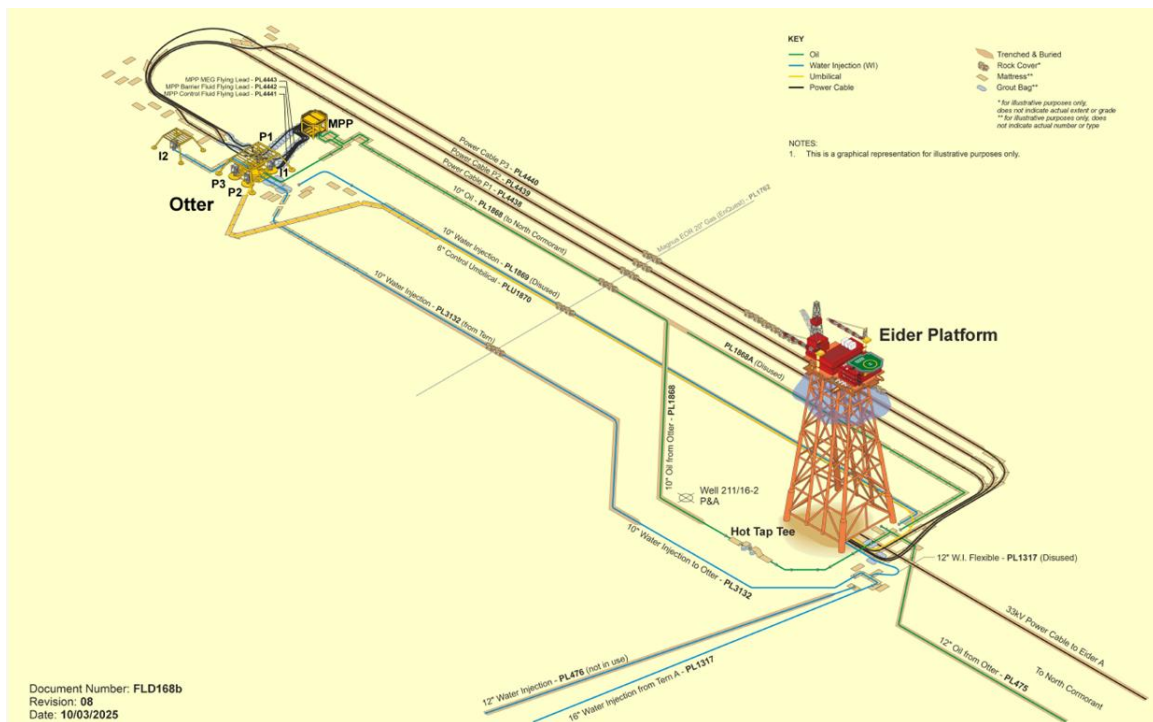




OTTER FIELD DECOMMISSIONING

Subsea Environmental Appraisal



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ABBREVIATIONS

Abbreviation	Meaning
AET	Apparent Effect Threshold
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
AR6	sixth assessment report
AWMP	Active Waste Management Plan
BAT	Best Available Technique
BC	Background Concentrations
BEIS	Department for Business, Energy & Industrial Strategy
BEP	Best Environmental Practise
CA	Comparative Assessment
CAD	Computer-Aided Design
CCC	Climate Change Committee
CCS	Carbon Capture and Storage
CFCs	chlorofluorocarbon
CH ₄	Methane
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
CoP	Cessation of Production
CPR	Continuous Plankton Reader
CSV	Construction Support Vessel
DECC	Department for Energy and Climate Change
DESNZ	Department for Energy Security and Net Zero
DoB	Depth of Burial
DP	Decommissioning Programme
DSV	Dive Support Vessel
DTI	Department of Trade and Industry
EA	Environmental Appraisal
EBS	Environmental Baseline Survey
EEMS	Environmental Emissions Monitoring System
EIA	Environmental Impact Assessment
EMS	Environmental Management System
EPS	European Protected Species
ERL	Effect range low
EU	European Union
EUNIS	European Nature Information System
EWC	European Waste Catalogue Codes
FOCI	Feature of Conservation Interest
FRS	Fisheries Research Services
GHG	Greenhouse Gas
GIS	Geographical Information Systems
GJ	Gigajoules

Abbreviation	Meaning
HSE	Health, Safety and Environment
HSSE	Health, Safety, Security and Environment
ICES	International Council for the Exploration of the Sea
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
INTOG	Innovation and Targeted Oil and Gas
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JAMP	Joint Article Management Promotion-consortium
JNCC	Joint Nature Conservation Committee
LAT	Lowest astronomical tide
LTOBM	Low Toxicity Oil Based Muds
MarLIN	Marine Life Information Network
MARPOL	International Convention for the Prevention of Pollution from Ships
MCZ	Marine Conservation Zone
MDAC	Methane-derived authigenic carbonates
MEG	Monoethylene glycol
MMO	Marine Management Organisation
MoD	Ministry of Defence
MPE	Ministry of Petroleum and Energy
MPP	Multi-phase Pump
NCMPA	Nature Conservation Marine Protected areas
NMP	National Marine Plan
NMPI	National Marine Plan Interactive
NNS	Northern North Sea
NOAA	National Oceanic and Atmospheric Administration
NORM	Naturally Occurring Radioactive Material
NorOG	Norsk Olje and Gass
NO _x	Nitrous oxides
NPD	Naphthalenes, Phenanthrenes and Dibenzothiophenes
NSTA	North Sea Transition Authority
O ₃	Ozone
OBM	Oil-based Mud
OEUK	Offshore Energies United Kingdom
OGA	Oil and Gas Authority
OGUK	Oil and Gas United Kingdom
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	The Oslo Paris Convention
OWF	Offshore Wind Farm
PAH	Polynuclear Aromatic Hydrocarbons
PCO	Precipitated Carbonates
PMF	Priority Marine Feature

Abbreviation	Meaning
POC	Particulate Organic Carbon
PSA	Particle size analysis
ROV	Remotely Operated Vehicle
ROVSV	Remotely Operated Vehicle Support Vessel
SAC	Special Areas of Conservation
SBM	Synthetic Based Mud
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SCOS	Special Committee on Seals
SEA	Strategic Environmental Assessment
SEEMP	Shipboard Energy Efficiency Management Plan
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SMP	Sectoral Marine Plan
SNH	Scottish National Heritage
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
SSS	Side Scan Sonar
THC	Total Hydrocarbon Content
TOC	Total Organic Carbon
TOM	Total Organic Matter
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
UKCS	UK Continental Shelf
UKHO	UK Hydrographic Office
UKOOA	UK Offshore Operators Association
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
VMS	Vessel Monitoring System
VOCs	Volatile organic compounds
WBM	Water-Based Mud
WHPS	Wellhead protection structure

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1 EXECUTIVE SUMMARY

1.1 Introduction and Background

This Environmental Appraisal (EA) assesses the potential environmental impacts resulting from the decommissioning of the Otter subsea facilities. The purpose of this EA is to understand and communicate the potential significant environmental impacts associated with the proposed decommissioning of the Otter subsea facilities, hereon referred to as the 'Otter Area'.

The Otter subsea facilities are located in Block 210/15a of the United Kingdom Continental Shelf (UKCS). The Otter pipelines cross Block 211/16b and to a lesser extent Blocks 211/16a, 211/16d and 210/20a. The Eider platform, which is located in Block 211/16a provided subsea controls / utilities for the Otter field. The Otter manifold is approximately 119 km northeast of Unst in Shetland and 38 km west of the UK/Norway median line (Figure 2-1).

The Otter field was discovered in October 1977 and commenced production in 2002. Otter production was originally routed to the Eider platform located 21 km south-east of Otter. However, in 2018 a subsea production bypass was implemented to allow production to the North Cormorant platform, 32 km south-south-east of Otter, while the Eider platform was switched to 'utility' mode. Otter production was supported by water injection, provided from the Tern platform. Hydrocarbons were exported from the Otter Field via the North Cormorant platform to the south and onwards through the Brent Pipeline System to the Sullom Voe Terminal on the Shetland Islands.

The North Cormorant platform and associated subsea installations, including the Otter field reached Cessation of Production (CoP) in Q2 2024. All facilities are out of use following CoP.

The facilities within the Otter Area which are included in the Otter subsea Decommissioning Programme (DP; Xodus, 2026) and therefore the scope of this EA, is listed below.

1.1.1 Structures

- Otter Template;
- Otter Manifold;
- Otter Manifold Protection Structure (including three production wells and one water injection well);
- Multiphase Pump (MPP) station;
- Satellite Water Injection Wellhead Protection Structure; and
- Multiphase Pump (MPP) Station, and MPP module.

1.1.2 Pipelines

- Production Pipelines;
- Water Injection Pipelines;
- Control / chemical umbilicals;
- Power cables; and
- Jumpers connecting the satellite water injection well and MPP to the Otter manifold.
- Production pipelines, water injection pipelines, control / chemical injection umbilical, and power cables;

1.1.3 Protection/Stabilisation Materials

- Concrete mattresses;

- Grout Bags;
- Concrete Block Supports; and
- Rock protection.

1.2 Regulatory Context

The decommissioning of offshore oil and gas infrastructure in the UKCS is principally governed by the Petroleum Act 1998, as amended by the Energy Act 2008, which sets out the requirements for a formal Decommissioning Programme (DP) and the approval process. The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) which sits within the Department for Energy Security and Net Zero (DESNZ) published Guidance Notes on Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998 (BEIS, 2018). This Guidance describes a proportionate Environmental Assessment (EA) process that culminates in a streamlined EA Report to support the DP. The EA process focuses on scoping out of non-significant impacts and presenting a detailed assessment of potentially significant impacts.

The Guidance Notes (BEIS, 2018) also state that subsea installations (e.g., drilling templates, wellheads, and other subsea structures) must, where practicable, be completely removed for reuse or recycling or final disposal on land. With regards to pipelines (including flowlines and umbilicals), the Guidance Notes (BEIS, 2018) require that these should be considered on a case-by-case basis and highlights instances where pipelines could be decommissioned *in situ*. For example, pipelines that are adequately buried or trenched or which are expected to self-bury could be considered as candidates for *in situ* decommissioning. Where an Operator is considering decommissioning pipelines *in situ*, the decision-making process must be informed by a Comparative Assessment (CA) of the feasible decommissioning options. However, small diameter pipelines, including flexible flowlines and umbilicals, are expected to be entirely removed (BEIS, 2018). Finally, the Guidance Notes (BEIS, 2018) state that mattresses and grout bags installed to protect pipelines should be removed for disposal, reuse or recycling onshore, if their condition allows.

1.3 Proposed Schedule

The precise timing of the decommissioning activities is not yet confirmed and will be subject to market availability of decommissioning services and contractual agreements. The potential window for Otter Area decommissioning activities is between 2029 – 2032.

1.4 Options for Decommissioning

TAQA used a CA process in line with the recommendations in relevant Guidance (BEIS, 2018) to determine the preferred decommissioning options for the Otter Area. Each decommissioning option was assessed against five criteria – safety, environment, technical, societal, and economic. The CA outlined the decommissioning options available for the various types of pipelines. Recommended options for pipelines included:

- Full removal of surface laid umbilicals, jumpers, and spools by cut and lift techniques or reverse installation;
- Full removal of surface laid portions of pipelines and umbilicals and protection/stabilisation features that are not in close proximity to the Eider platform¹;

¹ Limited sections of surface laid flowlines and umbilicals in close proximity to the Eider platform may be decommissioned *in situ*, subject to derogation to leave the footings in place, and agreement with OPRED.

- Removal of line ends and remediation of snagging risk (rock placement) for flexible flowlines and umbilicals trenched and buried that will be decommissioned *in situ*; and
- Removal of line ends and remediation of snagging risk (rock placement) for low integrity and/or concrete coated rigid pipelines trenched and buried.

Protection and stabilisation materials (including mattresses, concrete block supports and grout bags) will be removed from the seabed. Where difficulties arise TAQA will discuss and agree with OPRED alternative decommissioning solutions.

1.5 Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in the Otter Area are summarised in Table 1-1.

Table 1-1 Key Environmental and Social Sensitivities for the Otter Area

Physical Characteristics
<p>The water depth across the Otter Area ranges from 180.7 – 191.8 m below Lowest Astronomical Tide (LAT). The seabed deepens very gently towards the northwest with a gradient of <math><1^\circ</math> throughout.</p> <p>To the south of the Otter manifold, the mean wave height ranges from 2.11 - 2.40 m whilst to the north it ranges from 2.41 - 3.30 m and wave energy is classified as 'low'. The mean residual current through the Otter Area is approximately 0.05 to 0.1 m/s to the south or east.</p> <p>The physical seabed characteristics recorded from survey work show a high degree of uniformity across the Otter Area. Sediments around the Otter manifold comprise silty, shelly sand with occasional pebbles and cobbles, while within Eider survey area sediments are dominated by sands. Survey identified numerous depressions across the Otter Area, all less than one metre deep.</p> <p>Under the European Nature Information System (EUNIS) habitat classification, the most widespread seabed type across the Otter Area is predicted to be MD52 "Atlantic offshore circalittoral sand" with areas of MD62 "Atlantic offshore circalittoral mud" and MD32 "Atlantic offshore circalittoral coarse sediment". This habitat type falls within the broad habitat Priority Marine Feature (PMF) "offshore subtidal sands and gravels".</p> <p>There are no drill cuttings piles associated with the Otter manifold as defined by OSPAR (2006). Otter I2 was the only well drilled with Organic Phase Fluid (OPF). The definition of an OPF cuttings pile within OSPAR Recommendation 2006/5 "The Management Regime for Offshore Cuttings Piles" places the cuttings accumulation at Otter I2 well outside the scope of the recommendation. All the other production wells and water injection well at the manifold were drilled with Water Based Mud (WBM), and thus any associated cuttings accumulations would not be expected to pose a potential for significant environmental effects (IOGP, 2016; Bakke <i>et al.</i>, 2013).</p> <p>A distinct cuttings pile has been identified at the Eider Platform. The Eider cuttings pile was estimated at to cover an area of 15,891 m² with a pile volume of approximately 11,267 m³, which is classed as a medium cuttings pile (5,000-20,000 m³, as per Norsk Olje Gass (NorOG) guidance (2016)).</p>
Sediment Chemical Composition
<p>Analyses of the Otter manifold area and along the Otter to Eider pipeline route revealed concentrations largely representative of fine sandy sediments in the NNS. The recorded Total Hydrocarbon Concentrations (THCs) also fall below 50 µg g⁻¹ value, that represents the OSPAR threshold above which hydrocarbons are expected to have a "significant environmental impact".</p> <p>At several stations within 500 m of the Eider platform there is evidence of drilling related hydrocarbon contamination (exceeding the UK Offshore Operators Association (UKOOA) 95th percentile for the NNS) in the form of zinc. There is also some evidence of elevated THC within 250 m of the Eider platform, in line with levels recorded during cuttings pile surveys carried out at platforms across the North Sea.</p> <p>Surveys were undertaken of the Eider cuttings pile to determine the chemical composition. Elevated concentrations of cadmium, chromium, copper, mercury, nickel, lead and zinc were recorded across the cuttings pile, with levels generally exceeding their OSPAR Effect Range Low (ERL) levels. A gradient of THC levels decreased with distance from location, suggesting a point source of hydrocarbons most likely</p>

related to drilling discharges. THC levels recorded at most sample stations exceeded the OSPAR 'ecological effect' threshold. The sediment leachate analysis results indicated that both the oil loss to the water column and the persistence of hydrocarbons in the Eider cuttings pile fall below the relevant OSPAR threshold values and could generally be described as typical for cuttings piles at North Sea installations.

Seabed Habitats and Species

In broad terms, the infauna present is characterised by the most abundant species present, which appears very similar in all surveys undertaken in the Otter Area. Species consistently appearing in the lists of most abundant taxa centre around polychaetes and the bivalve molluscs.

The epifauna present in all areas is generally noted as sparse (in direct contrast to the infauna) and typically features species mobile that have wide distributions throughout the North Sea. These include, for example, hermit crabs, various starfish and sea urchins.

Fish and Shellfish

The Otter Area is within spawning grounds for cod, haddock, Norway pout, saithe and whiting. Atlantic cod is the only species with a high intensity spawning ground in the Otter Area (between February and March) while other species have a lower or undetermined spawning.

The Otter Area a potential nursery ground for anglerfish, blue whiting, European hake, haddock, herring, ling, mackerel, spurdog, whiting and Norway pout. Blue whiting is the only species with a high intensity nursery ground in the Otter area while other species have a lower nursery intensity.

Seabirds

In the NNS the most numerous species present are likely to be northern fulmar, black-legged kittiwake and common guillemot.

The Otter Area is located within or in the vicinity of a wider area of aggregation (or hotspots) for northern fulmar, northern gannet, European storm petrel, Arctic skua, great skua, black-legged kittiwake, herring gull, Arctic tern, guillemot, razorbill and Atlantic puffin during their breeding season.

Seabird sensitivity to oil pollution in the Otter Area is considered low throughout most of the year, though is considered medium for November through to February inclusive for in Block 210/15; November to January in Block 211/16 and November and December, increasing to high for January in Block 210/20.

Marine Mammals

Harbour porpoise, Atlantic white-sided dolphin, minke whale and beaked whale are the most abundant species recorded in the Otter Area. Harbour porpoise is by far the most frequently recorded cetacean in the Otter Area, which is reflective of this being the most abundant and widely distributed cetacean species in the North Sea.

Both grey and harbour seal densities are low in the Otter Area. The average number of both grey and harbour seals in the vicinity of the area is predicted to be low, between 0-1 per 25 km².

Conservation

There are no Nature Conservation Marine Protected areas (NCMPAs), Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) within 40 km of the Otter Area. The closest protected site is the Pobie Bank Reef SAC, approximately 96 km west of the Otter manifold.

According to the PMF distribution maps, the seabed in the Otter Area is within a wider area of 'subtidal sand and gravels' a seabed type designated as a PMF in Scottish waters, which supports fish populations.

With regards to free-swimming species, ling, anglerfish and cod were observed within the vicinity of the Eider platform and along Otter to Eider pipeline route. Ling, anglerfish and cod are PMF species. Additionally, cod is an OSPAR listed threatened and/or declining species.

Numerous small depressions and a few large depressions were identified during the Otter Area surveys. These might be classified as 'Submarine structures made by leaking gases' (Annex I Habitat). The lack of

Methane-Derived Authigenic Carbonates (MDAC) present in pockmarks identified across the Otter Area indicates that Annex I 'Submarine structures caused by leaking gases' are not present.

