. ■ No-fishing zone around project vessels and platforms. <u>Discharge:</u> ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02). <u>Waste:</u> ■ Liquid (WBM during milling) and solid waste (swarf from milling); ■ From completion string removal.	<u>Underwater noise:</u> ■ No significant impact on sensitive receptors from vessels (temporary, broadband noise, no impulsive noise) (see activity 5.1 in Table 5.6) <u>Interference of marine activities:</u> ■ Project activities within existing safety exclusion zone (see activity 15.1 in Table 5.6) <u>Discharges:</u> ■ No significant impacts on the water quality and therefore on sensitive receptors (see activity 5.2 in Table 5.6) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (see activity 5.2 in Table 5.6) <u>Waste:</u> ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6) ■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6) **No or negligible impact**	Populations of commercially exploited fish and shellfish will be unaffected; Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement or the maintenance of good environmental status for Descriptor 3	Section 4.3.3 Section 4.4.8
Descriptor 4 - Food webs: All elements of the marine food webs occur at normal abundance and diversity and levels capable of ensuring the long-term abundance of the species and the retention of their full reproductive capacity.	4.1 The Ministry of Environment and Food contributes to regional work regarding establishment of threshold values and determination of good environmental status and works to ensure that the anthropogenic impacts on the food web are in accordance hereto.	Threshold values are established by the Ministry of Environment and Food. See targets 1.2, 1.8, 1.13, 3.1 and 6.3.	As stated in the targets 1.2, 1.8, 1.13, 3.1, and 6.3, the impacts on all components of the marine ecosystem due to the Project have been evaluated as having no impact or negligible impact, therefore no significant impacts on the elements of the marine food webs are expected to occur. Minor/ Negligible impacts will not negatively impact the normal abundance, diversity and population levels capable of ensuring the long-term survival of the species and their full reproductive capacity. **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 4	Section 4.3
Descriptor 5 - Eutrophication: Human-induced eutrophication is minimized, especially adverse effects thereof, such as losses in biodiversity, ecosystem degradation, harmful algal blooms and oxygen deficiency in bottom waters.	5.1 The Ministry of Environment and Food contributes to regional work regarding establishment of threshold values and determination of good environmental status for the North Sea, including the Skagerrak, and works to ensure that anthropogenic eutrophication and its effects are in accordance hereto. 5.2 Danish inputs of nitrogen and phosphorus (TN, TP) comply with the maximum acceptable inputs stipulated under HELCOM.	Drainage discharge from jack-up rig and vessels, i.e. runoff drainage, ballast water, sewage, greywater.	<u>Drainage discharge:</u> ■ Wastewater discharges from project vessels will be managed in accordance with MARPOL 73/78- Annex 1 (see activity 3.1 and 3.2 in Table 5.6) **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the maintenance of good environmental status for Descriptor 5	Section 4.2.7
Descriptor 6 - Seafloor integrity:	6.4* In connection with licensing activities at sea requiring an environmental impact assessment	Seabed disturbance from jack-up rig positioning (spud cans);	<u>Seabed disturbance:</u> ■ Interaction with the seabed will be minor and temporary (see activity 4.1 and 6.1 in Table 5.6)	Project activities will not affect established environmental	Section 4.2.6 Section 4.3.2

Descriptors Based on the MSFD	Target	Source of Impact	Overall Impact Assessment	Impacts to Environmental Targets	Location of Baseline Assessment
Seafloor integrity is at a level that ensures that the structure and functions of the ecosystems are safeguarded and benthic ecosystems, in particular, are not adversely affected.	(EIA), the approval authority encourages assessment and reporting to the Danish Environmental Protection Agency (monitoring programme) of the extent of physical losses and physical disturbances of benthic broad habitat types. 6.5 The marine habitat types under the Habitats Directive achieve favourable conservation status in accordance with the timeline laid down in the Habitats Directive. 6.7 The most important habitats contain the typical species and communities for Danish marine areas. 6.9* Need for protection initiatives for HELCOM and OSPAR Red List habitats is assessed. If there are any natural habitats on the Red Lists that are endangered or not sufficiently protected, the Ministry of Environment and Food will assess specifically the need for further initiatives in collaboration with relevant ministries.	<u>Underwater noise from:</u> ■ Jack-up rig; ■ Operation of support and supply vessels; and ■ No-fishing zone around project vessels and platforms. <u>Discharge:</u> ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02). <u>Waste:</u> ■ Liquid (WBM during milling) and solid waste (swarf from milling); ■ During completion string removal.	<u>Underwater noise:</u> ■ No significant impact on sensitive receptors from vessels (temporary, broadband noise, no impulsive noise) (see activity 5.1 in Table 5.6) <u>Discharges:</u> ■ Any increased turbidity or smothering will be small scale and temporary (see activity 6.2 in Table 5.6) ■ No significant impacts on the water and sediment quality are expected, Discharged fluids will generally disperse in the water column (activity 3.1 in Table 5.7 and section 5.4.2.3) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (activity 3.1 in Table 5.7 and section 5.4.2.3) <u>Waste:</u> ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6) ■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6) **Negligible impact**	targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 6	
Descriptor 7 - Hydrographical conditions: Permanent alteration of hydrographical conditions does not adversely affect marine ecosystems.	7.1 Anthropogenic activities that are particularly associated with physical loss of the sea floor, and which cause permanent hydrographical changes ■ only have local impacts on the sea floor and in the water column, and ■ are designed to take account of the environment and what is technically possible and financially reasonable to prevent harmful effects on the seabed and in the water column. 7.2 In connection with licensing activities at sea requiring an environmental impact assessment (EIA), the approval authority is encouraging reporting to the Danish Environmental Protection Agency (monitoring programme) of hydrographical changes and the adverse effects of these.	Alterations to hydrographical conditions due to the jack-up rig legs.	The area impacted by project activities is small and located near the Dan E platform on areas already affected by the existing platform.The presence of the jack-up rig is temporary (approximately 99 days) .The hydrographic conditions will quickly revert to its previous state once the rig leaves (see activity 2.1 in Table 5.6). **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 7	Section 4.2.2
Descriptor 8 - Contaminants: Their concentrations are at levels not giving rise to pollution effects.	8.1 Discharges of contaminants in the water, sediment and living organisms do not lead to exceeding of the environmental quality standards applied in current legislation. 8.2 Emissions, discharges and losses of PBDE and mercury are ceased or phased out.	<u>Discharge:</u> ■ Liquid (drainage, ballast discharge, sewage, grey water) from jack-up rig and project vessels; ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02). <u>Waste:</u> ■ Liquid (WBM during milling) and solid waste (swarf from milling). ■ Temporary resuspension of any sediment-bound contaminants disturbed by the jack-up rig spud cans.	<u>Drainage discharge:</u> ■ Wastewater discharges from project vessels in accordance with MARPOL 73/78- Annex 1 (see activity 3.1 and 3.2 in Table 5.6) <u>Discharges:</u> ■ No significant impacts on the water and sediment quality are expected, (activity 2.1 and 3.1 in Table 5.7 and section 5.4.2.2 and 5.4.2.3) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (activity 2.1 in Table 5.7 and section 5.4.2.2) <u>Waste:</u> ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6) ■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6)	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 8	Section 4.2.7 Section 4.2.6