Ocean quahogs are listed on the OSPAR list of threatened and/or declining species and habitats and are designated as a PMF. Five individuals were identified during the Eider platform survey but not in aggregations. No ocean quahogs were observed in the vicinity of the Otter manifold or along the Otter to Eider pipeline route.

The habitat 'Seapen and burrowing megafauna communities' is also on the OSPAR list of threatened and/or declining habitats and species and is a PMF. Surveys identified evidence of this habitat along the Otter to Eider pipeline route with a large burrow density classified as 'frequent' on the top of the trenching pipeline mounds. These sections could therefore be considered as the 'Seapen and Burrowing Megafauna Communities' habitat.

Fisheries and Shipping

The Otter Area is located in International Council for the Exploration of the Sea (ICES) rectangles 52F0, 51F0 and 51F1. This region is primarily targeted for demersal species, with a negligible contribution from shell fisheries. Fishing effort is dominated by trawl fishing gears. Annual fishery landings by weight and value are considered to be broadly comparable to other high-performing ICES rectangles in the UKCS.

Shipping density in the Otter Area is very low or low. There are localised increases in vessel activity around surface installations including the Eider platform, due to the presence of operational and maintenance vessels.

Other Sea Users

The Otter Area is located in a well-developed area for oil and gas activity. The closest piece of surface infrastructure is the Magnus platform, 22 km east northeast of the Otter manifold. A number of the Otter pipelines cross the Magnus PL1762 pipeline, which connects the Magnus platform to the Sullom Voe oil terminal. Apart from pipelines and cables associated with the Otter manifold and Eider platform, and PL1762, there are no other cables or pipelines in the vicinity.

There are no planned or operating telecommunication cables within 40 km of the Otter Area. The nearest telecom cable is the Cantat 3 Faroese, located 77 km east northeast of the Otter manifold.

There are no designated military practice and exercise areas within 40 km of the Otter Area.

There are four (non-dangerous) wrecks between 30 and 40 km from the Otter Area. There are no planned or operating renewable energy sites within 40 km of the Otter Area. There are no planned or operating renewable energy sites within 40 km of the Otter Area. The closest renewable energy site is Tidal farm, Bluemull Sound, located 137 km west southwest of the Otter manifold. The closest Offshore Wind Farm (OWF) licence area is the NE1 ScotWind area, which lies approximately 110 km south-southwest of the Otter Area. The Otter Area is partially within areas identified under the Innovation and Targeted Oil and Gas (INTOG) scheme which targets smaller-scale OWF developments designed to reduce to oil and gas platform emissions. The Otter manifold is located within INTOG area NE-b and approximately 2 km to the south of INTOG area NE-a.

1.6 Impact Assessment Process

The impact assessment has been informed by several different processes, including identification of potential environmental issues through project engineer and marine environmental specialist review during a desktop scoping exercise, and consultation with key stakeholders (the Marine Directorate, the Joint Nature Conservation Committee (JNCC) and the Scottish Fishermen's Federation (SFF)).

An impact assessment exercise addressed the proposed decommissioning activities (Section 3.3) and any potential impacts these may pose. This assessment identified nine potential impact areas based on the chosen proposed removal method. Six potential impacts were scoped out of further assessment based on the low level of severity, or likelihood of significant impact occurring. An overview of the nine potential impacts is provided in

Table 1-2, together with justification statements for the scoping decisions and proposed mitigation measures.

Based on the initial scoping, three aspects warrant further assessment within the EA as having potential environmental and/or socioeconomic impacts. These are emissions to air, disturbance to the seabed and the physical presence of infrastructure decommissioned *in situ* in relation to other sea users. These three aspects are assessed further in Sections 6.2, 6.3 and 6.4 of this EA respectively.

Table 1-2 Environmental Impact Scoping Summary for the Otter Area

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Emissions to air	Yes	<ul style="list-style-type: none"> • Potential to contribute to global climate change. <p>Emissions generated during the proposed decommissioning operations are considered to be of low consequence (not significant). However, due to stakeholder, scientific and public concern around the cumulative impact of GHGs, atmospheric emissions resulting from project activities are assessed further in Section 6.2.</p>	See Section 6.2
Disturbance to the seabed	Yes	<ul style="list-style-type: none"> • Presence of protected habitats and species in the Otter Area. • Potential for disturbance to seabed during subsea decommissioning activities. • Seabed impacts may range in duration from temporary sediment suspension or smothering, to permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire. • Potential impact of long-term discharges from degrading infrastructure on the receiving environment. • Potential disturbance to cuttings pile located at Eider platform. <p>Impacts to the seabed from project activities are considered to be of a moderate consequence (significant) and are therefore assessed further in Section 6.3.</p>	See Section 6.3

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Planned discharges to sea	No	<ul style="list-style-type: none"> Pipelines and umbilicals will be flushed to an appropriate standard. Where this is not possible, this will be discussed with OPRED and an appropriate solution will be mutually agreed. Discharges from vessels are typically well-controlled activities. <p>Discharges to sea are considered to be of a negligible consequence (not significant) and are therefore not assessed further.</p>	<ul style="list-style-type: none"> International Convention for the Prevention of Pollution from Ships (MARPOL) compliance. Treatment and maceration to International Maritime Organization (IMO) standards. Bilge management procedures. Vessel equipment maintained according to manufacturer's recommendations. Vessel assurance procedures. Contractor management procedures. Compliance with the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005. Compliance with the Offshore Chemical Regulations 2002 (as amended). Regulator engagement on potential residual pipeline and subsea system discharges

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Physical presence of vessels in relation to other sea users	No	<ul style="list-style-type: none"> • Limited in duration. • Similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. • Vessel activity will not occupy 'new' areas. • Other sea users will be notified in advance of and after operations. • The decommissioning of the Otter Area is estimated to require up to five vessels however these would not all be on location at the same time, and there will be a maximum of two vessels working at any time. <p>The physical presence of vessels in relation to other sea users is of negligible consequence (not significant) and is therefore not assessed further.</p>	<ul style="list-style-type: none"> • Safety zones (where / when applicable and being mindful that arrangements will change at certain stages of the project). • United Kingdom Hydrographic Office (UKHO) standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings. • Use of Automatic Identification Systems (AIS) and other navigational controls.
Physical presence of infrastructure decommissioned <i>in situ</i> in relation to other sea users	Yes	<p>Scoping considered the highly unlikely but potentially major consequences (significant) on the fishing industry of decommissioning the infrastructure and drill cuttings piles <i>in situ</i>. The physical presence of infrastructure decommissioned <i>in situ</i> in relation to other sea users (namely commercial fisheries) has been fully assessed in Section 6.4.</p>	See Section 6.4

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Underwater noise emissions	No	<ul style="list-style-type: none"> Aside from vessel noise and cutting activities, there will be no other noise generating activities. Vessel presence and cutting activities will be limited in duration. The project is not located within an area protected for marine mammals. With industry-standard mitigation measures and adherence to JNCC guidance, EAs for offshore oil and gas decommissioning projects typically show no injury, or significant disturbance associated with these projects. The cutting technique is likely to be diamond wire, or possibly abrasive water jet. Recently published DESNZ (2023) guidance states that “Sound radiated from the diamond wire cutting of a conductor or abrasive water jets is not easily discernible above the background noise.” <p>On this basis, underwater noise emissions are considered to be of minor consequence (not significant) and are therefore not assessed further.</p>	<ul style="list-style-type: none"> Vessel management. Minimal vessel use/movement. Vessel sharing where possible. Cutting activities will be minimised and carried out in isolation where possible.
Resource use	No	<ul style="list-style-type: none"> Limited raw materials required (largely restricted to fuel use). Estimated total energy usage for the activities is 442,348 GJ. Of this total, 230,247 GJ is associated with the remanufacture of recyclable materials decommissioned <i>in situ</i> and 190,727 with offshore operation of vessels. Material returned to shore as a result of project activities will be managed in line with the waste hierarchy. <p>Resource use is considered to be of a negligible consequence (not significant) and is therefore not assessed further.</p>	<ul style="list-style-type: none"> Minimal number of vessels deployed. Use of low sulphur diesel. Vessel equipment maintained according to manufacturer's recommendations.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Onshore impacts/ Waste	No	<p>The waste brought to shore will be managed in line with TAQA's Waste Management Strategy and the Waste Hierarchy, as part of the project's Active Waste Management Plan (AWMP), using licensed waste contractors and in liaison with the relevant Regulators.</p> <p>Waste management is a highly regulated activity and is considered to be a of a minor consequence (not significant). It is therefore not assessed further.</p>	<ul style="list-style-type: none"> • 'Duty of Care' obligations. • Adherence to Waste Management Strategy. • Active waste tracking including close-out reporting. • Adherence to the Waste Hierarchy. • Selection of suitably authorised site and contractors. • Communication with relevant Regulator(s) – e.g., the Scottish Environment Protection Agency (SEPA). • Project Waste Management Targets focussed on maximising reuse and recycling. • Supply Chain Action Plan.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Unplanned events	No	<ul style="list-style-type: none"> The scope of the North Cormorant Oil Pollution Emergency Plan (OPEP) (TAQA, 2023a) includes the Otter facilities. This OPEP will be used to cover the Otter Area decommissioning activities. Any spills from vessels in transit and outside the Otter and Eider 500 m zones will be covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Vessel fuel inventories are split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory. Dropped object procedures are industry-standard and there is only a very remote probability of interaction with any live infrastructure. The <i>in situ</i> decommissioning of some infrastructure will also limit the potential for dropped objects or dislodged materials/objects. <p>The potential impacts are considered to be of a negligible consequence (not significant) and therefore do not warrant further assessment.</p>	<ul style="list-style-type: none"> Safety zones (where / when applicable and being mindful that arrangements will change at certain stages of the project). UKHO standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings. Use of AIS and other navigational controls. OPEP in place for operations. SOPEP on all vessels. Navigational warnings in place. Spill response procedures. Contractor management and communication. Lifting operations management of risk PON 1 / PON2 submissions. Careful planning, management, and implementation of activities. The location of any dropped or dislodged material will be accurately recorded and reported via Hydrographic Office and Kingfisher notification system.

1.7 Environmental Management

The project has limited activity associated with it beyond the main period of decommissioning. The main focus of environmental performance management for the project, is to ensure that the activities that will take place during the limited period of decommissioning happen in a safe, compliant and acceptable manner. This includes ensuring that there are no unacceptable environmental consequences following decommissioning. The primary mechanisms by which this will occur are TAQA's certified Environmental Management System (EMS) and Health, Safety, Security and Environment (HSSE) Policy.

To support TAQA's HSSE policy, a project Health, Safety and Environment (HSE) Plan will be developed to outline how HSE issues will be managed and how the policy will be implemented effectively. The plan will apply to all work carried out, both onshore and offshore. Performance will be measured to satisfy regulatory requirements, compliance with environmental consents and to identify progress on fulfilment of project objectives and commitments.

TAQA also operates a Waste Management Strategy and will develop an AWMP for the project to identify and describe the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the DPs for the Otter Area. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during decommissioning.

TAQA is committed to working towards the government policy of Net Zero in line with the North Sea Transition Authority (NSTA) Stewardship Expectation 11. This commitment includes decommissioning activities and is intended to drive increased energy efficiencies and minimise emissions. TAQA seeks to influence its joint venture partners and suppliers to ensure that everyone is striving to reduce and manage the emissions associated with the Otter Area decommissioning.

In terms of activities in the NNS, the National Marine Plan (NMP) has been adopted by the Scottish Government to help ensure sustainable development of the marine area. The NMP has been developed in line with UK, European Union (EU) and OSPAR legislation, directives and guidance. With regards to decommissioning, the NMP states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. TAQA has given due consideration to the Scottish NMP during project decision making.

1.8 Conclusions

This EA has considered the objectives and marine planning policies of the NMP across the range of policy topics including biodiversity, natural heritage, cumulative impacts and the oil and gas sector. TAQA considers that the proposed decommissioning activities are in alignment with these objectives and policies.

Risk assessment of air emissions led to the conclusion that the emissions associated with the Otter Area decommissioning are of low consequence for global climate change, and overall, not significant. TAQA acknowledge the context of global climate change and in line with NSTA's (2021) expectations is dedicated to minimising Greenhouse Gas (GHG) emissions, as far as is reasonable for each project.

Having reviewed the project activities and taken into consideration: the remote offshore location of the Otter Area; that the activities will have a small area of impact; that the benthos is likely to have a degree of natural resilience to suspension of natural and contaminated sediments; the availability of similar habitat within the context of the wider North Sea, as well as mitigation measures to limit impact, there is not expected to be a significant impact on the seabed environment or any European or nationally designated protected sites in proximity to the Otter Area decommissioning activities. In terms of potential drill cuttings impacts, considering that disturbance will be limited to the

localised excavation to facilitate disconnections and recovery of infrastructure including protection/stabilisation features from the seabed, it is concluded that contamination of the surrounding seabed is expected to be minimal. Overall, the impacts on the seabed sensitive receptors are expected to be low and therefore not significant in the context of the impact assessment.

Finally, there is not expected to be an impact on commercial fisheries from buried infrastructure decommissioned *in situ*. Should any fishing critical spans be identified during pre-decommissioning surveys then these will be remediated as appropriate. Should the survey and monitoring programme provide evidence of increase in a level of potential risk (from snagging), the areas of concern shall be remediated on a case-by-case basis. Coupled with plans to undertake a further pipeline burial study, plans to remediate fishing critical spans, and the relatively low presence of demersal fishing vessels in the Otter Area, impacts to commercial fisheries are deemed low and therefore not significant in the context of the impact assessment.

2 INTRODUCTION

In accordance with the Petroleum Act 1998, TAQA Bratani Limited (TAQA), an established United Kingdom Continental Shelf (UKCS) operator, on behalf of the Section 29 notice holders, is applying to The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for decommissioning the infrastructure associated with the Otter Field including subsea installations, pipelines, umbilicals and protection/stabilisation features.

This Environmental Appraisal (EA) has been conducted to assess the potential environmental impacts that may result from undertaking the subsea decommissioning activities as part of the decommissioning of the Otter Field (referred to as the Otter Area) (Figure 2-1).

The removal of the Otter template and water injection wellhead protection structures roof hatches in Q3 2024 and the associated environmental impacts are covered under a separate DP (TAQA, 2024a).

2.1 Project Overview

The Otter Area lies in the Northern North Sea (NNS) UKCS Blocks 210/15, 210/20 and 211/16 in a water depth of approximately 182 m. The Otter manifold lies approximately 119 km northeast of Unst in Shetland and 38 km west of the UK/Norway median line (Figure 2-2).

The Otter Field was discovered via well 210/15-2 in October 1977, with first production in October 2002 under the operatorship of TotalFinaElf Exploration UK Plc. Otter Field production was supported by the Tern platform located 27 km southwest from the Otter manifold. Production was originally routed to the Eider platform located 21 km southwest from the Otter manifold, however, in 2018, a subsea bypass was implemented to allow continued production to the North Cormorant platform, approximately 32.5 km to the south southeast of the Otter manifold, while the Eider platform was switched to 'utility' mode. Hydrocarbons were exported from the Otter Field via the North Cormorant platform to the south and onwards through the Brent Pipeline System to the Sullom Voe Terminal on the Shetland Islands.

Otter Field ownership has changed over the years with several merger and acquisition activities until TAQA Bratani Limited and TAQA Bratani LNS Limited assumed 100% equity in 2013. The Otter Field ceased production in Q2 2024.

2.1.1 Purpose of the Environmental Appraisal

This EA assesses the potential environmental impacts associated with the proposed Otter Area decommissioning activities. The impact identification and assessment process encompasses stakeholder engagement, comparison of similar decommissioning projects undertaken in the UKCS, expert judgement, and the results of supporting studies. This EA documents this process and details, in proportionate terms, the extent of identified potential impacts and any necessary mitigation/control measures proposed.