Descriptors Based on the MSFD	Target	Source of Impact	Overall Impact Assessment	Impacts to Environmental Targets	Location of Baseline Assessment
			■ Only minimal surface layers of sediment may be resuspended (see activity 3.4 in Table 5.6) **Negligible impact**		
	8.9 The spatial extent and duration of acute pollution events is gradually reduced as much as possible through prevention, monitoring and risk-based scaling of contingency and response facilities. 8.10 Adverse effects on marine mammals and birds from acute pollution events are prevented and minimised as much as possible. For example, this may be secured by means of floating booms as well as through contingency plans for marine mammals and birds injured in oil spills.	Major accidental event	Acute pollution events are assessed in Section 5.6. The probability of a major accidental event is very unlikely. Mitigation measures are embedded in the project design to prevent and manage all sources of acute pollution. Further, the TEPDK Oil/Chemical Contingency Plan includes wildlife response.		
Descriptor 9 - Contaminants in seafood: Contaminants in fish and other seafood for human consumption do not exceed levels established by Community legislation or other relevant standards.	9.1 Emissions of contaminants generally do not lead to exceeding of the maximum residue levels applicable in the food legislation for seafood	Discharge: ■ Liquid (drainage, ballast discharge, sewage, grey water) from jack-up rig and project vessels; ■ Used cement, inhibited seawater and WBM during well temporary abandonment (DE-01 and DE-02). Waste: ■ Solid waste (food, cleaning, maintenance) from jack-up rig and project vessels; ■ Liquid (WBM during milling) and solid waste (swarf from milling). Sediment resuspension from Jack-up rig positioning, well temporary abandonment, demobilization. .	Drainage discharge: ■ Wastewater discharges from project vessels in accordance with MARPOL 73/78- Annex 1 (see activity 3.1 and 3.2 in Table 5.6) Interference of marine activities: ■ Project activities within existing safety exclusion zone (see activity 15.1 in Table 5.6) Discharges: ■ No significant impacts on the water and sediment quality are expected, (activity 2.1 and 3.1 in Table 5.7 and section 5.4.2.2 and 5.4.2.3) ■ The DEWTA project will use limited quantities of only green and yellow classified substances (see activity 5.2 in Table 5.6) Waste: ■ The milled solids (swarf) will be removed from WBM. Used milling WBM and swarf are retained and returned to shore for processing and disposal (see activity 5.2 in Table 5.6) ■ Waste will be transported to shore and recycled through an appropriate facility as per TEPDK´s waste management plan (see activity 3.3 in Table 5.6) Sediment resuspension Only minimal surface layers of sediment may be resuspended (see activity 4.1 in Table 5.6) **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement or the maintenance of good environmental status for Descriptor 9	N/A
Descriptor 10 - Marine litter: Properties and quantities of marine litter do not cause harm to the coastal and marine environment.	10.1 The amount of marine litter is reduced significantly in order to achieve the UN goal that marine litter is prevented and significantly reduced by 2025.	Litter generated during Project activities.	Solid waste: ■ All marine litter will be collected, transported to shore and recycled through an appropriate facility as per TEPDK´s Waste Management Plan (see activity 3.3 in Table 5.6) **No or negligible impact**	Project activities will not affect established environmental targets. The Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 10	Section 4.2.7
Descriptor 11 - Energy including underwater noise: Introduction of energy, including underwater noise, is at levels that do	11.1 As far as possible, marine animals under the Habitats Directive are not exposed to impulse sound which leads to permanent hearing loss (PTS). The limit value for PTS is currently assessed as 200 and 190 dB re.1	Underwater noise from: ■ Jack-up rig; ■ Operation of support and supply vessels.	Underwater noise: ■ No significant impact on sensitive receptors from vessels (temporary, broadband noise, no impulsive noise) (see activity 5.1 in Table 5.6) **No or negligible impact**	Given the temporary nature and type of underwater noise, negligible impacts will not affect established environmental targets. The	Section 4.2.3

Descriptors Based on the MSFD	Target	Source of Impact	Overall Impact Assessment	Impacts to Environmental Targets	Location of Baseline Assessment
not adversely affect the marine environment.	uPa2s SEL for seals and harbour porpoise, respectively. The best knowledge currently available is on these species. However, it is likely that these limits will be revised as new knowledge on the area becomes available. The values are the sound-exposure level accumulated over two hours.			Project's environmental impact will not hinder the achievement of good environmental status for Descriptor 11	

Source: ERM, 2023

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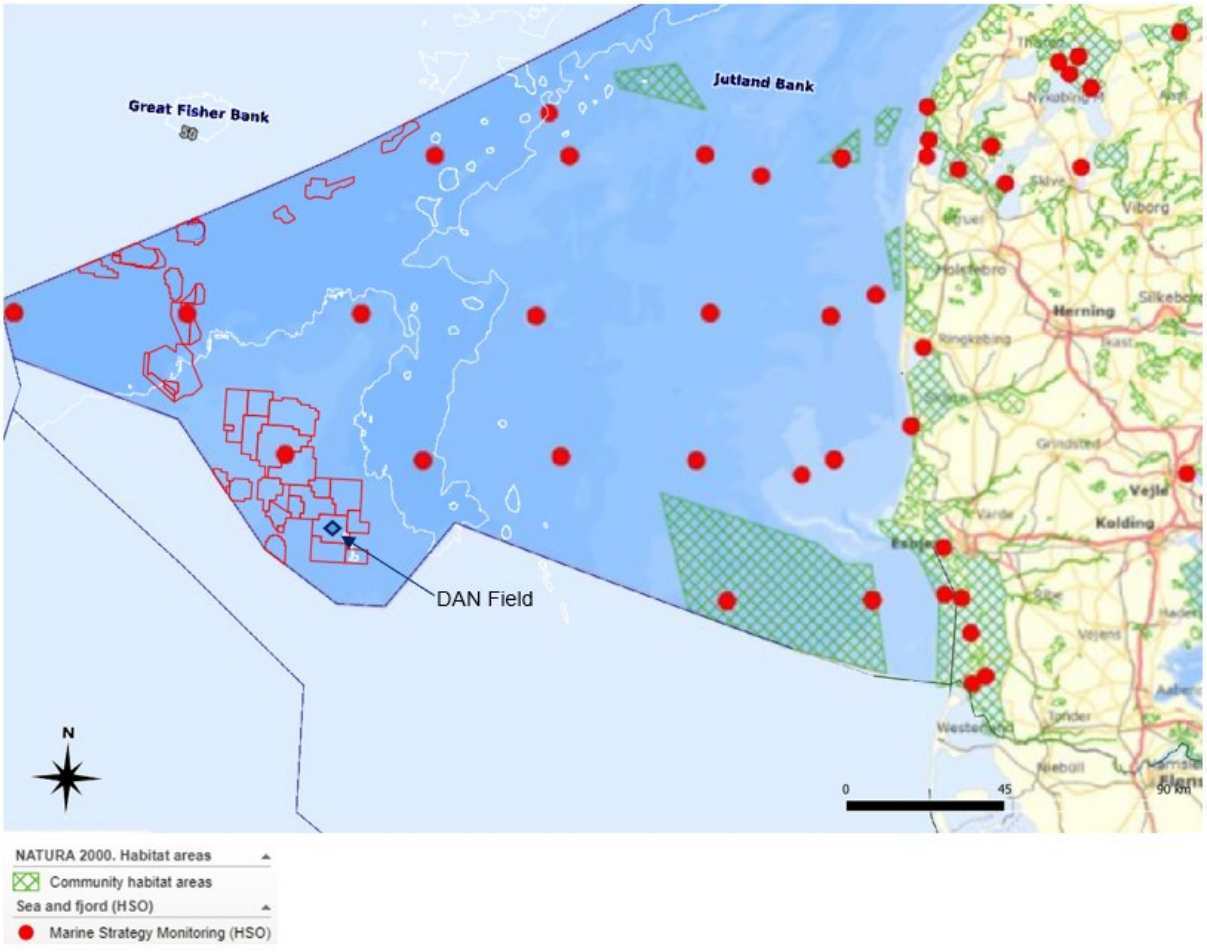
8.1.3 Potential Impacts from DEWTA Project Activities on NOVANA Program

The marine strategy's monitoring program 2021-2026 is mainly based on monitoring activities of NOVANA - sub-program for seas and fjords 2017-2021 (DEPA, 2017). New activities in the marine strategy's monitoring program 2021-2026, which either supplement already existing monitoring or represent completely new activities within a subject area, have effect since 2021 and will also be incorporated in the future NOVANA program for sea and fjords after its revision made in 2021. The offshore monitoring stations under the NOVANA Program and the DAN Field location are shown in Figure 8.3.

Figure 8.3 NOVANA - National Monitoring Program 2017-2021 – Marine Monitoring Stations and Location of the Dan Field



Source: NOVANA GIS Portal, 2023. Prepared by ERM, 2023.

The DEWTA project activities involve the DAN Field. The Dan E platform is approximately 29 km from the closest NOVANA program station. 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, and the impact assessment.

9. OUTLINE ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

9.1 Introduction

This outline Environmental and Social Management Plan (ESMP) summarises the avoidance, minimisation and mitigation measures that are required to manage the potential environmental and social impacts of the DEWTA project. These measures address the anticipated project-related impacts, including potential unplanned/accidental events, identified in Section 5.6. Impact Assessment and mitigation, from the planning, mobilisation, plugging and operational activities of the Project.