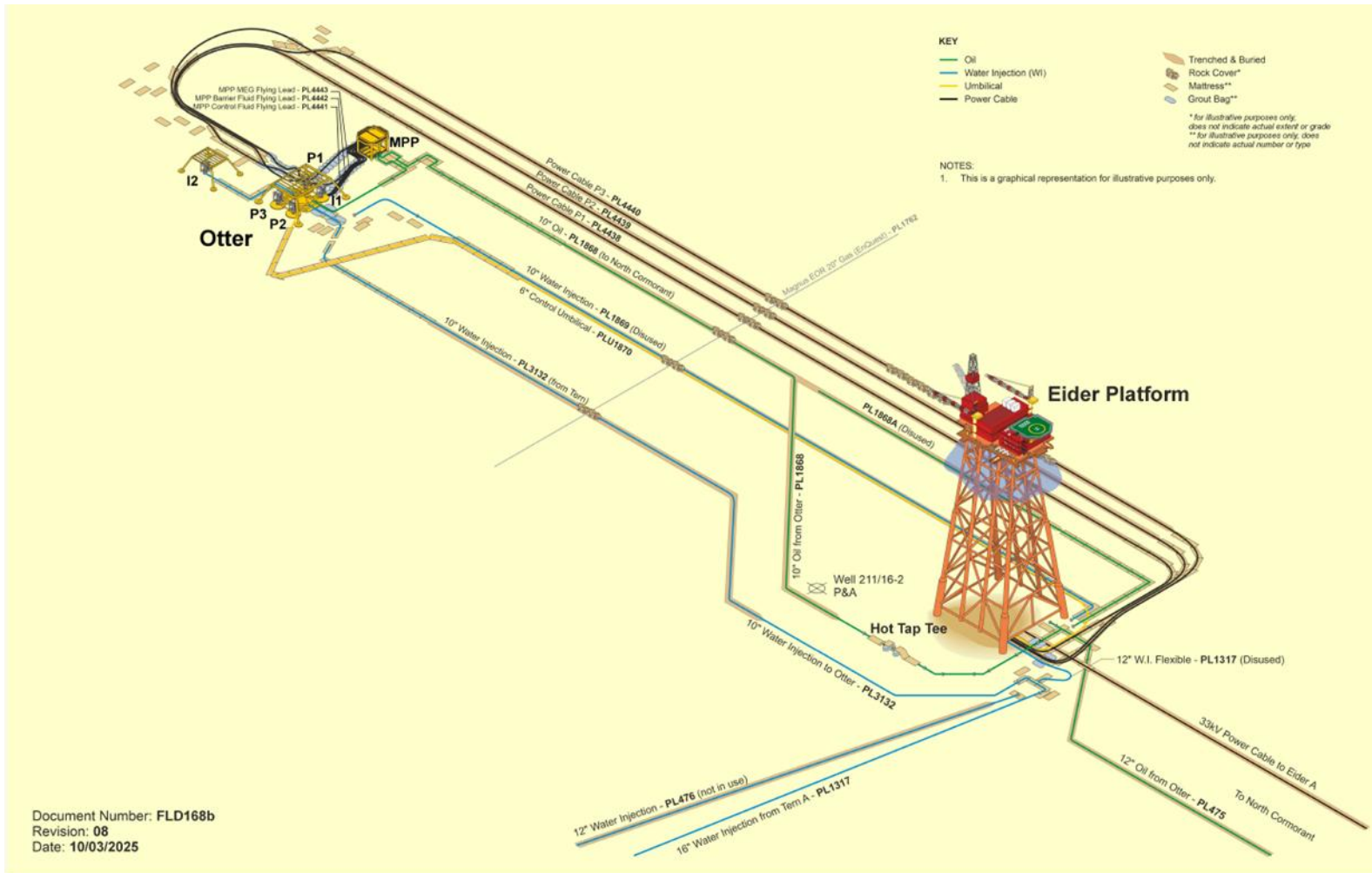


Figure 2-1 Otter Area Pipelines and Subsea Infrastructure

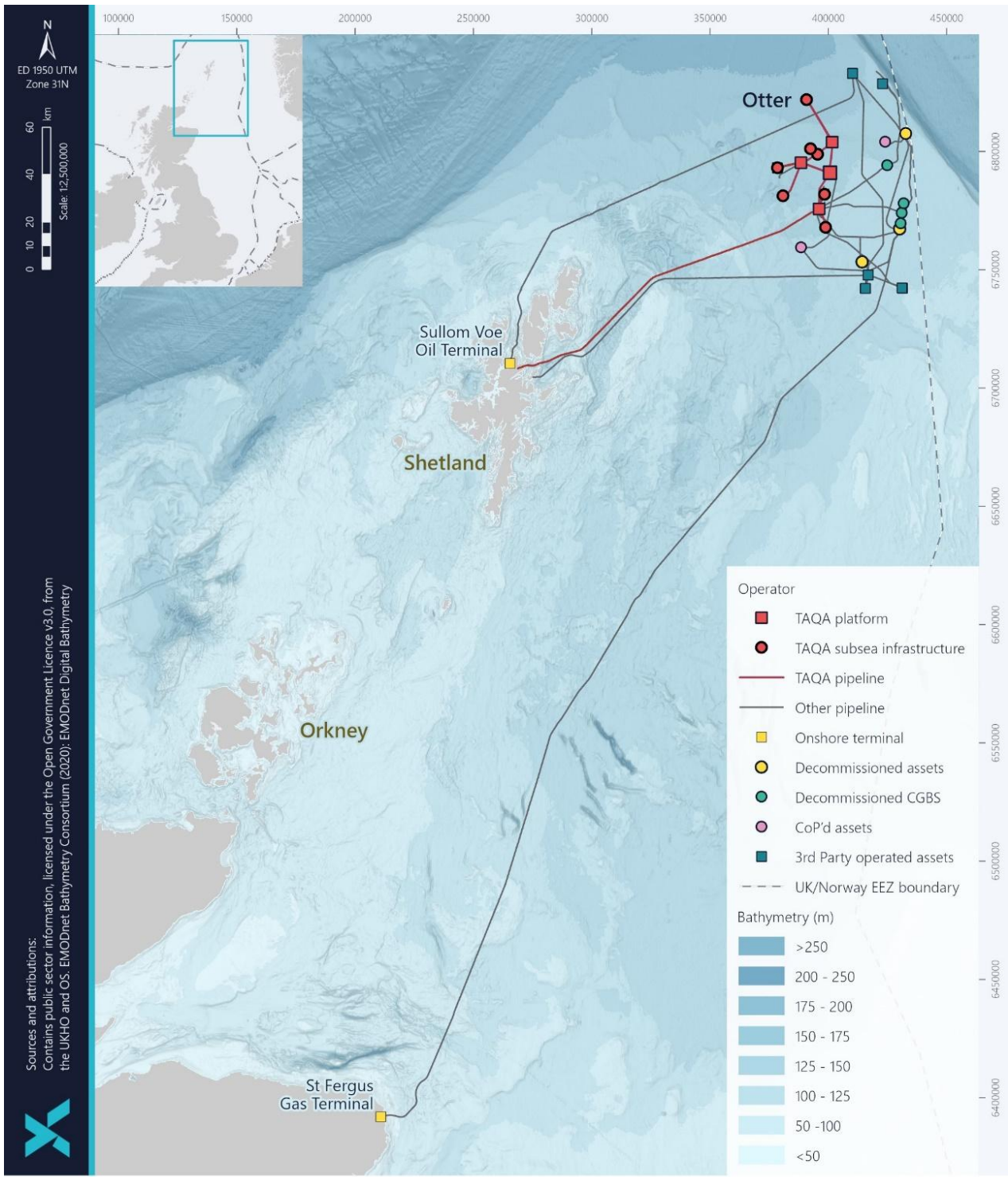


Figure 2-2 Location of the Otter Area Subsea Infrastructure

2.2 Regulatory Context

2.2.1 Legislation and Guidance

The decommissioning of offshore oil and gas installations and pipelines on the UKCS is controlled through the Petroleum Act 1998 (as amended). Decommissioning is also regulated under the Marine and Coastal Act 2009 and, in Scotland, by the Marine (Scotland) Act 2010. The UK's international obligations on decommissioning are primarily governed by the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (the Oslo Paris (OSPAR) Convention). The responsibility for ensuring compliance with the Petroleum Act 1998 rests with OPRED.

The Petroleum Act 1998 requires the operator of an offshore installation or pipeline to submit a draft DP for statutory and public consultation, and to obtain approval of the DP from OPRED, before initiating decommissioning works. The DP must outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place.

The *Guidance Notes for the Decommissioning of Offshore Oil and Gas Installations and Pipelines* (BEIS, 2018) state that subsea installations (e.g., drilling templates and wellheads) must, be completely removed for reuse or recycling or final disposal on land, unless there are exceptional or unforeseen circumstances that prevent complete removal. Should an Operator wish to make an application to decommission a subsea installation *in situ* because of the difficulty of removing it, justification in terms of the environmental, technical or safety reasons would be required.

Any subsea installation foundation piles should be cut below natural seabed level at such a depth as to ensure that any remains are unlikely to become uncovered, typically 3 m below the seabed.

With regards to pipelines (including flowlines and umbilicals), these should be considered on a case-by-case basis. The guidance provides general advice regarding removal for two categories of pipelines:

- *For small diameter pipelines (including flexible flowlines and umbilicals), the guidance states that they should normally be entirely removed; and*
- *For pipelines covered with rock protection, the guidance states that these are expected to remain in place unless there are special circumstances warranting removal.*

The guidance also highlights instances where pipelines could be decommissioned *in situ*. For example, pipelines that are adequately buried or trenched or which are expected to self-bury could be considered as candidates for *in situ* decommissioning. Where an Operator is considering decommissioning pipelines *in situ*, the decision-making process must be informed by a Comparative Assessment (CA) of the feasible decommissioning options. The CA takes account of safety, environmental, technical, societal, and economic factors to arrive at a preferred decommissioning solution.

Finally, the guidance states that:

'Mattresses and grout bags installed to protect pipelines should be removed for disposal onshore, if their condition allows. If the condition of the mattresses or grout bags is such that they cannot be removed safely or efficiently, any proposal to leave them in place must be supported by an appropriate Comparative Assessment of the options.'

The primary guidance for offshore decommissioning from the regulator (BEIS, 2018), details the need for an EA to be submitted in support of a DP. The guidance sets out a framework for the required environmental inputs and deliverables throughout the approval process. The BEIS guidance is supported by Decom Mission's (Decom North Sea, 2018) *Environmental Appraisal*

Guidelines for Offshore Oil and Gas Decommissioning, which provide further definition on the requirements of the EA report.

In terms of activities in the NNS, the Scottish National Marine Plan (NMP) has been adopted by the Scottish Government to help ensure sustainable development of the marine area. The NMP is considered throughout this EA. The NMP was developed in line with UK, European Union (EU) and OSPAR legislation, directives and guidance. With regards to decommissioning, the Plan states that:

'Where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets from the seabed will be fully supported where practicable and adhering to relevant regulatory process'.

TAQA has given due consideration throughout this EA to the NMP during Project decision making and the interactions between the decommissioning activities and the NMP.

2.3 Scope and Structure of this Environmental Appraisal Report

This EA report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with decommissioning of the Otter Area facilities and to demonstrate the extent to which these can be mitigated and controlled to an acceptable level. This is achieved in the following sections, which cover:

- The process which informed the selected decommissioning strategy (Section 3.1.2);
- A description of the proposed decommissioning activities (Section 3.3);
- A summary of environmental baseline sensitivities relevant to the Otter Area (Section 4);
- The approach to impact assessment (Section 5);
- A review of the potential impacts from the proposed decommissioning activities and justification for the assessments that support this EA (Section 6);
- Assessment of key issues (Section 6); and
- Conclusions (Section 7).

3 PROJECT SCOPE

3.1 Otter Area Infrastructure

3.1.1 Decommissioning Programme

The infrastructure (subsea structures, pipelines, umbilicals, cables, and protection/stabilisation materials) included in the Otter Area DP, and therefore the scope of this EA, is listed in Table 3-1 to Table 3-5. The tables detail the dimensions, weight and status of this infrastructure.

Subsea installations (Table 3-1)

- The Otter template structure;
- The Otter manifold;
- The Otter template protection structure excluding the roof hatches (which are covered under a separate DP (TAQA, 2024a). This structure protects wells P1, P2, P3 and I1;
- The wellhead protection structure (WHPS) associated with Well 210/15a-5 (I2) excluding the roof hatches (which are covered under a separate DP (TAQA, 2024a); and
- The multiphase pump (MPP) station and the MPP module.

Pipelines and umbilicals (Table 3-2)

- The two multiphase production pipelines one connecting the Otter manifold to the North Cormorant platform and the other connecting the Otter manifold to the Eider platform;
- The two water injection pipelines one connecting the Otter manifold to the Tern platform and the other connecting the Otter manifold to Eider; and
- The three Otter power cables and the control and chemical injection umbilical connecting the Eider platform to the MPP. These are trenched and buried.

Protection/Stabilisation materials

- Concrete mattresses (Table 3-3);
- Grout Bags and Concrete Block Supports (Table 3-4); and
- Rock protection (Table 3-5).

Table 3-1 Subsea Installations

Item	Number	Size (m) [LxWxH]	Weight (Te)	Location		Comments / Status
Otter Template Structure	1	30.9 x 25.2 x 10.4	80	WGS84 Decimal	61.5141° N 00.9495° E	The Otter template structure is secured to seabed by four suction piles.
				WGS84 Decimal Minute	61° 30.84' N 00° 56.97' E	
Otter Manifold	1	8.8 x 5.5	69	WGS84 Decimal	61.5141° N 00.9495° E	Manifold located within Otter template protection structure.
				WGS84 Decimal Minute	61° 30.84' N 00° 56.97' E	
Otter Template Protection Structure	1	30.9 x 25.2 x 10.5	69	WGS84 Decimal	61.5141° N 00.9495° E	Template Protection Structure weight excludes roof hatches, which were removed in Q3 2024 ¹ .
				WGS84 Decimal Minute	61° 30.84' N 00° 56.97' E	
Water Injection WHPS	1	21.2 x 10.2 x 10.4	55	WGS84 Decimal	61.5142° N 0.9489° E	WHPS weight excludes roof hatches, which were removed in Q3 2024 ² .
				WGS84 Decimal Minute	61° 30.85' N 00° 56.94' E	
Multiphase Pump Station	1	11.2 x 10.2 x 7.3	95	WGS84 Decimal	61.5142° N 0.9499° E	Weight of station structure includes weight of four foundation piles. Piles will be cut 3m below the seabed and the upper sections of the piles will be removed.
				WGS84 Decimal Minute	61° 30.85' N 00° 56.99' E	
Multiphase Pump Module	1	4.3 x 3.3 x 5.7	42	WGS84 Decimal	61.5142° N 0.9499° E	Piles will be cut 3m below the seabed and the upper sections of the piles will be removed.
				WGS84 Decimal Minute	61° 30.85' N 00° 56.99' E	

Notes:

1. The template protection structure is anchored to the seabed by four suction piles. These are separate to the template structure suction piles.
2. The water injection wellhead protection structure is secured to the seabed by suction piles.

Table 3-2 Pipelines / Flowlines / Umbilicals

Description	Pipeline No	Dia-meter	Length (km)	Component Parts	Product Conveyed	From – To	Burial Status ¹	Pipeline Status	Current Content
Production Flowline	PL1868	13.32"	21.0409	Steel	Hydrocarbons	Otter Manifold – Production tie-in Tee (PL475)	Trenched and buried	Out of use	Seawater
Production Flowline	PL1868A ¹	13.32"	6.171	Steel	Hydrocarbons	Sealed Pipeline End at Mid-line – Sealed Spool Flange at Eider	Trenched and buried	Out of use	Treated seawater
Water Injection Pipeline	PL1869	10.95"	20.135	Steel	Water	Sealed Spool Flange at Eider – Sealed Pipeline End at Otter	Trenched and buried	Out of use	Treated seawater
Control and Chemical Injection Umbilical	PLU1870	6.38"	21.37995	Umbilical	Chemicals	Cut Point A – Disconnected Flange Adjacent to Otter Manifold	Trenched and buried	Out of use	Hydraulic fluid, MEG
Water Injection Pipeline	PL3132	10.95"	20.8125	Steel	Water	Water Injection Delivery Tee – Otter Manifold	Trenched and buried	Out of use	Seawater
Water Injection Pipeline spool	PL4310 ² (formerly part of PL1869)	10.95"	0.287895	Steel	Water	Cut Point A – Cut Point F	Surface laid	Out of use	Treated seawater
Power Cable #1	PL4438 ³	3.56"	21.64995	Power Cable	Power	Cut Point A – Disconnected Flange Adjacent to Otter Multiphase Pump	Trenched and buried	Out of use	N/A Power Cable
Power Cable #2	PL4439 ³	3.56"	21.64995	Power Cable	Power	Cut Point A – Disconnected Flange Adjacent to Otter Multiphase Pump	Trenched and buried	Out of use	N/A Power Cable
Power Cable #3	PL4440 ³	3.56"	21.59995	Power Cable	Power	Cut Point A – Connector (Termination)	Trenched and buried	Out of use	N/A Power Cable
Multiphase Pump Control Fluid Flying Lead	PL4441	1.14"	0.06	Umbilical	Control fluid	Otter Manifold Umbilical Termination Assembly (UTA) – Multiphase Pump	Surface laid	Out of use	Control Fluid
Multiphase Pump Barrier	PL4442	1.3"	0.062	Umbilical	Barrier fluid	Otter Manifold UTA – Multiphase Pump	Surface laid	Out of use	Barrier Fluid



Description	Pipeline No	Dia-meter	Length (km)	Component Parts	Product Conveyed	From – To	Burial Status ¹	Pipeline Status	Current Content
Fluid Flying Lead									
Multiphase Pump MEG Flying Lead	PL4443	2.17"	0.063	Umbilical	MEG	Otter Manifold UTA – Multiphase Pump	Surface laid	Out of use	MEG

Notes:

- ¹ PL1868B, the riser that previously formed part of PL1868, is outside the scope of the DP. The portion of PL1868B attached to the Eider Upper Jacket is addressed in the Eider Upper Jacket DP (TAQA, 2023b). The portion of PL1868B attached to the Eider Jacket footings will be addressed in the Eider footings DP.
- ² PL4310 extends beyond the riser base flange to the Eider platform topsides. Decommissioning of the riser portion of PL4310 attached to the Eider Upper jacket is addressed in the Eider Upper Jacket DP (TAQA 2023b). The riser portion of PL4310 attached to the Eider jacket footings will be addressed in the future Eider Footings DP.
- ³ Power cables PL4438, PL4439 and PL4440 extend beyond the base of the Eider platform to the platform topsides. The portions of these power cables attached to the Eider Upper jacket are addressed in the Eider Upper Jacket DP (TAQA, 2023b). The portions of the cables attached to the platform footings will be addressed in the future Footings DP.

Table 3-3 Concrete Mattresses

Location	Weight and Dimensions (Per Item)	Number	Total Weight (Te)	Exposed/Buried/Condition	
PL1868	6.5 Te 6 x 3 x 0.15 m	239	1,549	Exposed on seabed	
PL1868A		117	758		
PL1869		85	551		
PLU1870		145	940		
PL3132		60	389		
PL4438		27	175		
PL4439		41	266		
PL4440		62	402		
PL4441		1	7		
PL4442		1	7		
PL4443		1	7		
TOTAL			779		5,051

Table 3-4 Grout Bags and Concrete Block Supports

Location	Type	Number	Total Weight (Te)	Exposed/Buried/Condition
PL1868	25kg Grout Bags*	2,450	61	Exposed on seabed
PL1868		120	3	
PL1868, PL1869, PL3132		120	3	
PL1868A		327	8	
PL1869		90	5	
PLU1870		264	7	
PLU1870		60	2	
PL3132		3,628	91	
PL4438		250	6	
PL4438, PL4439		120	3	
PL4439		250	6	
PL4440		117	3	
PL4441		117	3	
PL4442		117	3	
PL4443		117	3	
TOTAL			8,147	
PL1868	Concrete Block Support	8	338	
PL1869		8	338	
PL3132		2	85	
TOTAL		18	761	

* Each grout bag weighs 25 kg with exception to the grout bags located at PL1869 which weigh 50kg each. Total weights are rounded up to the nearest tonne.

Table 3-5 Rock Placement (As-Laid)

Location	Total Weight (Te)	Exposed/Buried/Condition
PL1868 - rock cover along length of pipeline and at Magnus pipeline crossing	34,642	Exposed
PL1869 - rock cover at pipeline crossing and one location along pipeline between Otter manifold and Eider platform.	2,670	Exposed
PLU1870 - rock cover at pipeline crossing.	1,066	Exposed
PL3132 - rock cover to remediate pipeline exposure sections, and at 17 areas of span	3,000	Exposed
PL4438 - rock cover at 6 locations between Otter manifold and Eider platform, and at pipeline crossing.	2,042	Exposed
PL4439 - rock cover at 9 locations between Otter manifold and Eider platform, and at pipeline crossing.	2,327	Exposed
PL4440 - rock cover at 176 locations between Otter manifold and Eider platform, and at pipeline crossing.	31,408	Exposed
TOTAL	77,155	

3.1.2 Well Decommissioning

There are five Otter wells; three production wells P1 (210/15a-T2), P2 (210/15a-T1), P3 (210/15a-T3), and one Injection well I1 (210/15a-T4) within Otter manifold and satellite water injection well I2 (210/15a-T5). The wells will be Phase 3 decommissioned, in accordance with Offshore Energies United Kingdom (OEUK) Well Decommissioning Guidelines (OEUK, 2022). Well decommissioning operations will be supported by appropriate regulatory applications and submissions and are not covered within the scope of this EA.