The key objectives of this outline ESMP are as follows:

- To maintain continuing compliance with legal requirements (local, national and international) and TEPDK's corporate policies;
- To provide the initial mechanism for measures identified in the ESIA report to mitigate potentially adverse impacts to be implemented;
- To provide a framework for mitigating impacts during project execution;
- To provide assurance to regulators and stakeholders that requirements for environmental, social and health performance shall be met;
- To undertake monitoring to demonstrate that predictions made within the ESIA report are valid; and
- To provide a framework for the compliance auditing and inspection programmes that shall enable TEPDK to be assured that its aims for environmental, social and health performance are being met.

The overall objective of this outline ESMP is to provide a practical tool to summarize and list the minimisation and mitigation measures identified and committed to in the ESIA report. These measures will be translated into practical management actions, which can be adequately implemented, resourced, monitored and reported against throughout the planning, installation, mobilisation and operational phases of the Project.

9.2 Outline ESMP Scope

This outline ESMP shall be applied to the Project's planning, mobilisation, plugging and operational activities, as carried out by TEPDK and its representatives (a new assessment shall be carried out prior to decommissioning so that adequate procedures are followed).

The DEWTA Project's AoI is likely to include the following:

- the physical project footprint;
- areas adjacent to the site that may be affected by emissions and effluents; and
- the area affected by any unplanned event from project activities.

9.3 Regulatory Requirements

TEPDK employees and all contractors and subcontractors throughout the supply chain for the Project activities shall adhere to the applicable regulatory framework for the project described in Section 2 Regulatory Framework of this report.

9.3.1 TEPDK's Health, Safety and Environmental Policy

TEPDK's senior management has committed to a set of principles and standards to support and enhance TEPDK's environmental performance in line with the TEPDK Health, Safety and Environmental (HSE)

Policy (Figure 9.1). The HSE Policy aligns with the TotalEnergies Group Safety Health Environment & Quality (SHEQ) Charter and is fit for the purpose and context of the organisation.

Figure 9.1 TEPDK's HSE Policy (September 2022)

TotalEnergies

TotalEnergies EP Danmark A/S

HEALTH, SAFETY AND ENVIRONMENT POLICY

In TotalEnergies EP Danmark, we are committed to deliver our business objectives while holding health, safety and environment (HSE) as a core value with the belief that all incidents are preventable and that we can be an incident free organization.

Throughout the lifecycle of our activities, we aim to provide a safe and healthy working environment for our employees, contractors and other stakeholders; to protect the environment; and to prevent major accident hazards and pollution. We seek to achieve continuous improvement and sustainability with respect to HSE, as a responsible Operator and an integral part of Danish society.

This commitment is in line with the TotalEnergies Group SHEQ Charter, and is visibly demonstrated through our implementation and embedment of the One Maestro Principles in the Company Management System.

A high standard of HSE performance by everyone who works for or with us is critical to the success of our business. Accordingly, we expect our suppliers, contractors and partners to share our values and ambitions.

IT IS OUR POLICY TO:

- Comply with all applicable legal and other obligations including TotalEnergies Referential, follow industry HSE best practice, and support Danish tripartite consultations.
- Systematically identify and assess all risks to which people, the environment and assets are exposed, and implement measures to eliminate or reduce such risks to As Low As Reasonably Practicable (ALARP).
- Minimise the impact to climate, natural environments and biodiversity through the reduction of our carbon footprint and ensure the efficient use of resources in all company activities, products, services and designs.
- Adopt the principle of continuous improvement by setting measurable objectives, monitoring and reviewing performance and effectiveness through independent audits and analysis of results.
- Maintain a positive HSE culture, through strong visible leadership and safety representation, in which each person cares for colleagues, both employees and contractors, behaves in an honest and transparent manner, and acts as role model in accordance with our Golden Rules and Company Values.
- Require anyone working for the company, be it any employee or contractor, to proactively intervene and stop an ongoing activity if actions or situations are unsafe or have the immediate potential to lead to an accident.
- Recognize good HSE performance, ensure a just and fair culture, and protect whistle blowers.
- Ensure our employees and contractors are equipped with the right skills and competencies to fulfill their responsibilities in HSE matters.
- Learn from experience by promoting a proactive HSE incident reporting culture, investigating causes, effectively identifying and closing out the actions to avoid reoccurrence.
- Ensure our emergency response capability is suitable for responding to the worst case scenarios and regularly test its effectiveness through periodic controlled exercises.
- Actively engage with relevant stakeholders to understand their HSE interests and foster open and long-term dialogue to achieve our HSE objectives.

We expect that all employees familiarize themselves with the content of our HSE Policy and work accordingly, enabling us to reach our objectives within health, safety and the environment.

September 2022

Eric Delattre Managing Director
Louise Koldig HSE Manager
Nathanael Herbomez Asset Manager
Yannick Neaud Finance & Business Services Manager
Jens Kjell Larsen Business Dev, and JV Manager
Jennifer Stien HR Manager
Olivier Gochely Project Director Tyra Redevelopment
Susanne Lassen Business Transformation

TEPDK-L1-POL-HSE-0001-E Rev. 8

Source: TEPDK, 2023

9.3.2 TEPDK's Environmental Management System and Plans

The Environmental Management System (EMS) is part of TEPDK's Health, Safety and Environmental Management System (HSE-MS) and its associated framework (ONE MAESTRO). ONE MAESTRO is TotalEnergies' HSE Management System Framework that ensures all affiliates have a harmonised approach to HSE across all branches of the TotalEnergies Group. The EMS is therefore a collection of practices, processes, procedures, standards and documentation that TEPDK uses to implement ONE MAESTRO with regard to the environmental aspects of its current operations.

The EMS follows a "Plan-Do-Check-Act" (PDCA) management system model (Figure 9.2). This enables TEPDK to continually improve, adopt a risk-based approach, develop improvement plans, periodically review performance and progress, and effectively react to changing internal and external factors.

Figure 9.2 PDCA Model and the TotalEnergies ONE MAESTRO HSE Framework

Source: TEPDK, 2022

This outline ESMP shall be incorporated into the TEPDK Environmental Management System. TEPDK shall also integrate the DEWTA project into existing plans. A list of management system plans that have already been created by TEPDK that shall be followed during the DEWTA project, are presented below.

These are the management plans deemed relevant to ensuring adequate management of environmental and social impacts, consequently this is not an exhaustive list of all the plans created by TEPDK.

9.3.2.1 Leadership and Commitment

- Health Safety and Environmental Policy, TEPDK-L1-POL-HSE-0001-E;
- HSE Management System Manual, TEPDK-L2-MAN-HSE-007-E;
- Environmental Management System Manual, TEPDK-L2-PRO-HSE-0011-E.

9.3.2.2 Planning

- Stakeholder and Local Impact Management, CR-GR-HSE-412;
- Local Content / In Country Value development, CR EP HSE 131.

9.3.2.3 Operational Controls

- Operational Safety Procedures (OSPs);
- Drilling and Well Integrity Management Systems (WIMS);
- Field Operations Management System (FOMS);
- Logistics and Services Operations (LSO) Management System;
- Energy Management System Danish Business Unit TEPDK-L2-PRO-EN-FP-0006-E;
- Chemical Management Plan, TEPDK-L2-PRO-HSE-0028-E;
- Environmental Management of Offshore Chemicals, TEPDK-L2-PRO-HSE-0010-E;
- Waste Management Plan, TEPDK-L2-PRO-HSE-0026-E.

9.3.2.4 Emergency Preparedness & Response

- TEPDK's Emergency Management Procedure, TEPDK-L2-PRO-HSE-0020-E;
- Offshore Contingency Plan, TEPDK-L2-PRO-HSE-0021-E;
- Oil/Chemical Spill Contingency Plan, TEPDK-L2-PRO-HSE-0016-E;
- TEPDK Blowout Contingency Plan (BOCP), TEPDK-L2-PRO-WLS-0043-E.

9.3.2.5 Contractor Management

- Procedure – Contract Process TEPDK/TUDK, TEPDK-L2-PRO-CP-0001-E;
- HSE Requirements for Contractors, CR-GR-HSE-501;
- Qualification Inspection and Compliance of Contractors, GM-GR-HSE-504;

9.3.2.6 Air Emissions

- Manual for Emissions Monitoring CO_2, NOX, VOC, SOX, TEPDK-L2-PRO-FO-0097-E;
- General Emissions Monitoring Plan (CO_2, NOx, SOx, VOC), TEPDK-L2-PRD-FO-0003-E;

9.3.2.7 Offshore Surveys

- Environmental baseline and monitoring studies: Offshore and Coastal Waters, GS EP ENV 112.

9.3.2.8 Competency and Training

- HSE Training of Exploration and Production Personnel, CR EP HSE 081;
- HSE Technical Training for HSEQ Domain Personnel, CR EP HSE 082;
- HSE Training for the Field Operations, CR EP EXP 754;
- HSE Well Control and Chain of Command Trainings for Drilling and Wells Personnel, CR EP FP 250;
- HSE Training for Projects & Construction Discipline, CR EP PJC 421.

9.3.2.9 Audits & Non-compliances

- Audit Procedure, TEPDK-L2-PRO-HSE-0037-E;
- TEPDK HSE Event Reporting, Investigation and Return on Experience, TEPDK-L2-PRO-HSE-0012-E.

9.4 Implementation

This outline ESMP is applicable to all work activities during the planning, mobilisation, plugging and operational phases of the proposed activities. This outline ESMP shall be fully integrated into TEPDK's existing management system documents (HSE-MS) by TEPDK prior to the proposed Dan E Well temporary abandonment Project activities to cover the implementation of the Project following its approval.

TEPDK shall provide a copy of the approved ESMP and associated approvals to the Project contractors and subcontractors. The approved ESMP shall be bridged to the contractor's ESMP or a copy shall be kept onboard and complied with during the relevant vessel and rig activities.

The updated existing DEWTA project plans shall:

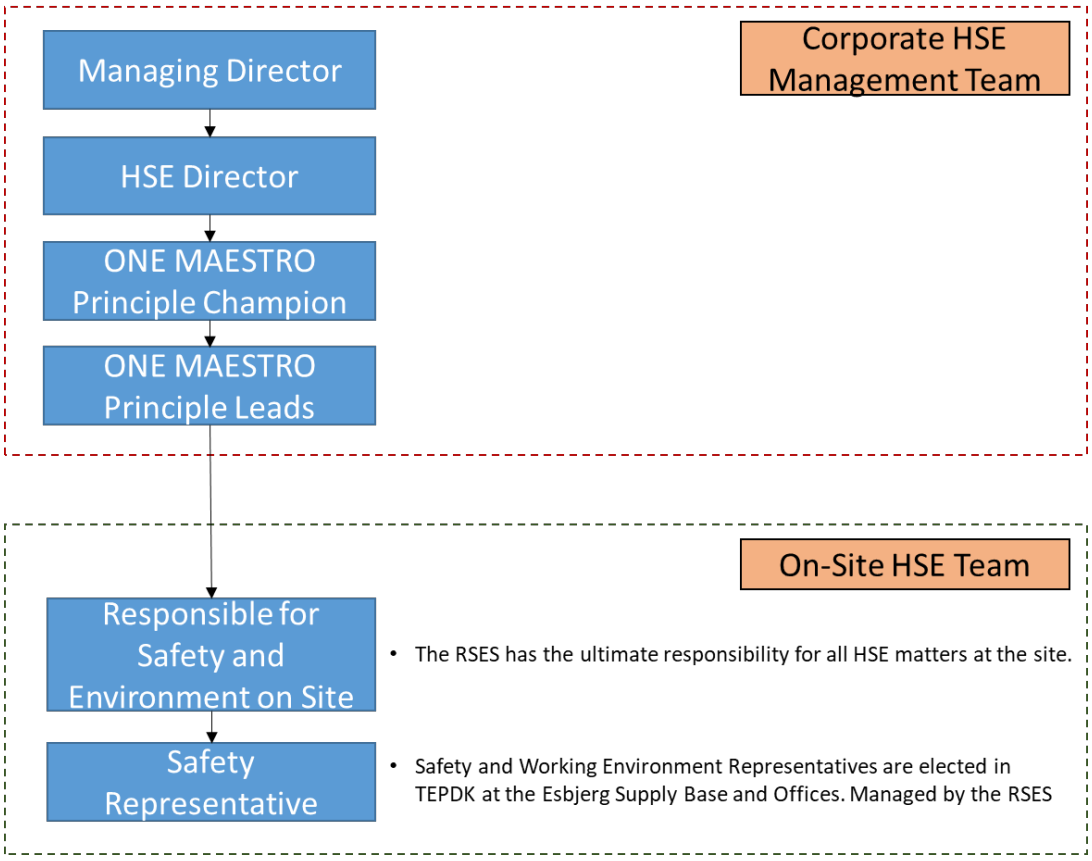
- List the commitments made in the ESIA report (Commitments Register) to avoid, minimize and mitigate potentially adverse impacts, enhance positive benefits and document roles and responsibilities for ensuring that they are implemented;
- Identify and outline relevant policies, processes, procedures and management plans required to implement the identified avoidance, minimization and mitigation measures;
- Provide the basis for monitoring the effective implementation of the identified avoidance, minimization and mitigation measures and ascertain their efficacy; and
- Assist in meeting compliance with all Applicable Standards (i.e. relevant national legislation and TEPDK standards).

9.5 Roles and Responsibilities

The overall roles and responsibilities for the TEPDK organization are described in the TEPDK Management System document (TEPDK-L2-PRO-HSE-0011-E). Figure 9.3 provides a simplified overview of the HSE management structure at TEPDK. This figure shows the roles responsible for HSE at a corporate level and at the project level.

The ultimate responsibility for the Project's environmental performance lies with TEPDK, specifically the Managing Director and Health, Safety and Environment (HSE) Director. This shall involve ensuring that the HSE requirements are applied and that all requirements are met by contractors and subcontractors engaged in work, including monitoring the performance of its contractors and the overall Project. Environmental commitments shall be incorporated into operational procedures, working practices and overall management procedures. TEPDK shall be required to track and steward implementation of the approved ESMP.

Figure 9.3 TEPDK's HSE Management Team



Source: TEPDK, 2022

9.6 Environmental Management Programme Commitments Register

This section details the specific management commitments for implementation to prevent, minimise or manage significant negative impacts and optimise and maximise any potential benefits of the Project. These commitments are presented for the planning, mobilisation, temporary abandonment operational activities (a new assessment shall be carried out prior to decommissioning to ensure adequate procedures are followed).

TEPDK and its contractors and subcontractors throughout the supply chain shall abide by the measures mentioned here, which are further complemented by those shown.

These ESMP Commitments Registers (Table 9.1 and Table 9.2) are structured in the following manner so that the avoidance, minimisation and mitigation measures have a clear and logical context within which they are designed, implemented, monitored and evaluated:

- Potential Impact;
- Source of Impact;
- Control / Mitigation Measures;
- Party Responsible; and
- Timing / Frequency.

The significance rating of the residual impacts summarised in Section 5.7 assumes that the recommended mitigation measures have been fully implemented, and that they have been effective. Thus, regardless of the significance rating presented, the mitigation measures are necessary.

Table 9.1 ESMP Commitments Register for Planned Activities

Activity	Source of Impact	Control/ Mitigation Measures	Party Responsible	Timing / Frequency
Phase 1: Rig Mobilization Phase 2: 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.	■ TEPDK ■ HSE ■ Contracting & Procurement	■ Throughout the project's planning, mobilization and temporary abandonment phases
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.	■ TEPDK ■ HSE ■ Contracting & Procurement ■ Contractors	■ During temporary abandonment
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.	■ TEPDK, ■ Contractors and supply chain	■ When applicable

Table 9.2 ESMP Commitments Register for Unplanned/Accidental Events

Potential Impact	Source of Impact	Control/ Mitigation Measures	Party Responsible	Timing / Frequency
■ Contamination of marine environment ■ Toxic effects on marine fauna ■ Contamination of fish catches ■ Risk to public health and safety ■ Risks to workers' health and safety ■ Degradation of sensitive areas	■ 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) 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.	■ TEPDK ■ All contractors and supply chain	Throughout the project's planning, mobilization, and temporary abandonment phases
	■ 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.	■ TEPDK/ All contractors and supply chain	Throughout the project's planning, mobilization, and temporary abandonment phases
	■ 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;	■ TEPDK/ All contractors and supply chain ■ HSE and onshore ops ■ DUC onshore control centre	■ Prior to starting temporary abandonment activities ■ During plugging activities

Potential Impact	Source of Impact	Control/ Mitigation Measures	Party Responsible	Timing / Frequency
		■ 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.	■ TEPDK/ All contractors and supply chain	Throughout the project's planning, mobilization, and temporary abandonment phases

9.7 Monitoring and Auditing

Monitoring and auditing of the environmental impacts of the Dan E Well temporary abandonment 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.