3.1.3 Pipeline Wax Management

Pipelines have been flushed in accordance with best environmental practices and outcomes.

Dissolved wax can be present in crude oil and may be deposited on the internal surfaces of pipelines and other production equipment under certain conditions. Wax will not be present in gas or water injection pipelines, nor in umbilicals that convey chemicals or hydraulic fluid. Wax is composed of long chain molecules containing between 18 and 50 carbon atoms. It may be deposited if the fluid temperature in a pipeline falls below the Wax Appearance Temperature (WAT) but disperses if the fluid temperature is above the Wax Dispersion Temperature (WDT). The presence of water in produced fluids in oil pipelines may reduce the likelihood of wax deposition, as the water tends to increase the temperature of the fluids. This is particularly the case towards CoP at the end of field life when the proportion of water in the fluids increases.

TAQA developed a Wax Management Strategy (2024b). This included assessing the Otter Area subsea pipelines and umbilicals using the criteria below. These were formulated as questions in a decision tree, to determine whether the presence of wax was “Possible” or “Unlikely”:

- Did the pipeline or umbilical convey crude oil? If not wax will not be present.
- Was the arrival temperature at the downstream end of the pipeline above the WDT at CoP? If yes, then the presence of wax is Unlikely, as any wax that may have been deposited early in field life will have dispersed in later field life.
- Was the arrival temperature of the fluid above the WAT throughout field life? If yes, then the presence of wax is Unlikely, as wax will not have been deposited during field life.
- Was wax inhibitor used as required throughout field life? If yes, then the presence of wax is Unlikely, as the inhibitor will have prevented wax deposition.
- Was an appropriate cleaning pig run through the pipeline after CoP? If yes, then the presence of wax is Unlikely as the pig run will have removed it.

- Was the pipeline multiphase, i.e. did it convey a mixture of oil, gas and water, was it insulated and was there any history of wax in the line? If the answers to these questions were respectively, “yes”, “yes” and “no” then the presence of wax is Unlikely. This is because the presence of water tends to elevate the temperature of the fluids, insulation tends to keep the fluids warm and a history of no wax being present in the line demonstrates that it is very unlikely to be present.

Using these criteria, TAQA determined that wax was unlikely to be present in the majority of the Otter pipelines. The exception to this is PL1868 which met the criteria identifying the possibility of wax being present. A spool from PL1868 was backloaded during the 2024 pipeline disconnection campaign and no evidence of wax was detected on the spool.

In parallel with the development of the Wax Management Strategy TAQA also commissioned a Wax Discharge Environmental Assessment (Xodus, 2024b). This assessed the environmental impact of any wax that may be present in pipelines decommissioned *in situ*, notwithstanding that this eventuality is Unlikely. The following paragraphs provide an overview of any potential environmental impacts should any pipelines decommissioned *in situ* contain any residual wax.

The Xodus (2024b) study considers the following aspects in the instance that pipelines with wax are decommissioned *in situ* with no further treatment:

- The physical, chemical, and ecological properties of wax
- Potential release pathways to the marine environment
- Environmentally sensitive receptors and their potential mechanism of interaction with wax
- Potential environmental impacts from wax dissolving chemical cleaning

Any wax that enters the sedimentary environment from a degrading pipeline could be ingested by benthic organisms that rework the sediment and as a result may bioaccumulate and enter the food chain potentially causing toxicity. However, paraffinic hydrocarbons with carbon numbers greater than 14 show no chronic toxicity (CONCAWE, 2001). Additionally, due to low temperatures (~4°C) at the seabed, any residual wax in the pipelines will have low mobility and a restricted pathway to reach the seabed. Wax is often classed as a stable chemical since it is unaffected by most common chemical reagents and at seabed conditions, no further chemical activity is envisaged. Microbial activity could, in principle, change the composition of wax over time, although this is not expected due to the limited availability of nitrogen, phosphorus and oxygen required to enable biological activity.

If released from an open pipeline, as wax has a density of less than seawater, it would rise through the water column and not interact with the seabed. Adverse impact is therefore not expected for benthos or demersal fish species.

In the water column, the limited exposure duration and low toxicity result in a negligible environmental hazard and adverse impact is not expected for the water column, pelagic fish species, marine mammals, or plankton. On reaching the sea surface although the temperature is above that at the seabed, it remains below the melting point of wax. Hence wax would remain a hard substance which will not form surface sheens or emulsions. Adverse impact is therefore not expected for seabirds either.

It can therefore be concluded that the potential environmental hazard of discharging any residual wax treatment chemical from pipelines would be greater than the limited hazard presented from leaving the immobile non-toxic wax *in situ*. The environmental impact assessment concludes that the decommissioning *in situ* with no additional intervention approach, proposed by TAQA can be considered Best Available Technique (BAT)/Best Environmental Practice (BEP).

3.2 Comparative Assessment

Under the Petroleum Act 1998 and as described in Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines, (BEIS, 2018), a CA is required to identify the recommended option for decommissioning the Otter Area pipelines which may potentially be decommissioned *in situ*.

3.2.1 CA Overview

The Otter Area infrastructure was assessed as part of the NNS subsea infrastructure CA (Xodus, 2024a). The overall methodology for the CA was as follows:

- Review the inventory of subsea facilities to identify characteristic equipment types (groups) into which the facilities may be classified.
- Carry out CA scoping and evaluation for each group to determine the preferred decommissioning option for that group.
- Finalise selection of options.
- Perform formal write-up detailing process and outcomes obtained.

The pipeline groups identified during the CA specific to the Otter Area are listed in Table 3-6.

Table 3-6 Otter Area Pipeline Groups Identified

Field/ DP	Group Number	Group Description
Otter	Group 3	Flexibles, flowlines and umbilicals (trenched and buried with areas of rock cover)
	Group 12	Spools and jumpers (surface laid)
	Group 18	Uncertain integrity or concrete coated rigid pipelines (trenched and buried)

The NNS subsea infrastructure CA process followed a combined quantitative and qualitative approach where group decommissioning options were scored using a pairwise process with ‘Neutral, Stronger, Much Stronger, Very Much Stronger, Weaker, Much Weaker and Very Much Weaker’ scores. For each group, the options were classified from most preferred to least preferred irrespective of the number of options for that group. The classification was performed as a balanced consideration of the five CA criteria derived from BEIS (2018) and (OEUK, 2015) Guidance. The criteria and associated sub-criteria are listed in Table 3-7.

Table 3-7 Primary and Sub-Criteria for the CA Process

Primary Criteria (Weighting)	Sub-Criteria
1 – Safety	Operations personnel
	Other users
	High consequence events
	Legacy risk
2 – Environment	Operational marine impact
	Atmospheric emissions & fuel consumption

Primary Criteria (Weighting)	Sub-Criteria
	Other consumptions
	Seabed disturbance
	Legacy marine impacts
3 – Technical	Technical risk
4 – Societal	Fishing
	Other aspects
5 – Economic	Short-term costs
	Long-term costs

3.2.2 Pipeline Preferred Decommissioning Options

A CA workshop was undertaken to explain the CA process and obtain feedback from stakeholders as part of the overall NNS subsea decommissioning programmes. The acceptability of decommissioning options was discussed and recorded and the most preferred decommissioning option for each segment was identified (Table 3-8).

Following completion of the CA, further work was undertaken that identified additional remediation may be required on some of the Otter Area pipelines. As such, TAQA propose the following approach to assess the worst-case environmental impact for these pipelines: rock placement to remediate spans, exposures and shallow burial < 20 m long and removal of spans, exposures and shallow burial > 20 m long by cut and lift. See Section 3.3.5 for further explanation.

Pipeline status will be confirmed using pipe-tracker survey techniques prior to the commencement of decommissioning activities, to provide an accurate and current picture of the situation for each of the Otter Area pipelines proposed to be decommissioned *in situ*. Should remediation of these pipelines be required following the pre-decommissioning surveys, this will be carried out using suitable vessels under the appropriate permitting process.

Table 3-8 Preferred Decommissioning Methods for the Otter Area Pipelines, Flowlines and Umbilicals

Equipment	Description	Selected Decommissioning Option
PLU1870 Control / Chemical umbilical	Control umbilical, 21 km long, 162 mm diameter from Eider to Otter	<p>Remove ends¹ and remediate snag risks</p> <p>Pipelines, umbilicals and cables will be disconnected.</p> <p>Removal by cut and lift of surface laid sections out with existing trench (including transitions).</p> <p>Rock placement to remediate snag risk from cut ends.</p>
PL4438 Power cable 1	MPP power supply cable, 21.6 km long, 55 mm diameter from Eider to Otter	
PL4439 Power cable 2	MPP power supply cable, 21.6 km long, 55 mm diameter from Eider to Otter	
PL4440 Power cable 3	Power supply cable, 21.6 km long, 55 mm diameter from Eider to Subsea Connector	
PL3132 Water injection pipeline	10" Water injection pipeline	
PL1869 Water injection pipeline	10" Water injection pipeline	
PL1868 Multiphase pipeline	10" Multiphase pipeline	
PL1868A Multiphase pipeline	10" Multiphase pipeline	

Notes:

1. Limited sections of surface laid pipelines and umbilicals in close proximity to the Eider platform jacket/sub-structure footings may be decommissioned in place, subject to derogation to decommission the footings in place and agreement with OPRED. "Close proximity" is considered within approximately 75 m of the platform footings. Logical break points between portions decommissioned *in situ* and portions removed will be selected, e.g., pipeline crossings, etc. This option represents a reasonable balance between the level of risk associated with removing the facilities, the degree of disturbance of the seabed, the use of resources during decommissioning and following decommissioning, the loss of amenity for other sea users. If derogation to decommission the jacket/sub-structure footings in place is not granted, all surface laid pipelines and umbilicals will be recovered and taken to shore for appropriate re-use, recycling, or disposal.

3.2.3 Subsea Structures Selected Decommissioning Options

The Guidance (BEIS, 2018) states that subsea installations must be completely removed for reuse or recycling or final disposal on land, unless there are exceptional and unforeseen circumstances that prevent their removal. The Guidance requires that any piles used to secure such installations be cut 3 m below natural seabed level. Table 3-9 outlines the selected decommissioning options for the Otter Area subsea structures.

Table 3-9 Decommissioning Options for the Otter Area Subsea Installations

Equipment	Description	Selected Decommissioning Option
Otter Template Structure	The template structure is secured to the seabed via four suction piles. Wells are drilled through slots allocated for the purpose located through each suction pile with trees supported above.	Return to shore for reuse or recycling, or waste treatment as appropriate.

Equipment	Description	Selected Decommissioning Option
Otter Manifold.	<p>Manifold, which includes various equipment, e.g., piping, valves, distribution unit and control jumpers. The manifold comingles production from the production wells P1, P2 and P3 into the production pipeline PL1868, routes water injection from the water injection pipeline PL3132 to the water injection wells I1 and I2, and distributes control, chemicals and power to all five wells.</p> <p>The manifold is a modular unit contained within the template structure.</p>	
Otter Template Protection Structure	<p>The template protection structure is a free-standing steel tubular framed structure secured to the seabed via four suction piles. It is located over and centred on the template guide base.</p>	
MPP Station (including piles)	<p>The MPP protection structure is an integrated steel framed structure within which the MPP is contained. It is secured to the seabed by four steel tubular piles</p>	<p>Piles will be recovered to approximately 3m below seabed, which means approximately 10m of each pile will be recovered and 50% left in place. Recovered sections will be returned to shore for reuse or recycling or waste treatment as appropriate.</p>
MPP Module	<p>MPP, which includes various equipment, piping, valves, etc is a modular unit contained within the MPP Station structure.</p> <p>The MPP receives production from the Otter manifold and routes it to North Cormorant via PL1868.</p>	
Water Injection WHPS	<p>The satellite well protection structure is a free-standing steel tubular framed structure secured to the seabed via four suction piles. It is located over and centred on the satellite well 210/15a-5 (I2).</p>	<p>Return to shore for reuse or recycling, or waste treatment as appropriate.</p>

3.3 Decommissioning Activities

3.3.1 Vessels

Specific vessel requirements for the decommissioning activities are not yet confirmed. It is anticipated that vessels may be shared across fields for efficiency. Activities include pipeline and umbilical removal, rock placement and post-decommissioning monitoring among others. Different vessel types are required for these different activities. The main decommissioning vessels are likely to be Dive Support Vessels (DSV), Construction Support Vessels (CSV), and Remotely Operated Vehicle Support Vessels (ROVSV). Time has also been accounted for a fall-pipe rock placement vessel, where rock remediation is required and survey vessels to support any non-intrusive post-decommissioning survey activities. Currently it is envisaged that all vessels undertaking the decommissioning and removal works will be dynamically positioned vessels and there will be no requirement for anchoring activities.

3.3.2 Subsea Infrastructure Decommissioning

Subsea infrastructure decommissioning will include dredging and cutting activities to remove the items listed in Table 3-8 and Table 3-9. For structures with suction pile foundations, it is expected that these shall be fully removed from the seabed by pressurising the pile cans against the seabed (reverse installation).

To facilitate removal of the conventionally piled MPP station structure, it is the intent to cut each of the foundation piles 3 m below the seabed using an internal cutter. This avoids having to carry out substantial seabed excavation at the pile locations to facilitate external cuts. The preference is to make the cuts using abrasive water jet technology and an inert garnet cutting medium. Such jet cutters are routinely used subsea for cutting piles and provide an efficient method with little impact for the surrounding environment.

At each foundation pile location, the cutting operation will comprise the following steps:

- Removal of the locking pins securing the structure to that pile, to give access to the inside of the pile. This operation is expected to require the use of divers;
- Running an internal clean out tool to remove any sediment infill, etc. from within the pile, and then removing the tool;
- Running a jet cutter into the pile to the required cutting depth; and
- Making the pile cut and withdrawing the cutting tool.

Following removal of the subsea structure, the cut off portions of the piles will then be recovered. Deployment of the cleaning and jet cutting tools and recovery of the structure and pile cut-offs will be by means of ROVs and vessel cranes. Unless mentioned otherwise, these operations are planned to be completed without the use of divers. It may be necessary to install rock cover to mitigate any depressions resulting from structure removal if these cannot easily be backfilled.

3.3.3 Decommissioning of Pipelines and Umbilicals

There are several options for the removal of the surface laid portions of the rigid pipelines, umbilicals, spools and jumpers from the seabed including:

- Cut surface laid sections into discrete lengths and recover each section using subsea grab or similar, and
- Cut surface laid sections into discrete lengths and recover multiple sections using subsea basket to vessel.

The cutting equipment used to cut the rigid pipeline and spools will typically be either a diamond wire saw or hydraulic shears. In terms of environmental impact and the time taken to complete the

cutting operation(s), there is little difference between the two methods, especially given the relatively small diameters of the pipelines.

Most surface laid umbilicals, flexible spools and jumpers will be fully removed, in line with the BEIS (2018) Guidance and the CA outcome.

Limited sections of surface laid pipelines and umbilicals in close proximity to the Eider platform jacket/sub-structure footings may be decommissioned in place, subject to derogation and agreement with OPRED. "Close proximity" is considered within approximately 75 m of the platform footings. Logical break points between portions decommissioned *in situ* and portions removed will be selected, e.g., pipeline crossings, etc. This option represents a reasonable balance between the level of risk associated with removing the facilities, the degree of disturbance of the seabed, the use of resources during decommissioning, and following decommissioning, the loss of amenity for other sea users. If derogation to decommission the jacket/sub-structure footings in place is not granted, all surface laid pipelines and umbilicals will be recovered and taken to shore for appropriate re-use, recycling, or disposal.

3.3.4 Removal of Protection/Stabilisation Materials

Concrete mattresses, grout bags and concrete block supports will be removed from the seabed unless it is not feasible to do so. If recovery of the protection/stabilisation materials will not be possible, TAQA will inform OPRED and agree an alternative approach to decommissioning these items.

The protection/stabilisation material in close proximity to the Eider platform jacket/sub-structure footings may be decommissioned in place, subject to derogation and agreement with OPRED. "Close proximity" is considered within approximately 75 m of the platform footings. Logical break points between portions decommissioned *in situ* and portions removed will be selected, e.g., pipeline crossings, etc. This option represents a reasonable balance between the level of risk associated with removing the facilities, the degree of disturbance of the seabed, the use of resources during decommissioning, and following decommissioning, the loss of amenity for other sea users.

3.3.5 Remediation

Pipelines, umbilicals and cables will be decommissioned *in situ* in accordance with the CA outcome. Ends of pipelines which have been cut will be remediated. There are two FishSAFE spans (exceeding 10 m long and 0.8 m high). These are both located at the pipeline ends which will be removed. If pre-decommissioning surveys identify any fishing critical spans these will be remediated. The remaining buried sections of the pipelines shall be decommissioned *in situ*.

The approach to remediation will be assessed on a case-by-case basis and rock cover represents a worst-case scenario. The worst-case scenario assessment is based on rock remediation of any future spans/exposures less than 20 m and cutting out areas of spans/exposures longer than 20 m (see Section 6.3.2.3.2 for more detail).

Subject to future surveys, permission to deploy additional rock cover required for remediation activities would be sought via applications for the relevant environmental licenses and consents. These applications would address associated seabed and emissions impacts (if required).

The factors that will be considered for remediation approach include:

- The length of time required to cut a span/spans and the associated Greenhouse Gases (GHGs);
- The GHGs associated with quarrying, transporting, and placing rock; and
- The amount of rock required to safely remediate a cut end, versus required to remediate a span.

- The GHGs generated by manufacturing new steel to replace steel that might have been recycled had it been recovered in the form of a spool cut out and transported to shore.