Through the process of monitoring and auditing, TEPDK shall seek to ensure that the conditions stipulated within the approved ESMP and its applicable standards, procedures and guidelines are complied with. Audits and verification of sub-suppliers shall, wherever possible, be performed as a joint effort with the contracting supplier.

Monitoring and audits shall be documented, and any corrective actions shall be assigned owners and timescales for implementation. An action-tracking database shall be used to coordinate the close out of corrective actions in a timely manner.

Monitoring and audit findings, along with their respective improvement programmes, shall be regularly reported to TEPDK senior management.

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.

10. CONCLUSIONS

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 project, presented as DEWTA project ("*Dan E Well Temporary Abandonment Project*"), will be developed from the existing Dan Echo infrastructure (Dan E), installed in water 45 m deep in the south-western part of the Danish sector of the North Sea (approximately 210 km west of Esbjerg and 185 km from the closest point on land). Dan E is relatively far from the maritime boundaries (EEZ) of Germany (20 km), Netherlands (45 km), Norway (113 km) and the UK (115 km). The Swedish maritime borders are more than 400 km from Dan E. Dan E is located close to Dan F facilities and approximately 9 km from Halfdan facilities (TEPDK) and 14 km from Skjold (TEPDK).

The Dan E wells were drilled in 1976 and were originally oil producers. In 1996, four wells including DE-01 and DE-02 were converted to water injection wells. All production has been shut in on Dan E since 2018. The DE-01 and DE-02 wells have both historically sustained casing pressure and recent investigations show that both wells only have one barrier (tubing and packer) from reservoir to surface. The risk assessment recommended to temporary abandon these wells. The Temporary Abandonment activities will be performed with a jack-up rig positioned close to Dan E.

The ESIA assessed the potential impacts of the DEWTA project and assessed the risks and impacts of potential unplanned events. The impact assessment is based on the methodology presented in Sections 5.1 and 5.2. Impacts, positive or negative, were described in terms of their characteristics, including the impact type and its spatial and temporal features (namely extent, duration, and scale). The impact assessment process involved assessing the significance of impacts identified through a scoping process (Section 5.3).

The *outcome of the assessment process for the planned activities* has identified that, by implementing the embedded control measures defined in Chapter 6, the DEWTA project will have **Negligible** impacts. These are summarised as follows:

- Impacts on climate change due to GHG emissions during the mobilization and temporary abandonment phases: negligible significance before and after mitigation. GHG emissions arising from the project represent about 0.01% of the total annual GHG emissions (CO_2 equivalent) of Denmark in 2021 according to EEA (2022);
- Impacts on seawater quality due to Inhibited Seawater/WBM and used cement discharges: negligible significance before and after mitigation. During the temporary abandonment phase key impacts are related to the discharge of inhibited seawater, WBM and used cement. Temporary abandonment activities will be intermittent over 99 days (short-term) and based on modelling, the impact is localized near the point of discharge. TEPDK will implement a Chemical Management Plan and a Waste Management Plan in line with Company's Standards and in compliance with OSPAR recommendations on offshore chemical and discharges. The DEWTA project will use limited quantities of only green and yellow classified substances. All WBMs will be retained and returned to shore for processing and disposal, i.e., WBMs and swarf will not be discharged under normal operations during milling activities.
- Impacts on the seabed and sediment quality due to Inhibited Seawater/WBM and used cement discharges: negligible significance before and after mitigation. The impacts are linked to the impacts on seawater quality described above. The effects on the seabed sediment quality are negligible considering the significantly small extent of impacts due to the discharges, the used cement not discharged on the seabed and the short timeframe of the temporary abandonment activities.

Regarding *Cumulative Impacts* (Section 6), the DEWTA project activities are planned in Q4 2023 (lasting approximately 99 days) and TEPDK is considering using only one jack-up rig for all its DUC operations, thus not involving simultaneous activities with its other development projects. No significant cumulative impacts are expected to occur as part of the DEWTA project and no cumulative

impacts will adversely affect any EU Habitat and Birds Directives sites (e.g. Natura2000 sites), the closest of which is 26.9 km away (SAC Doggerbanke - DE1003301, in Germany).

This ESIA has followed a systematic approach to identify *unplanned events, primarily related to potential spills*. Unplanned events are episodes that are not expected to occur during the DEWTA project's normal temporary abandonment activities. A risk evaluation for spills was conducted for impacts on environmental and social receptors in accordance with TEPDK's Risk Matrix (presented in Section 5.2.3.2). The outcome of the risk assessment process has identified that unplanned events (Section 5.6) will have a **Low** or **Medium** risk, which is considered **As Low As Reasonably Practicable (ALARP):**

- A **Medium Risk** is evaluated for 'Hydrocarbon/Chemicals Spills (Minor/Tier 1): e.g., hose failure during bunkering'. The risk is medium but is determined by '*minor pollution with a very limited environmental impact*' but with a '*Likely'* frequency of occurrence;
- A **Low Risk** is evaluated for 'Diesel Spills (Tier 2) from Vessel Collisions / Vessel to Vessel and Helicopter to Platform', 'Loss of containment as a consequence of dropped objects' and 'Hydrocarbon Spills (Major/Tier 3): Well Blowout'. The collision risk is determined by a '*Pollution having significant environmental consequences'* but with an '*Extremely Unlikely'* frequency of occurrence. The loss of containment as a consequence of dropped objects is determined by a '*Minor pollution with a very limited environmental impact'* with an '*Unlikely'* frequency of occurrence. For the blow out event, TEPDK contracted Oil Spill Response Ltd (OSRL) to conduct an oil spill modelling for a similar project. Impacts are discussed in full detail in Section 5.6.3.3. The modelled scenarios show that the seawater column impacts above the OSPAR threshold of 70 ppb was not reached. The hydrocarbon concentrations were below 25 ppb (threshold for the most sensitive marine life) within the Natura 2000/OSPAR MPA Doggerbank, or any other affected area. Results for shoreline impact above the threshold of 0.1 l/m^2 are expected with a probability of 55% in Denmark, 73% in Norway and 48% in Sweden. All the shoreline impacts would be related to light oiling, except for a small area in the northern tip of Denmark with moderate oiling.

Regarding *Transboundary Impacts* (Chapter 6), it is unlikely that there will be significant adverse transboundary environmental impacts due to planned activities for the project, given the localised and temporary nature of the environmental impacts associated with the proposed activities of the DEWTA project, and the distances between the DEWTA project area and the land and sea borders of neighbouring countries.

The potential effects on the Natura 2000 conservation sites were assessed in accordance with the EC Habitats Directive (92/43/EEC). The *Natura 2000 screening assessed* (Chapter 7) the potential impacts during both the planned mobilization and temporary abandonment activities and unplanned events phases of the DEWTA Project on the following Natura 2000 sites: SAC Doggerbank (DE1003301) found in Germany at 26.9 km to the west; SAC Doggersbank (NL2008001) found in Netherlands 56 km to the south west; SAC Jyske Rev, Lillefiskerbanke (DK00VA257) found in Denmark 175 km to the north east; SPA and SAC Sydlige Nordsø (DK00VA347) found in Denmark 109 km to the south east; SAC Sylter Außenriff (DE1209301) found in Germany 99 km to the south east.

The Natura 2000 screening assessment is based on the main ESIA evaluations and the unlikely blowout scenario during well temporary abandonment as summarized in the previous sections.

The assessment has demonstrated that the DEWTA project will not result in any likely significant effects on habitats and species populations for which Natura 2000-sites listed above have been designated, neither on Annex IV species.

The ESIA presents a specific section (Chapter 8) dealing with the *Marine Strategy Framework Directive (MSFD)*. The 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 MSFD as defined by the Danish Marine Strategy II

(Danish Ministry of Environment, 2019). As summarized in Section 8 the DEWTA project's environmental impacts will not hinder the achievement of good environmental status for the relevant descriptors.

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APPENDIX A LEGISLATIVE FRAMEWORK

1. LEGISLATIVE FRAMEWORK

1.1 Environmental Impact Assessment

1.1.1 Subsoil Act (Consolidation Act no. 1533 of 16/12/2019)

The purpose of this Act is to ensure appropriate use and exploitation of the Danish subsoil and its natural resources. The Act applies to:

- Preliminary investigations, the exploration for and production of raw materials in the Danish subsoil that were not subject to private commercial exploitation in Denmark prior to 23 February 1932.
- Use of the subsoil for storage or for purposes other than the production of raw materials.
- Scientific investigations of the subsoil that are important to the activities referred to in the paragraphs above.
- Emergency procedures for adjoining oil and natural gas pipelines facilities, separation facilities and terminal facilities for crude oil to secure the country's hydrocarbon supply.

The Act also applies in Danish territorial waters, the Danish EEZ and to the Danish continental shelf area.

1.1.2 Act on Environmental Assessment of Plans and Programmes and of Specific Projects (EIA) - LBK no. 4 of 03/01/2023

The "Act on Environmental Assessment of Plans and Programmes and of Specific Projects (EIA) - LBK no. 4 of 03/01/2023"[38] contains provisions implementing the Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment and parts of the EIA Directive 2011/92/EU ("Assessment of the effects of certain public and private projects on the environment" and the last 2014 amendment with Directive 2014/52/EU).

The purpose of the LBK 4 Act is to ensure a high level of environmental protection and to contribute to the integration of environmental considerations during the preparation and adoptions of plans and programs and by permitting projects with a view to promoting sustainable development, by conducting an environmental assessment of plans, programs and projects that can have a significant impact on the environment. The environmental assessment assesses the impact on the environment as a result of the project, including biological diversity, population, human health, flora, fauna, soil, land, water, air, climatic factors, material goods, landscape, cultural heritage, major human and natural disaster risk and accidents and resource efficiency and the interrelationship between these factors.
The Act has 7 Annexes:

- Annex 1 "Projects covered by section 15, paragraph 1, no. 1": projects that must undergo an EIA procedure":
    - 1. Petroleum refineries (except those producing lubricants exclusively from crude oil) and installations for the gasification and liquefaction of at least 500 tonnes of coal or bituminous shale per day.
    - 2.(a) conventional power stations and other combustion plants with a thermal output of at least 300 MW; (b) nuclear power stations and other nuclear reactors, including the dismantling and decommissioning of such power stations or reactors (excluding research installations for the production and processing of fissionable and fertile materials, the maximum capacity of which does not exceed 1 kW of continuous thermal output);
    - 3.(a) installations for the reprocessing of irradiated nuclear fuel; (b) Installations intended for (*other* processes in the context of nuclear energy)
    - 4. (a) integrated iron and steel works for the production of pig iron and crude steel; (b) installations for the extraction of non-ferrous crude metals from ores, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes;

- 5. installations for the extraction of asbestos and for the treatment and processing of asbestos and products containing asbestos
- 6. Integrated chemical plants,
- 7. (a) long-distance rail installations and airports;
- 8. (a) inland waterways and inland ports which may be visited by vessels of more than 1 350 tonnes; (b) merchant seaports, jetties for loading and unloading connected to port facilities on land and at sea (excluding ferry piers) which may be visited by vessels of more than 1 350 tonnes;
- 9. Installations for the disposal of hazardous waste by incineration, chemical treatment (as defined in Annex I to Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste15), section D9) or landfilling as defined in point 3 of Article 2 of that Directive.
- 10. Installations for the disposal of non-hazardous waste by incineration or chemical treatment (as defined in Annex I to Directive 2008/98/EC, section D9) with a capacity exceeding 100 tonnes per day.
- 11. Groundwater abstraction or artificial groundwater supply works where the volume of water abstracted or supplied is at least 10 millionm3/year.
- 12. (a) installations for the transfer of water resources between river basins, where the aim is to prevent possible water shortages and where the volume of water transferred exceeds 100 millionm3/year; (b) In all other cases, installations for the transfer of water resources between river basins where the average volume of water in the basin from which the water is transferred exceeds 2,000 millionm3/year over several years and the volume of water transferred exceeds 5% of that volume.
- 13. Waste water treatment plants with a capacity exceeding 150 000 population equivalents as defined in Article 2(6) of Council Directive 91/271/EEC of 21 May 1991 concerning urban waste watertreatment.
- 14. Extraction of more than 500 tons of crude oil/day and more than 500,000m3 of natural gas/day for commercial purposes.
- 15. Dams and other installations for the storage or permanent storage of water when the volume of new or additional storage or storage exceeds 10million m3.
- 16. Pipelines with a diameter of more than 800 mm and a length of more than 40 km: (a) for the transport of gas, oil, chemicals; (b) for the transport of carbon dioxide (CO2) streams for the purpose of geological storage, including associated pumping stations.
- 17. Installations for intensive poultry and pig farming with more than:
- 18. Industrial plants for the production of: (a) pulp of wood or other fibrous materials; (b) paper and board with a production capacity exceeding 200 tonnes per day.
- 19. Extraction of raw materials from opencast quarries where the area of the site exceeds 25 hectares or peat extraction on an area exceeding 150 hectares.
- 20. Extraction of raw materials from opencast quarries with a total recovery period of more than 10 years, with the exception of extraction within the excavation areas identified in a final adoption plan for raw materials.
- 21. Construction of high-current overhead lines with a voltage of at least 220 kV and a length of more than 15 km.
- 22. Installations for the storage of petroleum, petrochemical or chemical products with a capacity of 200,000 tonnes or more.

- 23. Storage site within the meaning of Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide18).
- 24. Installations for the capture of CO 2 streams from installations covered by this Annex for the purposes of geological storage pursuant to Directive 2009/31/EC or where the total annual capture of CO2 is 1,5 megatonnes or more.
- 25. installations for the direct purpose of fracturing solely in connection with exploration or extraction of shale gas.
- 26. Extraction of raw materials in the territorial sea and continental shelf in international nature protection areas, cf. Executive Order on the designation and administration of international nature protection areas and the protection of certain species.
- 27. Extraction of raw materials in the territorial sea and the continental shelf, which annually or collectively exceeds previously permitted, in common areas, cf. section 20(2)(2) of the Mineral Resources Act, where there is a valid permit for extraction that has not been granted on the basis of specific field studies of the environment.
- 28. Extraction of raw materials in the territorial sea and continental shelf of quantities exceeding 10,000 m3 per year or 50,000m3 in total in areas other than those referred to in point 27 where extraction of raw materials has not previously been permitted on the basis of specific field studies of the environment.
- 29. Any modification or extension of projects listed in this Annex, provided that such modification or extension in itself meets the thresholds, if any, set out in this Annex.

- Annex 2 ‘Projects covered by section 16’: projects that must undergo a Screening procedure;
- Annex 3 ‘Criteria for determining the likely significance of the environmental impact referred to in Section 10’: section 10 is about the Screening decision;
- Annex 4 ‘Information referred to in section 12”: section 12 is under Chapter 5 on “Environmental report, monitoring programme and summary statement’;
- Annex 5 ‘Information as referred to in section 19, paragraph 1, no. 1 (Information from the developer about the projects listed in Annex 2)’;

38 https://www.retsinformation.dk/eli/lta/2023/4

- Annex 6 “Selection criteria referred to in section 21”: criteria for the screening decision;
- Annex 7 “Information referred to in section 20(1) (Information for the environmental impact assessment report)”.

An environmental assessment of plans and programs is a process consisting of the preparation of an environmental report, conducting consultations, considering the environmental report and the results of the consultations in decision-making, and notification of the decision in accordance with the Act. An environmental report is part of the documentation concerning plans or programs that contains information from section 12 and Annex 4 of the Act.

Section 12 of the Act states that the environmental report (the EIA) shall include:

- Information that can be reasonably required, taking into account current knowledge and current assessment methods and how detailed the plan or program is, what it contains, what stage it is located in a decision process and whether conditions are better assessed at another stage;
- Information on the impact of the plan or program on the environment obtained at a different stage of the decision-making process or due to other legislation and covered by Annex 4 may be used in the environmental report; and
- A description of the intended measures regarding monitoring of the significant impacts on the environment in the implementation of the plan or program in accordance with rules laid down by the Minister of the Environment. The environmental report’s monitoring program shall be prepared to identify unforeseen adverse effects and take early appropriate remedial action.

Annex 4 of the Act states that the environmental report shall also include:

- an outline of the content, main objectives and links of the plan or program with other relevant plans and programs;
- the relevant aspects of the current environmental status and its likely development if the plan or program is not implemented;
- the environmental conditions in areas which may be significantly affected;
- any existing environmental problem relevant to the plan or program, in particular problems in areas of particular importance to the environment;
- the environmental protection objectives established at international, Community or Member State level, relevant to the plan or program, and how these objectives and other environmental considerations have been taken into account;
- the likely significant impact on the environment, including factors mentioned above and the interrelationship between them;
- planned measures to avoid, limit and offset any significant adverse effects on the environment of the implementation of the plan or program;
- a brief outline of the reasons for choosing the alternatives that have been considered and a description of how the assessment was carried out;
- a description of the proposed monitoring measures in accordance with section 14; and
- a non-technical summary of the information provided under the above points.