TAQA will conduct pre-decommissioning surveys within the Otter Area prior to the commencement of decommissioning programme scope and the latest environmental information will be incorporated in relevant permits. The areas of spans/exposures or shallow burial on any of these pipelines will be the subject of a future surveys and monitoring program. Should any exposures or free spans be identified during pre-decommissioning surveys, these will be appropriately remediated via rock placed by fall pipe vessel or using rock bags. An indicative and highly conservative estimate has been made for the rock cover required to remediate potential mid-line spans and exposures by the time the pre-decommissioning survey is undertaken. This estimate is based on the assumptions and approach detailed previously and a contingency for rock cover remediation between 2%-6% of the total Otter pipelines length. This accounts for a worst-case environmental impact informed by the burial data. For estimating the tonnage and footprint of remedial rock cover, it is assumed that the rock will be laid in a 5.1 m-wide corridor and will be designed with a 1:3 slope to be overtrawable. On this basis, the estimated total weight of rock that may be required for the remediation of spans and exposure is 33,000 Te, with a total footprint of 21,463 m².

Where required, rock cover will be used to remediate any cut pipeline ends, with a worst-case of 1,600 Te estimated. Rock berm profiles will be within a 10 m-wide corridor and will be designed to be overtrawable with a 1:3 slope. Rock will be laid precisely using a fall pipe vessel or with rock bags.

The removal of the foundation piles associated with subsea structures may leave depressions in the seabed therefore TAQA will monitor the seabed to assess any seabed depressions and ensure that they are overtrawable. Rock may be used as localised remediation locally for depressions where natural backfill is not possible.

3.3.6 Post-Decommissioning Surveys

Clear seabed verification will be carried out after decommissioning to ensure there is no residual risk to other sea users. Non-intrusive techniques will be considered in the first instance to identify any remaining debris or seabed obstructions. It is then TAQA's intention that, if present, these would be recovered/removed ensuring no oilfield-related debris that could interfere with future fishing operations remain (in line with Guidance; BEIS, 2018).

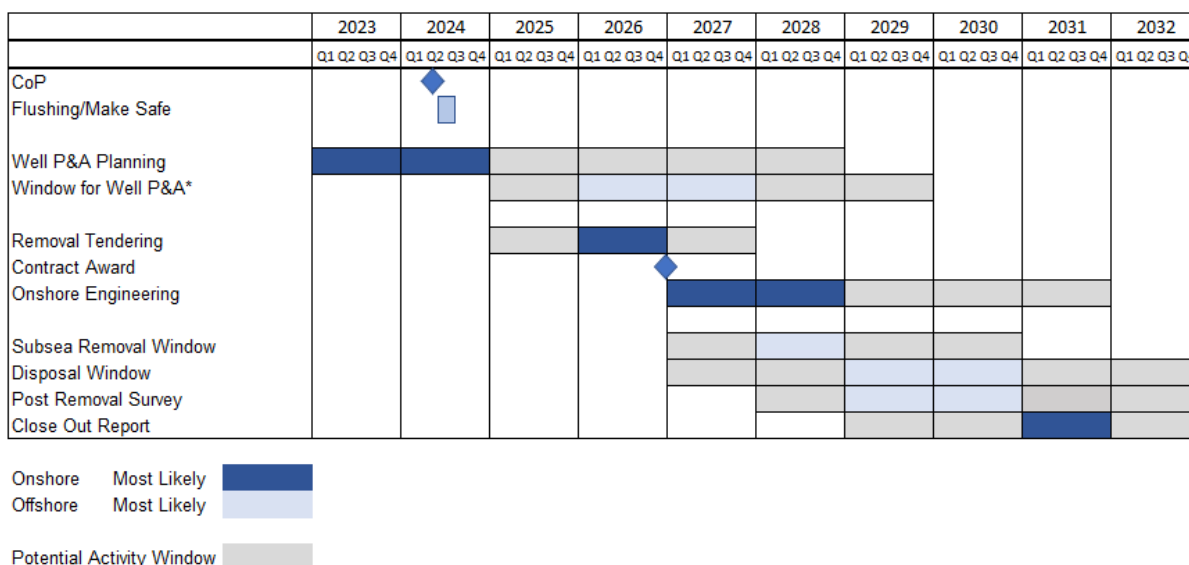
If the above cannot be achieved and potential debris or obstructions do remain then mitigations would be discussed with OPRED and fishing representative bodies. Following consultation with OPRED, the use of trawl sweeps or other intrusive means could in this instance be deployed to provide seabed clearance verification.

3.3.7 Ongoing Inspections & Evaluation

With any materials are decommissioned *in situ*, the Operator has a liability to monitor and mitigate any impacts from these materials. As the buried pipelines and associated remediation will likely be decommissioned *in situ*, they will be subject to on-going inspections when the Otter Area decommissioning activities are concluded. After the initial post-decommissioning site survey reports have been sent to OPRED and reviewed, a post-decommissioning inspection regime will be agreed with OPRED by TAQA.

3.3.8 Proposed Schedule

The precise timing of the decommissioning activities is not yet confirmed and will be subject to market availability, contractual agreements, and alignment with other decommissioning projects. The window for the decommissioning of the Otter Area is provisionally 2029 – 2032, as shown in Figure 3-1.



* The Well P&A offshore activity indicates Phase 3 Well Abandonment activity

Figure 3-1 Otter Area Decommissioning Schedule

3.4 Summary of Materials Inventory

The approximate amounts of materials that make-up the Otter Area infrastructure have been evaluated. A focused review of the inventories of materials will be conducted during the detailed engineering phase of decommissioning. A summary of the material inventory (Xodus, 2025) for the Otter Area is presented in Table 3-10 and Figure 3-2.

Table 3-10 Summary of Otter Area Subsea Materials Inventory

Material	Otter Area				
	Pipelines / Umbilicals / Protection / Stabilisation Material (Te)	Subsea Installations (Te)	Total (Te)	Planned Tonnage decommissioned <i>in Situ</i> (Te)	Planned Tonnage to Shore (Te)
Ferrous metals (all grades)	9,300	410	9,710	8,998	712
Non-ferrous metals (copper, aluminium alloys)	35		35	35	0.3
Plastics*	1,670		1,670	1,621	49
Concrete (mattresses and grout bags)	6,019		6,019	0	6,019
Hazardous – Naturally Occurring Radioactive Material (NORM)	2		2	2	0
Hazardous – Residual fluids	5		5	5	0
Other (marine growth)	6		6		6
Other - non hazardous	0.4		0.4		0.4

Material	Otter Area				
	Pipelines / Umbilicals / Protection / Stabilisation Material (Te)	Subsea Installations (Te)	Total (Te)	Planned Tonnage decommissioned <i>in Situ</i> (Te)	Planned Tonnage to Shore (Te)
Other (rock)	77,155		77,155	77,155	
Total Inventory Tonnage (Te) (excluding rock)	17,037	410	17,447	10,660	6,787

*The proportion of plastics that will be recycled versus disposed of to landfill depends on the condition of the plastics when they are recovered.

Pipelines & Stabilisation Materials (Excl. Rock)
 Total Weight = 17,037 Te

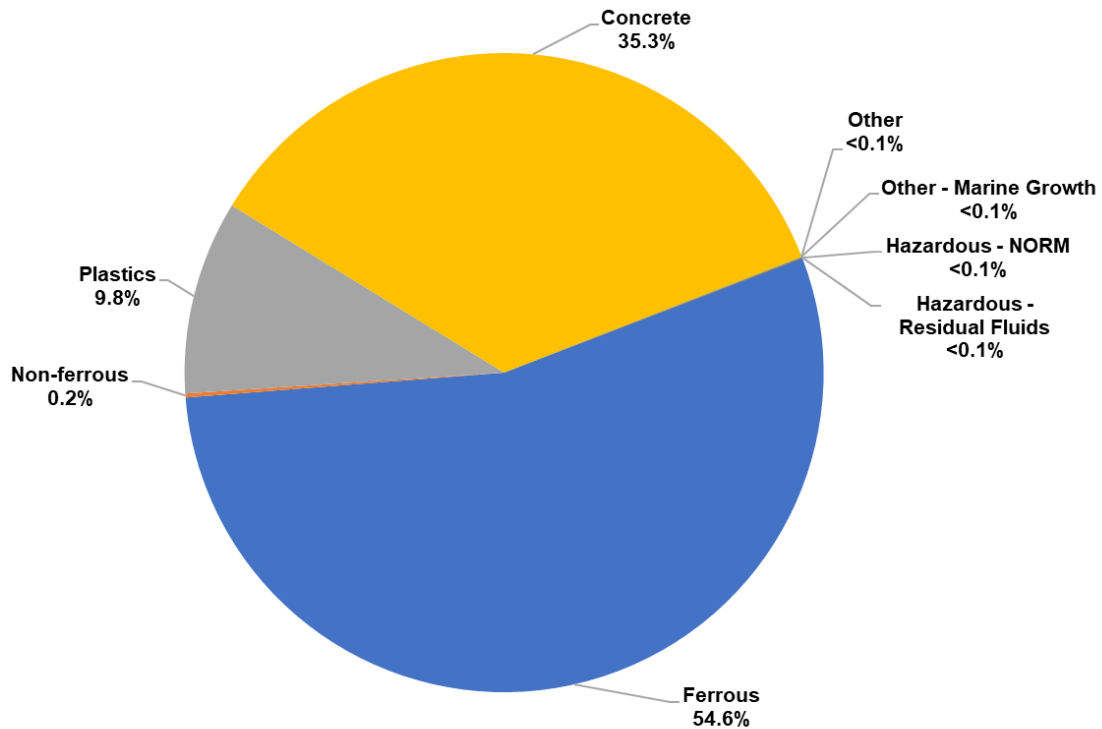


Figure 3-2 Otter Area Material Inventory

3.5 Waste Management

TAQA will comply with the Duty of Care requirements under the UK Waste Regulations and The Environmental Protection (Duty of Care) (Scotland) Regulations 2014. Waste Hierarchy will be followed at all stages of disposal (see Figure 3-3) along with the principles of the circular economy, prioritising reuse where possible. Industry best practice will be applied (Decom North Sea, 2018).

All waste will be managed in compliance with relevant waste legislation by a licenced and/or permitted waste management contractor. The selected contractor will be assessed for competence through due diligence and duty of care audits.

Most of the material recovered during the Otter Area subsea decommissioning activities will be non-hazardous, including steel, non-ferrous metals, plastic and concrete as outlined in Section 3.4. No asbestos materials are anticipated. However, if asbestos-containing materials are found they

will be recovered to shore and disposed of appropriately. The majority of hazardous waste and NORM will be decommissioned *in situ* (Table 3-10).

Preventing waste is ultimately the best option, achieved through reducing consumption and using resources more efficiently. However, this is followed by re-use and recycling of goods (Figure 3-3). If all re-use opportunities have been taken by TAQA, the next preferable option is for recycling of materials.

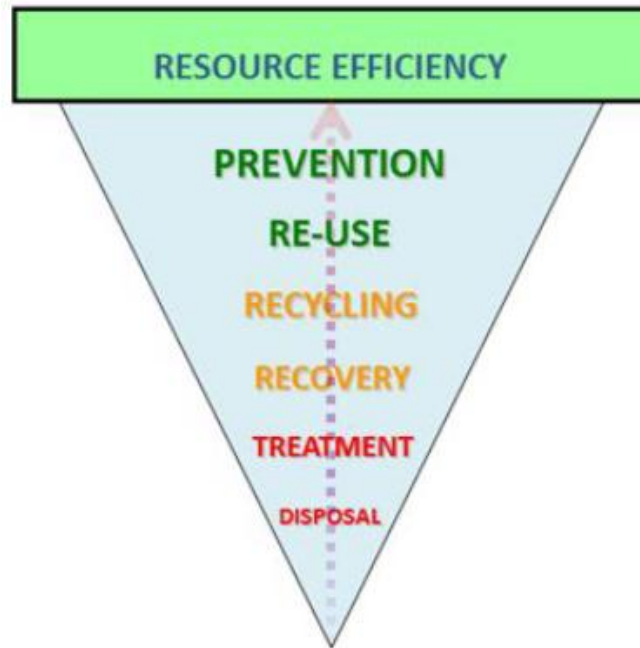


Figure 3-3 The Waste Hierarchy

The Material Inventory has also classified each material according to the European Waste Catalogue Codes (EWC) as required for disposal of wastes within the EU and a further categorisation of hazardous/special or non-hazardous/non-special wastes. The EWC is a standardised way of describing waste and was established by the European Commission. The use of EWC codes to describe waste is a requirement of the Duty of Care for waste which requires the holder of waste to take all reasonable steps to ensure that waste is described in a way that permits its safe handling and management.

Until a waste management contractor has been selected and disposal routes identified, the final disposal options for waste materials are unknown. The project aspiration is that all ferrous and non-ferrous metals, concrete and plastics will be recycled where possible and TAQA will work closely with the contractor(s) to ensure this is the case. There may be instances where infrastructure returned to shore is contaminated (marine growth, hydrocarbons, paints etc), in this situation TAQA will make every effort to clean such infrastructure to enable it to be recycled. In cases where this is not possible, and the infrastructure cannot be recycled, material will be disposed of in landfill.

As part of TAQA's standard processes, all sites and waste carriers will have appropriate environmental and operating licences and/or permits to carry out this work and will be closely managed within TAQA's contractor assurance processes.

Should NORM be encountered associated with the materials brought to shore, TAQA will ensure the disposal site is suitably licenced to accept the waste arising from the decommissioning of the subsea infrastructure.

An AWMP including an inventory of hazardous waste will be compiled to aid the segregation and recycling of waste.

TAQA is committed to working towards the government policy of Net Zero in line with the North Sea Transition Authority (NSTA) Stewardship Expectation 11 (NSTA, 2021). This commitment includes decommissioning activities and is intended to drive increased energy efficiencies and minimise emissions. TAQA seeks to influence our joint venture partners and suppliers to ensure that everyone is striving to reduce and manage associated emissions.

3.6 Environmental Management Strategy

TAQA has an established and independently verified Environmental Management System (EMS) which is certified in accordance with the requirements of ISO14001:2015. The scope of the TAQA EMS is defined to include all activities, onshore and offshore, in relation to the exploration for and production of hydrocarbons in defined license areas of the UK sector of the North Sea. This scope encompasses the Otter Area decommissioning activities. The EMS meets the requirements of OSPAR Recommendation 2003/5 which promotes the use and implementation of EMSs by the offshore industry.

TAQA is committed to managing all environmental impacts associated with its activities. Continuous improvement in environmental performance is sought through effective project planning and implementation, emissions reduction, waste minimisation and waste management. This mindset has fed into the development of the mitigation measures developed for the project. These measures include both industry-standard and project-specific mitigations. A copy of TAQA's Health, Safety, Security and Environment (HSSE) Policy is presented in Appendix A.

The project has limited activity associated with it beyond the main period of preparation for decommissioning of the Otter Area pipelines and subsea infrastructure. The focus of environmental performance management for the project is therefore to ensure that the activities that will take place during the limited period of decommissioning happen in a safe, compliant and acceptable manner. The primary mechanism by which this will occur is through TAQA's accredited EMS and HSSE Policy.

To support this, a project Health, Safety and Environment (HSE) Plan will be developed which outlines how HSE issues will be managed and how the policies will be implemented effectively throughout the project. The plan will apply to all work carried out, whether onshore or offshore. Performance will be measured to satisfy both regulatory requirements including compliance with environmental consents, as well as to identify progress on fulfilment of project objectives and commitments.

TAQA also operates a Waste Management Strategy and will develop an AWMP for the project to identify and describe the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the DP for the Otter Area. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during decommissioning.

TAQA has developed a draft Emissions Reduction Strategy which supports its commitment to Net Zero and the NSTA Stewardship Expectation 11 (NSTA, 2021). This strategy catalogues TAQA's asset portfolio and future decommissioning activities and is intended to drive increased energy efficiencies and reduced emissions. TAQA plans several initiatives under the Emissions Reduction Strategy including working with the supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

The NMP has been adopted by the Scottish Government to help ensure sustainable development of the marine area. The NMP has been developed in line with UK, EU and OSPAR legislation, directives, and guidance. With regards to decommissioning, the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as Carbon Capture and Storage (CCS), decommissioning must take place in line with standard practice, and as allowed by international obligations'. TAQA has given due consideration to the Scottish NMP during project planning and decision making.

4 ENVIRONMENTAL AND SOCIETAL BASELINE

As part of the EA process, it is important that the main physical, biological and societal sensitivities of the local environment are well understood. This environmental baseline describes the general characteristics and highlights the key environmental sensitivities of the seabed around the Otter Area. This section draws on several information sources including site-specific investigations, published papers, and relevant strategic environmental assessments (SEAs). The following surveys have been carried out in the Otter Area:

- UKCS 210/15a Otter Field Site Survey - Environmental Baseline Report (Gardline, 2012a);
- UKCS 210/15a Otter Field Site Survey (Gardline 2012b);
- Otter Mud Mound Analytical Report (Fugro, 2013);
- Assessment of the Oil Phase Fluid Discharges at Otter and Consequent Characterisation Requirements (Desktop Study). Asset: Otter Subsea Tieback (TAQA, 2017);
- Otter Field to Eider – Combined Environmental Baseline and Habitat Assessment Survey Report (Benthic Solutions, 2020);
- Eider – Combined Environmental Baseline and Habitat Assessment Survey Report (Benthic Solutions, 2019); and
- Eider Cuttings Pile, UKCS Block 211/16 (Fugro, 2018).

Further environmental baseline / habitat assessment surveys will be conducted prior to decommissioning, e.g. in the period prior to the subsea removal window, a risk-based monitoring and inspection strategy will be adopted for all pipelines. Time between surveys would not be expected to exceed 5 to 7 years.

4.1 Seabed Environment

4.1.1 Bathymetry

Water depth across the Otter Area ranges from 180.7 – 191.8 m below Lowest Astronomical Tide (LAT). The seabed deepens very gently towards the northwest with a gradient of $<1^\circ$ throughout (Gardline, 2012b). The Otter Area is not located on any large-scale features of functional significance such as shelf deeps, shelf banks and mounds, seamounts, or continental slopes (NMPI, 2025). However, iceberg ploughmarks were observed across the Otter Area during the Gardline Environmental Baseline Survey (EBS: Gardline 2012a; 2012b). The iceberg ploughmarks run in a predominantly northwest to southeast direction and are between 0.5 and 1 m in depth and between 100 m and 150 m in width. Three larger depressions were also observed in the north and west of the Otter Area during the survey (Gardline 2012a).