The Proponent submits an environmental impact report for a project covered by the requirements for permission, screening decision and the authority’s competence. The projects considered under section 15, which due to their nature, dimensions or location can be expected to have a significant impact on the environment, and therefore may not be commenced until the authority. Projects for the exploration and extraction of hydrocarbons, underground storage, pipelines etc. are covered by various points in Annex 1 and Annex 2.

The information that the client must provide about the applied-for project in the environmental impact report must demonstrate, describe, and assess the significant direct and indirect effects of the project on the factors mentioned above. Information referred to in section 20 of the Act is detailed in Appendix 7. The environmental impact report shall include at least the following information:

- a description of the project with information about the project's location, design, dimensions and other relevant features;
- a description of the project's expected significant impacts on the environment;
- a description of the characteristics of the project or the measures envisaged to avoid, prevent or limit and, if possible, neutralize the expected significant adverse effects on the environment;
- a description of the reasonable alternatives which the developer has examined and which are relevant to the project and its specific characteristics, and an indication of the main reasons for the chosen solution, taking into account the project's impacts on the environment;
- a non - technical summary of the information referred to in points 1 to 4; and
- any additional information referred to in Annex 7 that is relevant to the specific characteristics of a particular project or project type and to the environment that may be expected to be affected.

1.1.3 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 (Executive Order BEK no. 1050 of 27/06/2022)

This Ordinance concerns materiality assessment and impact assessment relating to nature protection areas and the protection of certain animal species in connection with projects in Danish territorial waters, in the Danish exclusive economic zone and on the Danish continental shelf. Applicable projects include those on feasibility study, exploration, extraction and transport of hydrocarbons, projects on the continental shelf on the exploration of the seabed and certain pipeline installations, projects on the continental shelf on the establishment of pipelines for the transport of hydrocarbons. The DEA requires the Proponent to draw up and submit an impact assessment before assessment for a permit and approval of the project. This ordinance contains provisions implementing parts of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive) and Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (Bird Protection Directive).

1.2 Other Legislation

1.2.1 Danish Fishery Act (LBK no. 17 of 04/01/2017, Ministry of Food, Agriculture and Fisheries)

The Danish Fishery Act sets regulations on the management of fisheries with the purposes of protecting living resources in marine and fresh-water and for protecting other marine animals and plants, to safeguard commercial fishing and related commercial activities.

The impact a project will have on fishing grounds must be assessed and addressed, if relevant, according to the Act.

1.2.2 Act on Ionizing Radiation and Radiation Protection (BEK no. 23 of 15/01/2018, DHARP)

The purpose of the Radiation Protection Act is to minimize the population's exposure to man-made and natural radiation and dispersal of radioactive material in the environment, to the extent it is realistically possible. The present Act is applicable to the use of radiation sources and exposure in any situation including Naturally Occurring Radioactive Material (NORM) and is managed through the Danish Health Authority, Radiation Protection (DHARP) Sundhedsstyrelsen (SIS).

1.2.3 Executive Order on Transboundary Shipments of Radioactive Waste and Spent Nuclear Fuel (BEK no. 672 of 1/7/2019, Ministry of Health and the Elderly)

This Executive Order (No. 672 of 1 July 2019) describes the authorization and reporting procedures to be observed for transboundary shipments of radioactive waste and spent nuclear fuel if the activity and activity concentration of a consignment exceed the values in Annex 3 of Executive Order No. 670 of 1 July 2019 on Use of Radioactive Substances.

1.3 International Agreements and Conventions

Denmark is a contracting party to international conventions, treaties and agreements which may have applicable requirements to TEPDK activities.

1.3.1 United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS) is an international treaty concerned with the territorial seas and the contiguous zone, the continental shelf, the high seas, fishing and conservation of living resources on the high seas. This Convention establishes the rights of coastal states, including navigation rights and the exploration for and exploitation of resources, such as oil and gas. It is a comprehensive regime of law and order in the world's oceans and seas establishing rules governing all uses of the oceans and their resources.

UNCLOS was incorporated into Danish law in 2005. The sovereignty of Denmark extends to its territorial sea. Denmark has sovereign rights for the purpose of exploring the continental shelf and exploiting its natural resources.

The Danish continental shelf is defined in accordance with UNCLOS as comprising the submerged prolongation of the land territory of the coastal State - the seabed and subsoil of the submarine areas that extend beyond its territorial sea to the outer edge of the continental margin, or to 200 nautical miles where the outer edge of the continental margin does not extend up to that distance.

The Danish EEZ comprises areas beyond and adjacent to the territorial waters extending seaward 200 nautical miles from the applicable coastal baselines.

1.3.2 International Maritime Organisation Conventions

The International Maritime Organisation (IMO) is the UN specialised agency responsible for the safety and security of shipping and the prevention of marine and atmospheric pollution by ships. Conventions include:

1. Convention for the Control and Management of Ships Ballast Water and Sediments (Convention on Ballast Water);
2. Convention on the Control of Harmful Anti-fouling Systems on Ships (Convention on anti-fouling systems);
3. Convention on Civil Liability for Oil Pollution Damage;
4. Convention on Oil Preparedness, Response and Co-operation;
5. Convention for the Prevention of Pollution from Ships, by the Protocol of 1978 (MARPOL 73/78) as modified; and
6. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (The London Convention).

Denmark strives to create regulation that ensures a level playing field for all countries' ship owners, while also ensuring that the shipping industry becomes safer and cleaner. This is achieved in cooperation with the other maritime nations that are members of the IMO. When Denmark has ratified a convention and it has entered into force, the Danish authorities are responsible for enforcing it.

1.3.3 The MARPOL 73/78 Convention

The International Convention for the Prevention of Pollution from Ships addresses pollution from ships by oil, by noxious liquid substances carried in bulk, harmful substances carried by sea in packaged form, sewage, garbage, and the prevention or air pollution from ships. The expression 'ship' in these regulations includes fixed and floating platforms, and the requirements also apply to offshore installations which are engaged in international voyages, e.g., drilling rigs. MARPOL 73/78 contains several provisions relevant to the TEPDK activities. These include general requirements regarding waste management, oil contaminated water discharges (e.g., bilge water), and grey and black waste water discharges.

Denmark has ratified its agreement to all six MARPOL 73/78 Annexes. Special areas with strict controls on operational discharges are included in most of these. MARPOL 73/78 defines certain sea areas as Special Areas. These areas are provided with a higher level of protection than other areas of the sea.

Annex VI Regulation for the Prevention of Air Pollution from Ships entered into force in 2005. It sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances. It also establishes designated Emission Control Areas setting more stringent standards for SO_x, NO_x and particulate matter (PM). The North Sea is designated a Special Area under Annex I and V and an Emission Control Area under Annex VI of MARPOL 73/78. MARPOL 73/78 is incorporated in Danish law.

1.3.4 The Convention for the Protection of the Marine Environment of the North-East Atlantic

The convention for the protection of the marine environment of the North-East Atlantic (OSPAR[39]) entered into force in 1998. OSPAR contains several Annexes which focus on prevention and control of pollution from different types of activities. OSPAR has a focus on application of the precautionary

[39] OSPAR is so named because of the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris).

principle, and on use of Best Available Technique (BAT), Best Environmental Practice (BEP) and clean technologies.