4.1.2 Currents, Waves and Tides

The annual mean wave height in the NNS region follows a gradient increasing from the southern point in the Fladen/Witch Ground to the northern area of the East Shetland Basin. In the south, the mean wave height ranges from 2.1 to 2.4 m whilst in the north it ranges from 2.41 to 3 m (NMPI, 2025). McBreen *et al.* (2011) shows wave energy at the seabed to range between 'low' (less than 0.21 N/m^2) and 'moderate' (0.21 to 1.2 N/m^2) for most of the NNS region, increasing to 'high' (more than 12 N/m^2) close to shore. The wave height within the area ranges from 2.11 to 2.40 m whilst in the north it ranges from 2.41 to 3.30 m (NMPI, 2025) and the annual mean wave power is between 42.1 and 48.0 kW/m (NMPI, 2025).

The anti-clockwise movement of water through the North Sea and around the NNS region originates from the influx of Atlantic water, via the Fair Isle Channel and around the northeast of

Shetland, and the main outflow northwards along the Norwegian coast (BEIS, 2022). Against this background of tidal flow, the direction of residual water movement in the NNS is generally to the southeast (BEIS, 2022). The peak flow for mean spring tide ranges between low velocities of 0.01 m/s in open water to 2.5 m/s in the narrow sounds around Orkney (Pentland Firth) (BEIS, 2022). The mean residual current surrounding the Otter Area is between 0.05 and 0.1 m/s (Wolf *et al.*, 2016).

The NNS is seasonally stratified, and the strength of the thermocline is determined by solar energy, tidal and wave forces (BEIS, 2022). Distinct density stratification occurs in the NNS region in summer at a depth of around 50 m and the thermocline becomes increasingly distinct in the deeper water to the north of the region (BEIS, 2022). This stratification breaks down in September as the frequency and severity of storms increases causing mixing in the water column (DECC, 2009).

4.1.3 Meteorology

The prevailing winds in the NNS are from the southwest and north northeast. Wind strengths in winter are typically in the range of Beaufort scale force 4-6 (6-11 m/s) with higher winds of force 8-12 (17-32 m/s) being much less frequent. Winds of force 5 (8 m/s) and greater are recorded 60-65% of the time in winter and 22-27% of the time during the summer months. In April and July, winds in the open, central to NNS, are highly variable and there is a greater incidence of north-westerly winds (BEIS, 2022).

4.1.4 Wider Otter Area Seabed Environment

4.1.4.1 Physical Characteristics

In the NNS, seabed sediments generally comprise a veneer of unconsolidated terrigenous and biogenic deposits, generally much less than 1 m thick. Sediments in the NNS are predominantly sand and muddy sand, although sediments in the deeper areas within the Fladen Ground comprise mud or sandy mud. The continental shelf slope to the north of the region is characterised by areas of mixed and coarse sediments, while the floor of the Faroe-Shetland Channel is classified as mud (Eggleton *et al* 2017; DECC, 2016).

Survey reports covering the Otter Area have been assessed and the full coverage of the surveys conducted, including sampling station locations, are shown in Figure 4-1.

The physical seabed characteristics in the vicinity of the Otter manifold recorded in the Gardline (2012a, b) survey report are featureless seabed sediments comprised of silty, shelly sand, with occasional pebbles and cobbles (Gardline, 2012a; 2012b). Areas of coarser sediments such as gravels and pebbles were observed. These areas were less than 10 m in diameter. Occasional boulders were also present across the survey area, generally less than 1 m in height (Gardline, 2012a; 2012b).

Grab sampling sediment observations around the Otter manifold reported by the Gardline EBS (Gardline, 2012a) are consistent with the geophysical interpretation (Gardline, 2012b), with samples described as fine silty sand with small amounts of shell fragments. Particle size analysis (PSA) revealed minor variability within the sediments across the survey area. All stations were classified as poorly sorted fine sand under the Wentworth classification, except for Station ENV3 (see Figure 4-1) which was described as very poorly sorted medium sand. The mean diameter of sediments ranged from 143 – 439 μm (mean 209 μm) and fine material (<63 μm silt and clay) accounted for 6.0% to 16.2% of the sediment, and gravel sized material (>2 mm) accounted for 0.1% to 12.9% of the sediment (Gardline, 2012a). Overall, there was considerable variability in sediments across the survey area, notably at Stations ENV3 and ENV8 containing respectively up to three and two times more gravel-sized material than the other stations. Accordingly, the percentages of fines at these two stations were the lowest of all stations. Under Folk classification, four stations were classified as muddy sand, due to their slightly higher proportion of fine material;

three were classified as slightly gravelly muddy sand, and two stations (ENV3 and ENV8) were classified as gravelly sand due to the higher proportion of gravel-sized material.

Sediments within the Eider platform survey area (Benthic Solutions, 2019) were generally dominated by sands with most stations conforming to the Folk classifications of muddy sand or slightly gravelly muddy sand. Most stations were classified as poorly sorted fine sand under the Wentworth classification, apart from one station which was classified as coarse silt and a further station that was classified as medium sand). Peaks in the proportion of sedimentary fines were observed at the seabed surrounding the platform and visually showed conformity to drilling muds. Similarly, higher proportions of gravels (>4%) were found exclusively within 100 m west of the Eider platform relating to the presence of drill cuttings.

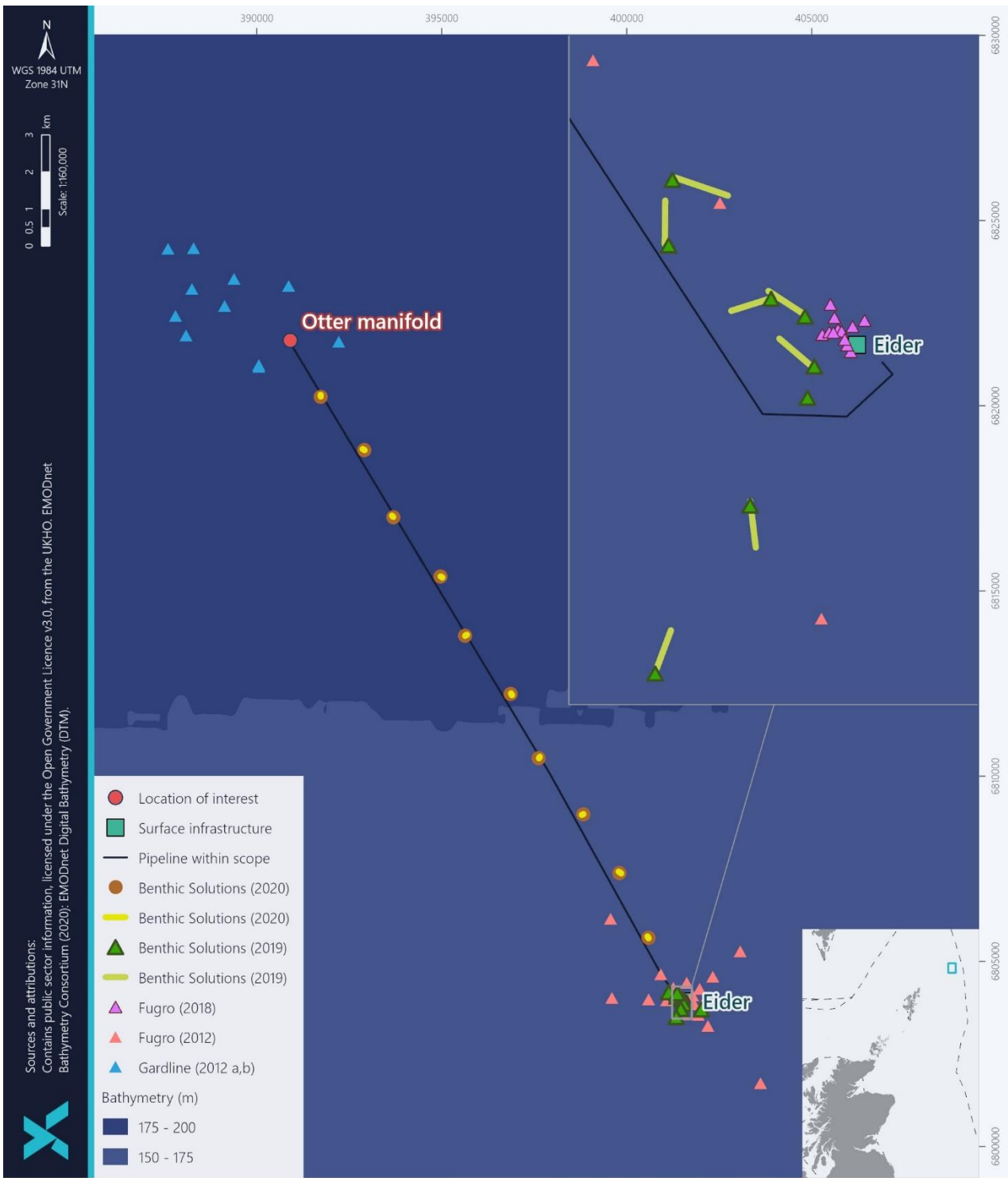


Figure 4-1 Location of Survey Stations Across the Otter Area

The sediments along the pipeline route were generally dominated by sand with all ten stations conforming to the Folk classification of muddy sand (Benthic Solutions, 2020). All stations were classified as poorly or very poorly sorted fine or very fine sand under the Wentworth classification. Peaks in percentage gravel content were generally found near the Otter manifold and Eider platform (in line with surveys from both sites). The results of PSA indicated a homogeneous sediment type composed primarily of sand, with moderate contributions of fines and negligible gravel content. The seabed sediments were sand dominated (mean 79.3%) with a lower proportion

of fines (mean 20.4%) and a negligible proportion of gravel (mean 0.32%) (Benthic Solutions, 2020). Images of the seabed within the Otter manifold, Eider Platform and Otter to Eider pipeline route survey are shown in Figure 4-2 (Gardline 2012a; 2012b; Benthic Solutions 2019; 2020).

Under the European Nature Information System (EUNIS) broad habitat classification, the most widespread seabed type across the Otter Area is predicted to be MD52 “Atlantic offshore circalittoral sand” with areas of MD62 “Atlantic offshore circalittoral mud” and MD32 “Atlantic offshore circalittoral coarse sediment” (EUSeaMap, 2023). The seabed in Blocks 210/15, 210/20 and 211/16 is within a wider area of “subtidal sand and gravels”, a seabed type designated as a Priority Marine Feature (PMF) in Scottish waters (Tyler-Walters *et. al.*, 2016; NMPI, 2025).

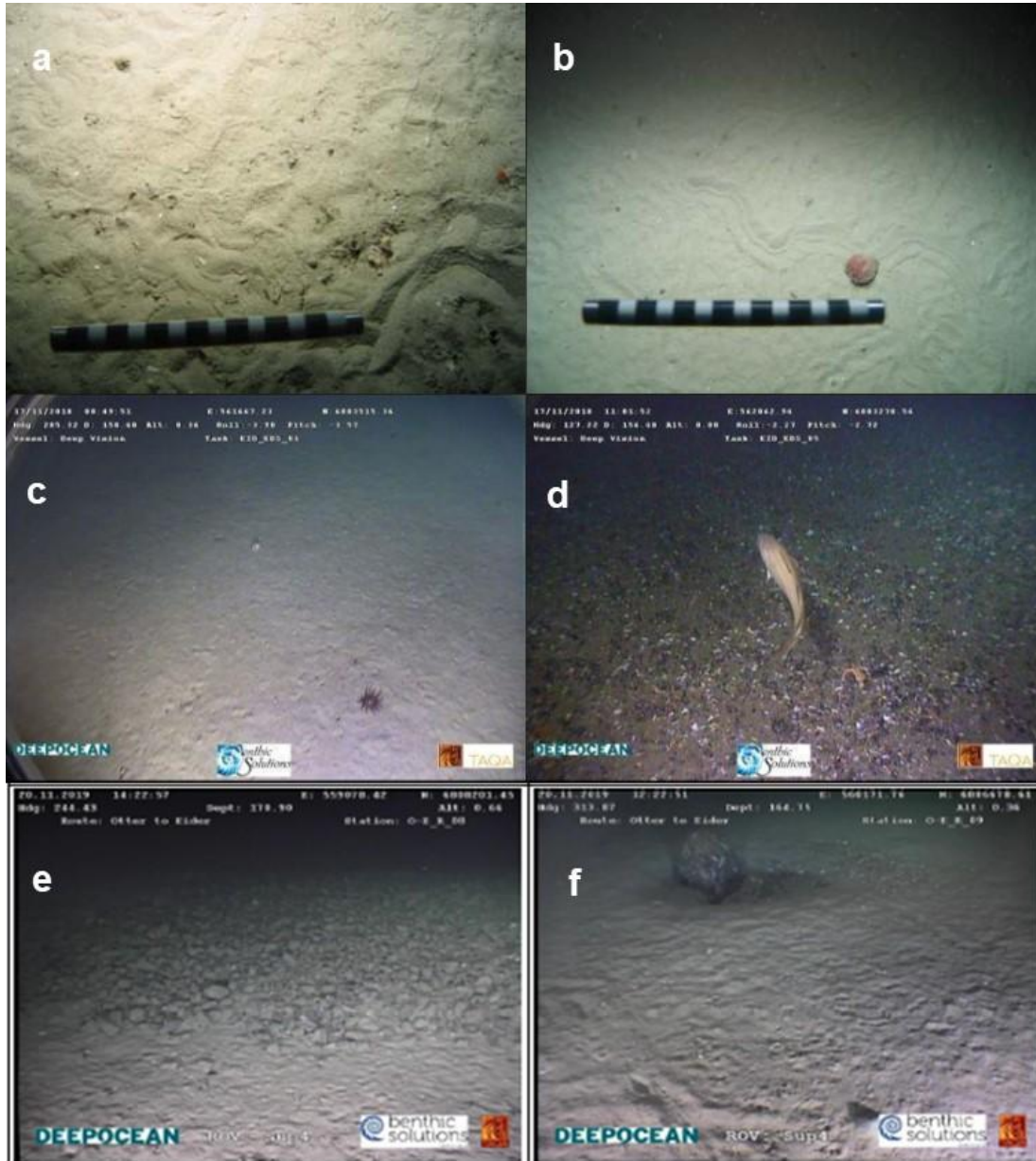


Figure 4-2 Seabed Imagery from Otter Area.

(Scale bars with 1 cm divisions shown) a, b (Gardline, 2012a); c, d (Benthic Solutions, 2019); e, f (Benthic Solutions, 2020).

4.1.4.2 Chemical Characteristics

Of relevance to the offshore oil and gas industry are metals associated with drilling-related discharges. Cuttings accumulate at drilling sites and comprise small amounts of drilling fluids which bind to drilling muds and rock fragments (cuttings) during the drilling activity, with larger particles settling rapidly to the seabed. Finer sediments comprising clay particles can be carried further away from platforms by currents.

The discharge of Oil-Based Muds (OBMs) was banned in the UK in 1984 (PARCOM, 1984), with their use also prohibited for exploratory drilling in 1987 and for all drilling in 1988. As a result, OBMs were gradually replaced by Low Toxicity OBM (LTOBM), Synthetic Based Mud (SBM) and Water-Based Mud (WBM; OSPAR, 2009). These fluids consist of water and non-water dispersible fluids and include weighting agents like barium (Ba) and other additives for viscosity, scale and corrosion control. Ba is frequently used to detect the deposition of drilling fluids around offshore installations (Chow and Snyder, 1980; Gattleson and Laird, 1980; Muniz *et al.*, 2004). Solid barites are often discharged during the drilling process and contain measurable concentrations of heavy metals as impurities, including cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), and zinc (Zn) (NRC, 1983; McLeese *et al.*, 1987).

The survey conducted around the Otter manifold in 2012 (Gardline 2012a) (Figure 4-1) showed concentrations of Ba ranging between 289 $\mu\text{g g}^{-1}$ (ENV6) and 411 $\mu\text{g g}^{-1}$ (ENV8), with a mean concentration of 314 $\mu\text{g g}^{-1}$. Ba concentrations were below the UKOOA (2001a) mean concentration of sediments more than 5 km from installations in the NNS (332 $\mu\text{g g}^{-1}$), except for station ENV8. ENV8 was however well within UKOOA 95th percentile of 638 $\mu\text{g g}^{-1}$. All other metal concentrations were below the published background concentrations (OSPAR, 2005) and below their respective Apparent Effect Thresholds (AETs; Buchman, 2008).

Surveys carried out at the Eider Platform (Figure 4-1) in 2018 (Benthic Solutions, 2019) showed significantly higher levels of Ba at two stations (EID_EBS_04 and EID_EBS_05) sampled 50 m from the Eider platform, reflecting the strong influence of drilling muds on the seabed. It is worth noting that the concentration at station EID_EBS_04 (46,200 $\mu\text{g g}^{-1}$) exceeded the level described by Cefas for stations located within 500 m of active UK platforms (33,562.12 $\mu\text{g g}^{-1}$; Cefas, 2001). Elevated levels for all 14 metals analysed were also identified at the two stations. This appeared to be a result of the Ba-rich drilling mud (Benthic Solutions, 2019). High Zn concentrations were also found across the entire survey area with 90% of stations recording levels exceeding the UKOOA 95th percentile for Zn levels in the NNS (17.1 $\mu\text{g g}^{-1}$). Notably, concentrations of Zn, Cu and Pb at EID_EBS_04 and EID_EBS_05 exceeded the mean levels expected at stations within 500 m of active UK platforms (Cefas, 2001; Benthic Solutions, 2019).

According to Benthic Solutions (2020), metal concentrations along the Otter to Eider pipeline route (Figure 4-1) showed a general spatial pattern of slightly higher values at stations near to the Eider platform and the closest historical well to the pipeline route (211S/16a-5), reflecting potential low level anthropogenic influence from the Eider platform and the 211/16a-5 well. However, this pattern was not evident for Ba, and most other metals concentrations were within typically expected background levels for the NNS. Zn and Cu were the only metals to record levels more than typical NNS background levels, although a correlation between Cu and gravel could indicate a natural driver for spatial distribution of this metal (Benthic Solutions, 2020).

The survey carried out around the Otter manifold in 2012 (Gardline, 2012a) (Figure 4-1) revealed concentrations largely representative of the fine sandy sediments of the NNS. Total Hydrocarbon Concentrations (THC) ranged from 2.0 $\mu\text{g g}^{-1}$ to 4.1 $\mu\text{g g}^{-1}$. Mean THC fell below the UKOOA (2001a, b) mean THC for 5 km from platforms in the NNS (10.8 $\mu\text{g g}^{-1}$) and the 50 $\mu\text{g g}^{-1}$ value that represents the threshold above which hydrocarbons are expected to have a “significant environmental impact” on benthic macrofauna (Kjeilen-Eilertsen *et al.*, 2004; UKOOA, 2002; UKOOA, 2005). Mean total polycyclic aromatic hydrocarbons (PAHs) and Naphthalenes, Phenanthrenes and Dibenzothiophenes (NPD) concentrations can be considered typical of this area of the NNS. Moreover, concentrations were well within their Effect Range Low (ERL)

concentrations (Long *et al.*, 1995) of $4.022 \mu\text{g g}^{-1}$, indicating that concentrations within this survey can be considered as background.

The survey carried out around the Eider platform in 2018 (Benthic Solutions, 2019) (Figure 4-1) showed that THC was as would be expected for natural sediment sampled away from the influence of the Eider platform (>250 m). However, the two stations within 50 m of the platform had considerably higher concentrations, with EID_EBS_05 recording a THC of $693 \mu\text{g g}^{-1}$, which is 30 times greater than the UKOOA 95th percentile for the NNS ($20.32 \mu\text{g g}^{-1}$) and indicates a significant hydrocarbon enrichment had occurred close to the Eider platform. Total PAH concentrations were highly variable across the Eider survey area and ranged from 36.5 ng g^{-1} to $2,730 \text{ ng g}^{-1}$ with a mean of 601.0 ng g^{-1} . Peak PAH concentrations were found at two stations within 50 m distance of the Eider Platform (EID_EBS_04, $1,900 \text{ ng g}^{-1}$ and EID_EBS_05, $2,730 \text{ ng g}^{-1}$). This distribution pattern likely related to contamination from drilling related discharges from the Eider Platform. All PAH concentrations fell in the range (20 ng g^{-1} to $74,700 \text{ ng g}^{-1}$) of the Cefas (2018) PAH concentrations for sediments surrounding NNS oil and gas installations (Benthic Solutions, 2019).

The survey conducted in 2019 along the Otter to Eider pipeline route (Benthic Solutions, 2020) (Figure 4-1) showed that THC concentrations were slightly higher at the stations closest to the Otter manifold and Eider platform. However, THC across all stations was below both the 95th and 50th percentiles for the NNS of $20.3 \mu\text{g g}^{-1}$ and $10.9 \mu\text{g g}^{-1}$, respectively. The gas chromatograms highlighted consistency in hydrocarbon signatures, being dominated by a signature common to all NNS sediments with no evidence of drilling impact. Slightly higher total PAH concentrations were found at the stations close to the Eider platform but the concentrations recorded were all within the typically expected background levels for the NNS.

The EBS carried out around the Otter manifold in 2012 (Gardline, 2012a) showed that Total Organic Matter (TOM) ranged from 1.9% to 5.6%, with a mean of 3.5% and showed little variation across the survey area. Total Organic Carbon (TOC) was negatively correlated with the sediment mean diameter, and positively correlated with the percentage of fines, indicating a similar pattern, with finer sediments inducing higher TOC concentrations.

Stations sampled between 100 m - 500 m from the Eider platform displayed TOC concentrations representative of an organically deprived environment, but this is considered typical of the NNS region due to the dominance of the sand fraction in the sediment. In contrast, stations EID_EBS_04 and EID_EBS_05 (Figure 4-1) presented peak TOC concentrations, in line with the higher fines content recorded, and thus indicative of the sediment being organically enriched by drilling muds and drilling related material (Benthic Solutions, 2019).

TOC levels were homogeneous along the Otter to Eider pipeline route, ranging from 0.29% to 0.39% (Benthic Solutions, 2020). All ten stations sampled along the Otter to Eider pipeline had TOC concentrations indicative of an organically deprived environment, which is typical for the NNS. TOC concentration was not significantly linked to the distance from the wells, but instead was positively correlated to TOM. This correlation is to be expected as both TOM and TOC will settle out of the water column in areas of lower natural disturbance by seabed currents (Benthic Solutions, 2020).

4.1.5 Cuttings Piles

The survey strategies followed the Norsk Olje and Gass guidance document for characterization of offshore drill cuttings piles (NorOG, 2016) with regards to sampling design across the topography of each cuttings pile. Analysis was aligned as far as practicable with the OSPAR Guidelines for the Sampling and Analysis of Cuttings Piles (OSPAR, 2017) and Joint Article Management Promotion-consortium (JAMP) Guidelines for Monitoring Contaminants in Sediments (OSPAR, 2015). In line with the UKOOA (2001b) Drill Cuttings Initiative recommendation, a THC concentration below $50 \mu\text{g g}^{-1}$ does not represent a significant environmental impact and this threshold is therefore used to delineate the chemical extent of each cuttings pile, also referred to as the ecological effects threshold.

OSPAR Decision 2006/5 (OSPAR, 2006a; 2006b) requires operators to assess cuttings piles against:

1. Oil loss to the water column of 10 Te yr⁻¹; and
2. Persistence of the area of seabed contamination of 500 km² yr⁻¹.

If either threshold is exceeded the operator is required to characterise the cuttings pile and review the impacts.

4.1.5.1 Otter Cuttings Piles

TAQA (2017) undertook desktop studies to assess the organic phase fluid (OPF) cuttings discharged during drilling of the Otter field and the likelihood that a cuttings pile, as defined within OSPAR Recommendation 2006/5, is present at the Otter location. Desktop studies comprised of the well history, the available seabed survey data, and also analogue oil-based drill cuttings accumulations.

Of the five wells drilled, only Water Injection well I2 was drilled using OPF that was subsequently discharged to sea. All other wells (Production Wells P1, P2 and P3) and Water Injection Well I1, were drilled using WBM. Therefore, only cutting accumulation at I2 location was subject of the TAQA 2017 study. As a result of exercise conducted by TAQA in 2016 (*cited in* TAQA, 2017), the cuttings accumulation at Otter I2 found to be 422.4 m² in area and 79.2 m³ in volume. Bathymetric maps clearly indicated that the cuttings mounds between Otter I2 and the remaining four wells at the Otter manifold were discrete and discontinuous.

A cuttings pile is defined by OSPAR (2006a; 2006b) as '*an accumulation of cuttings on the seabed which has been derived from more than one well*'. Therefore, the Otter I2, which is a single well with an OPF cuttings accumulation that is discrete and geographically separate from the four wells at the Otter manifold, cannot be defined as a cuttings pile.

Whilst the physical extent of the cuttings accumulations at Otter fall outside the scope of OSPAR Recommendation 2006/5, TAQA voluntarily undertook further work to understand the chemical signature of the Otter Water Injection Well I2 cuttings accumulation.

- The rate of oil loss is estimated to be 0.08 tonnes yr⁻¹, which falls below the OSPAR 2006/5 threshold of 10 tonnes yr⁻¹ by three orders of magnitude.
- The persistence of the cuttings contamination footprint is calculated as 1.62 km² yr⁻¹.

The results of the assessment demonstrated that the cuttings accumulation is several orders of magnitude less than the thresholds of 500 km² yr⁻¹ stated within OSPAR Recommendation 2006/5 and therefore will not significantly impact the marine environment.

The Otter Mud Mound Analytical Report (Fugro, 2013) analysed the composition of an unidentified mound in the vicinity of the Otter wellheads. Figure 4-3 shows the location of the mound in relation to the Otter wellhead. Seabed sediment samples were obtained from six stations around the mound for analyses. Results showed that the sediments were of similar physico-chemical composition to those at background locations around this area of the NNS and did not contain the levels of contaminants typically associated with oil and gas activities, in particular cuttings piles or drilling muds. The THC measured (0.8 µg g⁻¹) in the sediment sample was significantly lower than background levels recorded previously across the area, indicating that no contamination from oil and gas activities have occurred in the area. Heavy metal analyses were around, or lower than, background levels previously recorded across the area and when compared against OSPAR Background Concentrations (BC; OSPAR, 2006a; 2006b), highlighted the very low level of metal contaminants present in the sample. The BC figures are what would be expected of a remote or pristine environment, which further supports the conclusion of no contamination from oil and gas activities.

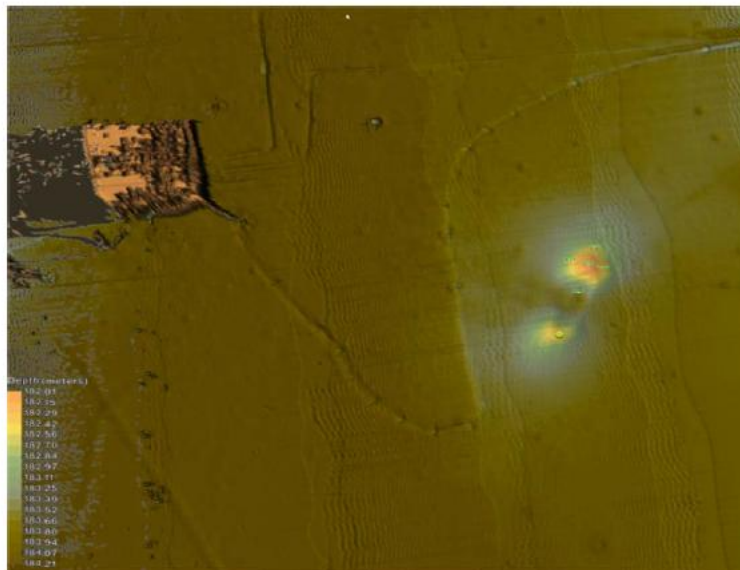


Figure 4-3 Location of Mound in Relation to Otter Wellhead (Fugro, 2013)

4.1.5.2 Eider Cuttings Pile

4.1.5.2.1 Physical Characteristics

Bathymetry data revealed a cuttings pile with an approximate 3.5 m elevation above the seabed beneath the Eider platform footings (Fugro, 2018). The physical cuttings pile boundary in relation to the footings is displayed in Figure 4-4. Following the investigation of the natural morphology of the seabed and the vertical profiles of the core samples from the survey, the approximate cuttings pile physical boundary and volume was calculated. The Eider cuttings pile was estimated to cover an area of 15,891 m² with a volume of approximately 11,267 m³ which is characterised as a 'medium cuttings pile' (5,000-20,000 m³; NorOG, 2016).

The Eider core sediments were predominantly classified as poorly to extremely poorly sorted medium silt to fine sand. In general, coarser material was noted in the top core sections compared to the middle and bottom core sections. The silt component dominated the sediment fines in all samples.

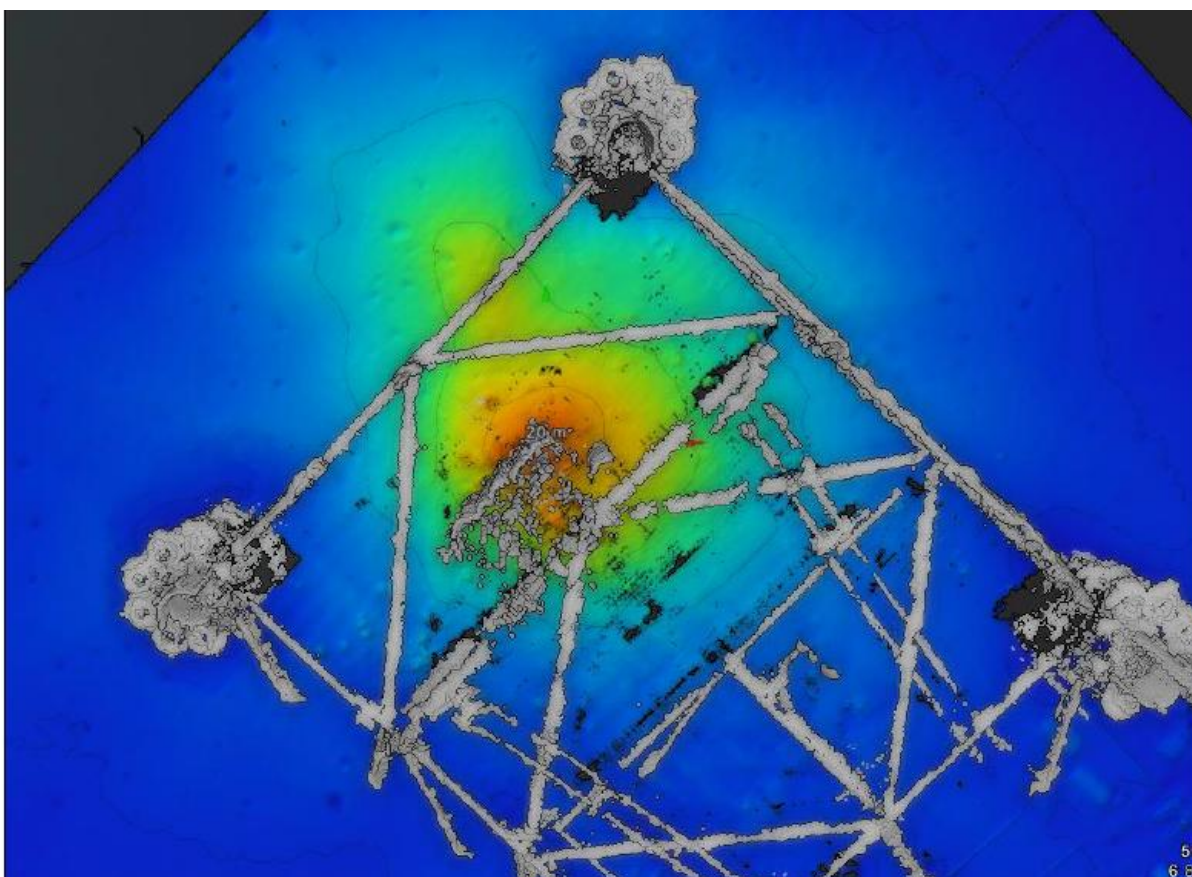


Figure 4-4 EIVA NaviModle Multibeam Image of the Eider Footings and Cutting Pile

4.1.5.2.2 Chemical Characteristics

Gas chromatogram profiles obtained from the Eider cuttings pile sediments shared a common hydrocarbon distribution typical of an input of a synthetic paraffin-based drilling fluid which had undergone varying degrees of weathering (Fugro, 2018).

THC ranged from $49.9 \mu\text{g g}^{-1}$ to $84,600 \mu\text{g g}^{-1}$, with a mean of $20,400 \mu\text{g g}^{-1}$. The THC levels exceeded the OSPAR cuttings pile ecological effects threshold of $50 \mu\text{g g}^{-1}$ in all core sections except one. Figure 4-5 displays the predicted extent of sediment with THC levels exceeding the $50 \mu\text{g g}^{-1}$ threshold (Fugro, 2018). The chemical footprint exceeds the physical pile boundary and covers a surface area approximately 0.214 km^2 with an extended footprint towards the northwest, potentially related to historical drilling activity at the 211/16a-5 well (Figure 4-4)

The sediment leachate analysis (the yearly oil loss) based on the chemical footprint of the cuttings pile ranged between 0.53 Te yr^{-1} to 0.57 Te yr^{-1} . This indicates that the oil loss to the water column does not breach the OSPAR oil loss threshold (10 Te yr^{-1}). With a persistence of 20.8 km^2 , the cutting pile also falls well below the respective OSPAR leaching threshold ($500 \text{ km}^2 \text{ year}$) (Fugro, 2018).

The sediment elemental concentrations were also normalised to allow direct comparison with OSPAR BC reference values (OSPAR, 2015). The normalised Cu, Hg, Pb and Zn concentrations exceeded the BC threshold values in all core sections. The normalised Ni concentrations exceeded the BC threshold in 35 of the 36 core sections.

Overall, the environmental data obtained from the pre-decommissioning survey at the Eider cuttings pile indicate that the cuttings pile sediments were heavily modified compared to the wider area but could generally be ascribed as typical for cuttings piles at North Sea installations (Fugro, 2018).

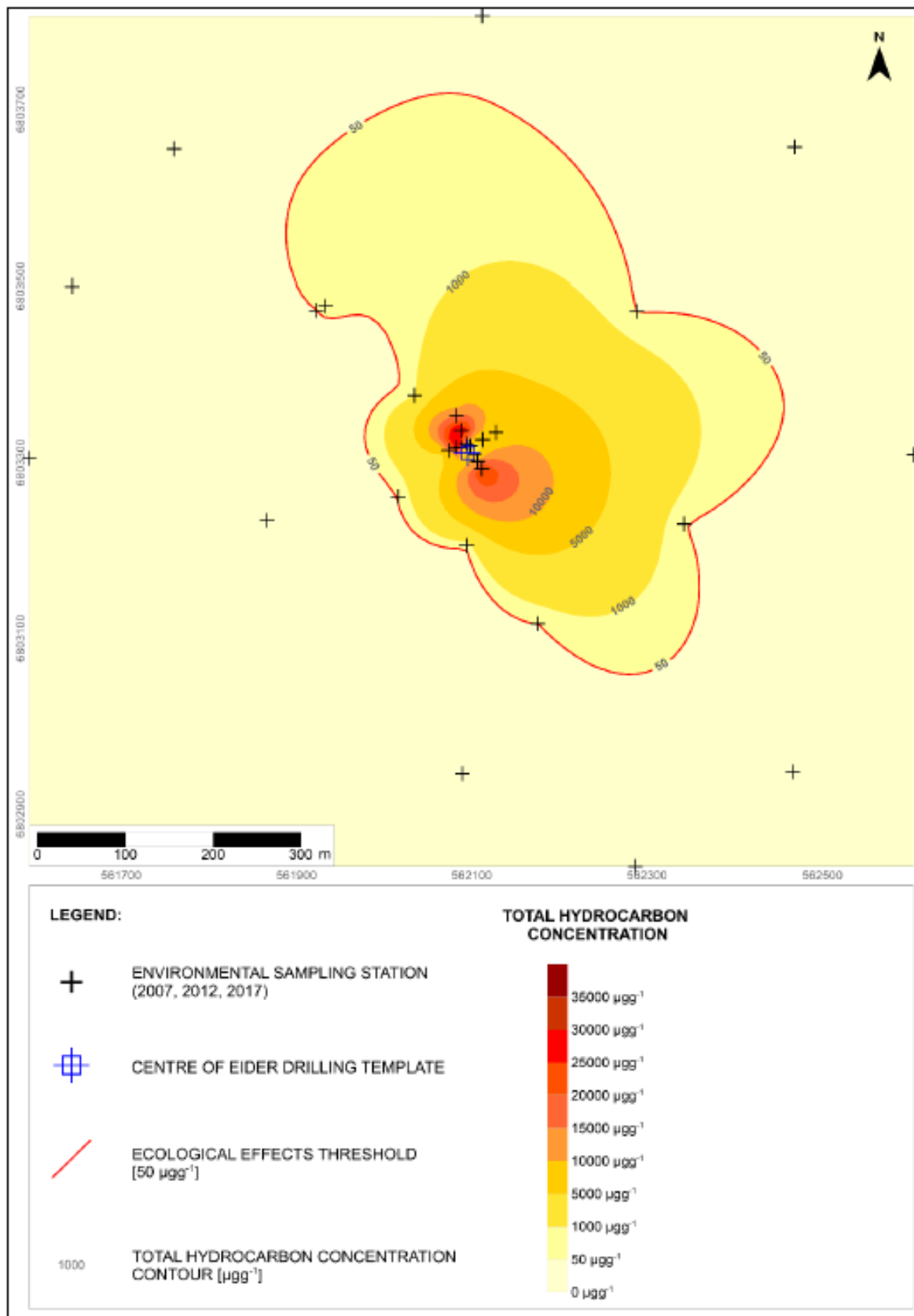


Figure 4-5 Contour Map of Sediment Total Hydrocarbon Concentrations Within the Eider Cuttings Pile and Wider Field (Fugro, 2018)

4.1.5.2.3 Biological Characteristics

Both species richness and abundance are shown to be affected by the influence of drilling related activity. All stations within the Eider cuttings pile showed a reduced species diversity and increase in the abundance of opportunistic species.