Strategies and recommendations from OSPAR which are relevant to the Project are:

- Annual OSPAR report on discharges, spills and emissions from offshore oil and gas installations;
- Reduction in the total quantity of oil in produced water discharged and the performance standard of dispersed oil of 30 mg/l (OSPAR Recommendation 2001/1);
- Harmonised mandatory control system for the use and reduction of the discharge of offshore chemicals (OSPAR decision 2005/1). Changes have been presented under OSPAR Recommendation 2017/01 on a Harmonised Pre-screening Scheme for Offshore Chemicals, as amended by OSPAR Recommendation 2019/04;
- List of substances/preparations used and discharged offshore which are considered to pose little or no risk to the environment (PLONOR) (OSPAR decision 2005/1) – proposed changes from OSPAR Recommendation 2019/02;
- To phase out the discharge of offshore chemicals that are, or which contain substances, identified as candidates for substitution, except for those chemicals where, despite considerable efforts, it can be demonstrated that this is not feasible due to technical or safety reasons (OSPAR Recommendation 2006/3). OSPAR Recommendation 2019/02 amending OSPAR Recommendation 2006/3 on Environmental Goals for the Discharge by the Offshore Industry of Chemicals that Are, or Which Contain Substances Identified as Candidates for Substitution had effect from 1 January 2018 and should be reviewed and, if necessary, revised in 2020. Upon taking effect, this Recommendation supersedes OSPAR Recommendation 2016/4;
- OSPAR Recommendation 2020/03 amending 2012/5 to manage the environment risk posed by added and naturally occurring chemicals in produced water discharges. It introduced the risk-based approach (RBA) to the Management of Produced Water Discharges from Offshore Installations. RBA is an approach aimed at managing produced water discharges based on a characterization of the risk to the environment of a produced water discharge by examining both the exposure due to discharge of the produced water effluent and the sensitivity of the receiving environment to this exposure and by taking appropriate measures to avoid or minimise exposure levels above the PNEC (Predicted No Effect Concentration: the concentration of a chemical or effluent below which adverse effects on the aquatic ecosystem and its organisms will most likely not occur during long-term or short term exposure); and
- OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations. Decision 98/3 on the disposal of disused offshore installations applies to the decommissioning of offshore oil and gas facilities.

1.3.5 Code of Practice on the International Transboundary Movement of Radioactive Waste

On 21 September 1990, the General Conference of the International Atomic Energy Agency, by resolution GC(XXXIV)/RES/530, adopted a Code of Practice on the International Transboundary Movement of Radioactive Waste and requested the Director General to take all necessary steps to ensure wide dissemination of the Code of Practice at both the national and the international level.

Every State should take the appropriate steps necessary to ensure that radioactive waste within its territory, or under its jurisdiction or control is safely managed and disposed of, to ensure the protection of human health and the environment. Every State involved in the international transboundary movement of radioactive waste should take the appropriate steps necessary to ensure that such movement is undertaken in a manner consistent with international safety standards.

The Code of Practice also includes other guidelines regarding the state's sovereign right to prohibit the movement of radioactive waste through its territory, to ensure and facilitate the safe transfer and to ensure correct disposal.

1.3.6 Basel Convention

The Basel Convention is the Control of Transboundary Movements of Hazardous Wastes and the Disposal. The overarching objective of the Basel Convention is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics (article 1 and annexes I, III, VIII and IX), and two waste types defined as "other wastes" (i.e., household waste and incinerator ash; article 1 and annex II). The provisions of the Convention centre around the following principal aims: (i) the reduction of hazardous waste generation and the promotion of environmentally sound management of hazardous wastes, wherever the place of disposal; (ii) the restriction of transboundary movements of hazardous wastes except where it is perceived to be in accordance with the principles of environmentally sound management; and (iii) a regulatory system applying to cases where transboundary movements are permissible.

1.3.7 London Convention and Protocol

The London Convention's objective is to promote the effective control of all sources or marine pollution and to take all practicable steps to prevent pollution of the sea by dumping of wastes and other matter.

In 1996, the London Protocol was agreed to further modernise the London Convention, and eventually replace it. Under the protocol, all dumping of waste is prohibited, except for possibly acceptable wastes on the so-called "reverse list". The London Convention and London Protocol are fully incorporated in Danish law.

1.3.8 United Nations Framework Convention on Climate Change

Under the United Nations Framework Convention on Climate Change (UNFCCC), developed countries are required to take measures aimed at reducing emissions of GHG (particularly carbon dioxide, CO_2), and to assist developing countries. Denmark ratified the UNFCCC in 1993 and it entered into force in 1994. The stated objective of the UNFCCC is to stabilise GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

1.3.9 Convention on Biological Diversity

The Convention on Biological Diversity establishes three main goals:

1. the conservation of biological diversity;
2. the sustainable use of its components; and
3. the fair and equitable sharing of the benefits from the use of genetic resources.

The Convention guides national strategies and policies and implements themes such as sustainable use and the precautionary principle.

Denmark is party to the convention since 21/03/1994 (ratification) targeting significant reduction in the current rate of biodiversity. Denmark has outlined its nature conservation policy objectives in a range of documents which are being implemented. The sea is an important resource for Denmark and a critical part of the country's environment and nature.

In January 2019, Denmark's Ministry of Environment and Food of Denmark published the 6th National Report[40]. The 6th Country Report has been adapted to a Danish and a European context. Along with the other EU Member States, Denmark has joined the EU Biodiversity Strategy, a common European contribution to meet the UN global targets on biodiversity. The EU Biodiversity Strategy overall aims to stop biodiversity loss by 2020, and sets six targets towards achieving this goal. On this basis, in 2014, the European Commission prepared a 5th Country Report for the EU to the UN, and the European Commission also prepares a 6th Country Report for the EU to the UN.

1.3.10 Ramsar Convention

The Ramsar Convention is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The convention entered into force in Denmark on 2 January 1978 with BKI No 26 of 04/04/1978 'Ordinance of the Convention of 2 February 1971 on Wetlands of International Importance, in particular as Habitats for Waterfowl'.

Under the "three pillars" of the Ramsar Convention, the contracting parties commit to:

7. Designate suitable wetlands for the List of Wetlands of International Importance and ensure their effective management;
8. Work towards the wise use of all their wetlands through national land-use planning, appropriate policies and legislation, management actions, and public education; and
9. Cooperate internationally concerning transboundary wetlands, shared wetland systems, shared species, and development projects that may affect wetlands.

Denmark currently has 43 sites designed as Wetlands of International Importance including along the west coast of Denmark.

1.3.11 Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS).

ASCOBANS was concluded under the auspices of the Convention on Migratory Species in 1991. It was incorporated into Danish law in 1994. The parties under this agreement will undertake to cooperate closely to achieve and maintain a favourable conservation status for small cetaceans. The following 20 cetacean species are protected under ASCOBANS:

- *Delphinus delphis* – Short-beaked Common Dolphin;
- *Feresa attenuata* - Pygmy Killer Whale;
- *Globicephala macrorhynchus* Short-finned Pilot Whale;
- *Globicephala melas* - Long-finned Pilot Whale;
- *Grampus griseus* - Risso's Dolphin;
- *Hyperoodon ampullatus* - Northern Bottlenose Whale;
- *Kogia breviceps* - Pygmy Sperm Whale;
- *Lagenorhynchus acutus* - Atlantic White-sided Dolphin;
- *Lagenorhynchus albirostris* - White-beaked Dolphin;
- *Mesoplodon bidens* - Sowerby's Beaked Whale;
- *Mesoplodon densirostris* - Blainville's Beaked Whale;
- *Mesoplodon europaeus* - Gervais' Beaked Whale;

[40] https://mim.dk/media/216815/sixth_danish_country_report.pdf

- *Mesoplodon mirus* - True's Beaked Whale;
- *Orcinus orca* - Killer Whale;
- *Phocoena phocoena* - Harbour Porpoise;
- *Pseudorca crassidens* - False Killer Whale;
- *Stenella coeruleoalba* - Striped Dolphin;
- *Steno bredanensis* - Rough-toothed Dolphin;
- *Tursiops truncatus* - Bottlenose Dolphin;
- *Ziphius cavirostris* - Cuvier's Beaked Whale.

1.3.12 World Heritage Convention - UNESCO World Heritage Site

The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The Wadden Sea on the west coast of Denmark is protected as a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage site.

1.3.13 Convention on the Conservation of Migratory Species of Wild Animals

The Convention on the Conservation of Migratory Species of Wild Animals (CMS or Bonn Convention) provides a global platform for the conservation and sustainable use of migratory animals and their habitats. The CMS aims to conserve terrestrial, aquatic and avian migratory species throughout their range. The CMS ranges from legally binding treaties to less formal instruments, such as Memoranda of Understanding, and can be adapted to the requirements of particular regions. Under the CMS, various agreements and memoranda of understanding have been signed. Agreements under the auspices of the CMS, aim to conserve:

- Populations of European Bats;
- Cetaceans of the Mediterranean Sea, Black Sea and Contiguous Atlantic Area;
- Small Cetaceans of the Baltic, North-East Atlantic, Irish and North Seas;
- Seals in the Wadden Sea;
- African-Eurasian Migratory Waterbirds;
- Albatrosses and Petrels; and
- Gorillas and their Habitats.

Denmark has ratified the CMS and it came into effect in 1983.

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