The characteristic taxa at all stations within the Eider cuttings pile were dominated by the opportunistic metals and hydrocarbon tolerant polychaete *Capitella sp.* (Petrich and Reish, 1979; Ward and Young, 1982), *Cirratulus cirratus* and other hydrocarbon favouring polychaetes including *Paramphinome jeffreysii*, *Raricirrus beryli* and *Ophryotrocha sp.* (Hiscock *et al.*, 2005) were also reported within the characteristic taxa at cuttings pile stations (Fugro, 2018).

As the Eider platform footings will be subject to a future DP and derogation application, a full assessment of the Eider cuttings pile is outside of the scope of this EA and the DPs that it supports. However, given that the spatial distribution of seabed impacted by drill cuttings extends beyond the physical boundary of the cuttings pile itself, the potential for disturbance of this contaminated sediment arising from the proposed decommissioning activities is addressed in greater detail in Section 6.3.

4.2 Biological Environment

4.2.1 Plankton

Planktonic assemblages exist in large water bodies and are transported by tides and currents as they flow around the North Sea. Plankton forms the basis of marine ecosystem food webs and therefore directly influences the movement and distribution of other marine species. While there is no specific data available on plankton communities in the Otter Area, plankton communities throughout the North Sea are well known.

In the northern area of the North Sea, the phytoplankton community is dominated by dinoflagellates of the genus *Ceratium* and diatoms such as *Thalassiosira spp.* and *Chaetoceros spp.* Phytoplankton blooms occur at the time of year when large amounts of nutrients are present in the sea water, and there is strong sunlight. Despite its cold waters, the North Sea is an ideal basin for these blooms due to the combination of the presence of abundant nutrients and intense Arctic winds that favour the mixing of waters (Copernicus, 2021). A general shift to the north-east of North Atlantic phytoplankton communities has been observed by Barton *et al.* (2016). The shift is driven by changes in various environmental conditions, including nutrient availability, light level and ocean circulation rather than being simply temperature driven (BEIS, 2022).

Zooplankton species richness is greater in the northern and central areas of the North Sea, than in the south and displays greater seasonality. Zooplankton communities in this area are dominated in terms of biomass and productivity by calanoid copepods, particularly *Calanus* species such as *C. finmarchicus* and *C. helgolandicus*. although other groups such as *Paracalanus* and *Pseudocalanus* are also plentiful. There is also a high biomass of *Calanus* larval stages present in the region. Other important taxa include *Acartia*, *Temora*, and *Oithona spp.* Larger zooplankton species such as euphausiids and decapod larvae are also important to the zooplankton community in this region (BEIS, 2022).

Calanus finmarchicus has historically dominated the zooplankton of the North Sea and is used as an indication of zooplankton abundance. Analysis of CPR surveys in the 10-year period between 1997 and 2007 shows that the biomass of *C. finmarchicus* in the NNS attains higher levels compared to more southerly areas. This peak in numbers is 70% greater than seen in the central North Sea (CNS) and 88% greater than the southern North Sea over the same period (SAHFOS, 2015). The increase is likely a reflection of the increased availability of nutrients and food (including phytoplankton) in spring. Evidence suggests that the increase of warmer water species at the expense of colder water species in the northeast Atlantic, as illustrated by the general trend in *C. finmarchicus* and *C. helgolandicus*, has accelerated (Edwards *et al.*, 2020). Since the 1960s, total

Calanus spp. biomass in the North Sea has declined by approximately 70%. As plankton communities are so closely linked to the physical environment, they can be good indicators of changes in the climate (BEIS, 2022). No data on plankton in the Otter Area is available.

4.2.2 Benthos

The biota living near, on, or in the seabed is collectively termed benthos. The diversity and biomass of the benthos is dependent on several factors including substrata (e.g. sediment, rock), water depth, salinity, the local hydrodynamics and degree of organic enrichment (BEIS, 2022). The species composition and diversity of the benthos or macrofauna found within sediments is commonly used as a biological indicator of sediment disturbance or contamination.

The macrofauna along the Otter Area was relatively homogeneous across survey areas. Species consistently appearing in the lists of most abundant taxa centre around the polychaetes (*Euchone incolor*, *Galathowenia oculata*, *Eclysippe vanelli*, *Glycera Lapidum*, and *Spiophanes kroyeri*), bivalves *Axinulus croulinensis* (Gardline, 2012a; Benthic Solutions, 2019; 2020).

The epifauna present in all areas was generally noted as sparse (in direct contrast to the infauna) and typically featured mobile species that have wide distributions throughout the North Sea. These include, for example, hermit crabs (usually *Pagurus* spp.), various starfish including *Asterias rubens*, *Astropecten Irregularis*, and *Luidia ciliaris*, and sea urchins such as *Gracielechinus acutus* (Gardline, 2012a; Benthic Solutions, 2019; 2020).

Overall, the observed species richness and abundance data was particularly high along Otter to Eider pipeline, reflecting the consistent muddy sand sediment and the lack of contamination from nearby drilling activities (Benthic Solutions, 2020).

Review of the faunal data obtained from the cuttings piles at Eider indicated an impacted macrofaunal community was present when compared to the wider area. In particular, the presence of two species (*Thyasira flexuosa* and *Thyasira sarsii*) within the marine bivalve family ‘*Thyasiridae*’ exclusive to stations close to the platform most impacted by drilling activities (Benthic Solutions, 2019).

4.2.3 Potential Sensitive Habitats and Species

A review of data from the surveyed areas indicated the presence of the following potential sensitive habitats and species and how they are considered to be protected in parentheses:

- ‘Submarine structures made by leaking gases’ (Habitats Directive Annex I Habitat);
- ‘Sea-pen and Burrowing megafauna communities’ (OSPAR List of Threatened and/or Declining Species and Habitats; United Kingdom Biodiversity Action Plan (UKBAP) habitat); and
- Ocean quahog (*Arctica islandica*) – (OSPAR List of Threatened and/or Declining Species and Habitats; Feature of Conservation Interest (FOCI); and Priority Marine Feature (PMF)).

4.2.3.1 Submarine Structures Made By Leaking Gases

‘Submarine structures made by leaking gases’ encompass hard substrates which support a unique community of organisms that can survive on the methane and hydrogen sulphide gasses associated with this habitat. There are two main types of submarine structures known to occur in the UK: bubbling reefs and submarine structures associated with pockmarks (JNCC, 2014). Methane seeping from the seabed, which creates these structures, reacts with the surrounding seawater forming carbonate blocks. These blocks are termed “Methane - Derived Authigenic Carbonates (MDAC)”.

The 2012 Otter manifold survey area (Gardline 2012a; 2012b) found no evidence of ‘Submarine structures made by leaking gases’.

In the Eider survey area, several seabed depressions (small seabed depressions, generally <1.5m diameter, and one large around 3 m diameter) resembling pockmarks, potential scour marks, and anchor scars were observed, suggesting sediment disturbance and possible methane gas release. However, no MDAC were found, indicating the absence of submarine structures made by leaking gases. Similarly, along the Otter to Eider pipeline route, depression features (approximately 4 m in diameter) were identified as scour marks around boulders, with no evidence of MDAC (Benthic Solutions, 2019; 2020).

In summary, there is no evidence that the Annex I habitat '*Submarine structures made by leaking gases*' occurs within the Otter Area.

4.2.3.2 Seapen and Burrowing Megafauna Communities

According to JNCC (2015) guidance, the key determinant for the classification of the habitat '*Seapen and burrowing megafauna communities*' is the presence of burrowing species or burrows at a SACFOR (super-abundant, abundant, common, frequent, occasional, rare) density of at least 'frequent'. While the presence of burrowing macrofauna is an essential element of classification, seapens may or may not be present.

Virgularia mirabilis juveniles were recorded during the Gardline survey (2012a) around the Otter manifold. Seapen species such as *Virgularia mirabilis* were also noted in the sieved grab samples from the Eider survey area however no evidence of bioturbation and burrowing megafauna communities was found (Benthic Solutions, 2019).

Benthic Solutions (2020) survey estimated the density of burrow openings located along the Otter to Eider pipeline route and found that density of both small (<3 cm) and large (3 - 15 cm) burrows mostly ranged between 'rare' and 'occasional' on the SACFOR scale. However, large burrow density was classified as 'frequent' on the top of the trenching pipeline mounds at stations O-E_R_05 and O-E_R_07 (Figure 4-1) and these locations could therefore be considered as '*Seapen and Burrowing Megafauna Communities*' habitat (Benthic Solutions, 2020). The EBS report mentions that this is likely to be an overestimate by counting multiple burrow openings which may in fact relate to a single burrow or burrowing individual. For example, the burrows of the mud shrimp *Callianassa subterranea* are known to consist of a multi-branched network of tunnels connected by various inhalant shafts, each terminating in a funnel shaped opening to the surface, which will further complicate the relationship between the number of burrow openings and the number of burrowing fauna.

4.2.3.3 Ocean Quahog

Ocean quahog *Arctica islandica* is listed as a PMF in Scottish waters (Tyler-Walters, 2016), is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008) and is a FOCI.

The EBS Surveys around the Otter manifold (Gardline, 2012a; 2012b) and along the Otter to Eider pipeline route (Benthic Solutions, 2020) did not identify any ocean quahog species.

The Eider survey area (Benthic Solutions, 2019) recorded five individuals of *A. islandica*. Four were found at stations 295 m and 500 m to the northwest of the platform and another individual was found 250 m to the southeast of the platform (Benthic Solutions, 2019). The distribution of *A. islandica* is relatively wide in the North Sea (OSPAR, 2009). The Eider platform is located on the edge of several UKCS Blocks where this species has been recorded. However, there was no evidence of distinct *A. islandica* siphons at the seabed on any of the video footage or still photographs (Benthic Solutions, 2019).

4.2.4 Blue Carbon

Marine sediments are the primary store of biologically derived carbon (mostly inorganic carbon). Marine ecosystems that contribute to climate change mitigation by sequestering excess carbon from the atmosphere are known as blue carbon ecosystems. The Intergovernmental Panel on

Climate Change (IPCC) defines blue carbon as “All biologically driven carbon fluxes and storage in marine systems that are amenable to management” (IPCC, 2019). Many natural processes and ecosystem components contribute to carbon sequestration and burial; when these are disrupted additional carbon previously stored can be released into the ocean or atmosphere.

As blue carbon increasingly becomes a focus for research and policymakers so does the ability to measure the rates and permanence of carbon sequestration (Macreadie *et al.*, 2017). To date, focus has been placed on biogenic marine habitats (e.g., saltmarshes and seagrasses), which are highly productive places. Scotland’s biogenic marine habitats have a very high rate of assimilation of carbon into plant material (662 gC/m²/yr), mostly in coastal areas (Burrows *et al.*, 2014; 2017). However, their overall contribution to the carbon budget is relatively small compared to offshore sediments (Himli *et al.*, 2021).

Carbon may be sequestered in marine sediments as precipitated carbonates (PCO) or as particulate organic carbon (POC). While it is known that sediment accumulation rates tend to be faster nearer to land (e.g. in sea lochs), it is unclear what processes maintain the accumulation basins on the shelf, or whether any of the rich supply of organic material from phytoplankton in productive shelf waters becomes refractory and remains there (Burrows *et al.*, 2014). The principal threat to long term carbon burial in sediments is any process that stirs up the sediment, particularly the top few millimetres of sediment. Resuspension of sediment allows rapid consumption of buried carbon by organisms and its subsequent release as carbon dioxide. This effectively reduces the carbon burial rate significantly and reduces the blue carbon some inventory.

Total standing stock of organic carbon in Scotland’s marine sediments is estimated as 18.1 MtC, and total sequestration capacity of Scottish seas as 7.2 MtC/yr. Patterns of standing stocks and sequestration capacity of organic carbon follow the distribution of mud and mud-sand-gravel combinations. Most organic carbon and the largest capacity for sequestration of organic carbon appears to be in deep mud off the continental shelf (Burrows *et al.*, 2014).

The percentage carbonate in the top 10 cm of superficial sediments in the Otter Area, ranges from 0 to 20% (NMPI, 2025) which is above average when compared to the UKCS average value of 10.1% (Burrows *et al.*, 2014; NMPI, 2025). The variation in carbonate sequestration can be attributed to the sediment composition across the fields, with sandy and muddy (fine) sediment generally exhibiting a higher percentage uptake of carbonate (Burrows *et al.*, 2014).

4.2.5 Fish and Shellfish

A number of commercially important fish and shellfish species occur in the vicinity of the proposed decommissioning operations. Fish and shellfish populations may be vulnerable to impacts from offshore installations such as hydrocarbon pollution and exposure to aqueous effluents, especially during the egg and juvenile stages of their lifecycles (Bakke *et al.*, 2013).

The Otter Area is within International Council for the Exploration of the Sea (ICES) rectangles 52F0, 51F1 and 51F0 in an area of spawning and nursery grounds for several commercially important species. Information on spawning and nursery periods for these different species, including peak spawning times are detailed in Table 4-1.

Table 4-1 Fish Sensitivities Within ICES Rectangles 52F0, 51F1 and 51F0 (Coull *et al.*, 1998; Ellis *et al.*, 2012)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N	N	N	N	N
Blue Whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	S	S*	S*	S								
European Hake	N	N	N	N	N	N	N	N	N	N	N	N
Haddock	N	S*N	S*N	S*N	SN	N	N	N	N	N	N	N
Herring	N	N	N	N	N	N	N	N	N	N	N	N
Ling	N	N	N	N	N	N	N	N	N	N	N	N
Mackerel	N	N	N	N	N	N	N	N	N	N	N	N
Norway Pout	SN	S*N	S*N	SN	N	N	N	N	N	N	N	N
Saithe	S*	S*	S	S								
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	SN	SN	SN	SN	SN	N	N	N	N	N	N

S = Spawning, N = Nursery, SN = Spawning and Nursery; * = peak spawning; **Species** = High nursery intensity as per Ellis *et al.*, 2012; **Species** = High intensity spawning as per Ellis *et al.* (2012); **Species** = High concentration spawning as per Coull *et al.*, 1998;

Spawning areas for most species are not rigidly fixed and fish may spawn either earlier or later from year to year. In addition, the mapped spawning areas represent the widest known distribution given current knowledge and should not be seen as rigid unchanging descriptions of presence or absence (Coull *et al.*, 1998). Whilst most species spawn into the water column of moving water masses over extensive areas, benthic spawners (e.g. herring) have very specific habitat requirements, and therefore their spawning grounds are relatively limited and potentially vulnerable to seabed disturbance and change.

The Otter Area represents spawning ground for Atlantic cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, Norway pout *Trisopterus esmarkii*, saithe *Pollachius virens* and whiting *Merlangius merlangus* (Ellis *et al.*, 2012; Coull *et al.*, 1998). Atlantic cod is the only species with a high intensity spawning ground in the Otter Area while other species have a lower or undetermined spawning intensity (Coull *et al.*, 1998; Ellis *et al.*, 2012). Figure 4-6 illustrates the general distribution of the spawning areas by species.

The Otter Area also represents a potential nursery ground for anglerfish (*Lophius piscatorius*), blue whiting *Micromesistius poutassou*, European hake *Merluccius merluccius*, haddock, herring *Clupea harengus*, ling, mackerel *Scomber scombrus*, spurdog *Squalus acanthias*, whiting and Norway pout *Trisopterus esmarkii*. Blue whiting *Micromesistius poutassou* is the only species with a high intensity nursery ground in the Otter Area while other species have a lower nursery intensity (Coull *et al.*, 1998; Ellis *et al.*, 2012). Figure 4-7 illustrates the general distribution of the potential nursery areas by species.

Haddock, saithe and Norway pout produce pelagic eggs. Herring are benthic spawners, but these are not reported to spawn within the Otter Area (Coull *et al.*, 1998; Ellis *et al.*, 2012).

Fisheries sensitivity maps produced by Aires *et al.* (2014) detail the likelihood of aggregations of fish species in the first year of their life (i.e. 0 group). These do not represent 'nursery grounds' as described in Coull *et al.* (1998) and Ellis *et al.* (2012), as nursery grounds can comprise a larger spread of ages and sizes. Maps from Aires *et al.* (2014), which show the probability of the presence of aggregations of 0 group anglerfish, blue whiting, cod, European hake, haddock, dover sole *Solea solea* herring, mackerel, horse mackerel *Trachurus trachurus*, Norway pout, plaice *Pleuronectes platessa*, sprat *Sprattus sprattus* and whiting are available on the NMPi (2025) (note, for European hake and anglerfish the maps show probability of presence of 0 group fish as opposed to presence of aggregations). Across the Otter Area, the probability of juvenile fish aggregations occurring is

low to medium for haddock, Norway pout, European hake and anglerfish. For blue whiting the probability is medium to high. (Aires *et al.*, 2014).

The following species are listed as Scottish PMFs and are considered of natural heritage importance: anglerfish, blue whiting, herring, ling, mackerel, Norway pout, saithe, spurdog, and cod (Tyler-Walters *et al.*, 2016).

Blue whiting, herring, Norway pout, saithe, spotted ray, and whiting are also on the International Union for Conservation of Nature (IUCN) Red List. However, they are listed as species of 'least concern' at a European level (IUCN, 2020). Herring, cod, whiting, hake, blue whiting, ling, plaice, mackerel, Norway pout and spurdog are on the Scottish Biodiversity List which identifies species of most importance for biodiversity conservation in Scotland (NatureScot, 2020). Spurdog are on the OSPAR (2008) List of Threatened and/or Declining Species and Habitats.

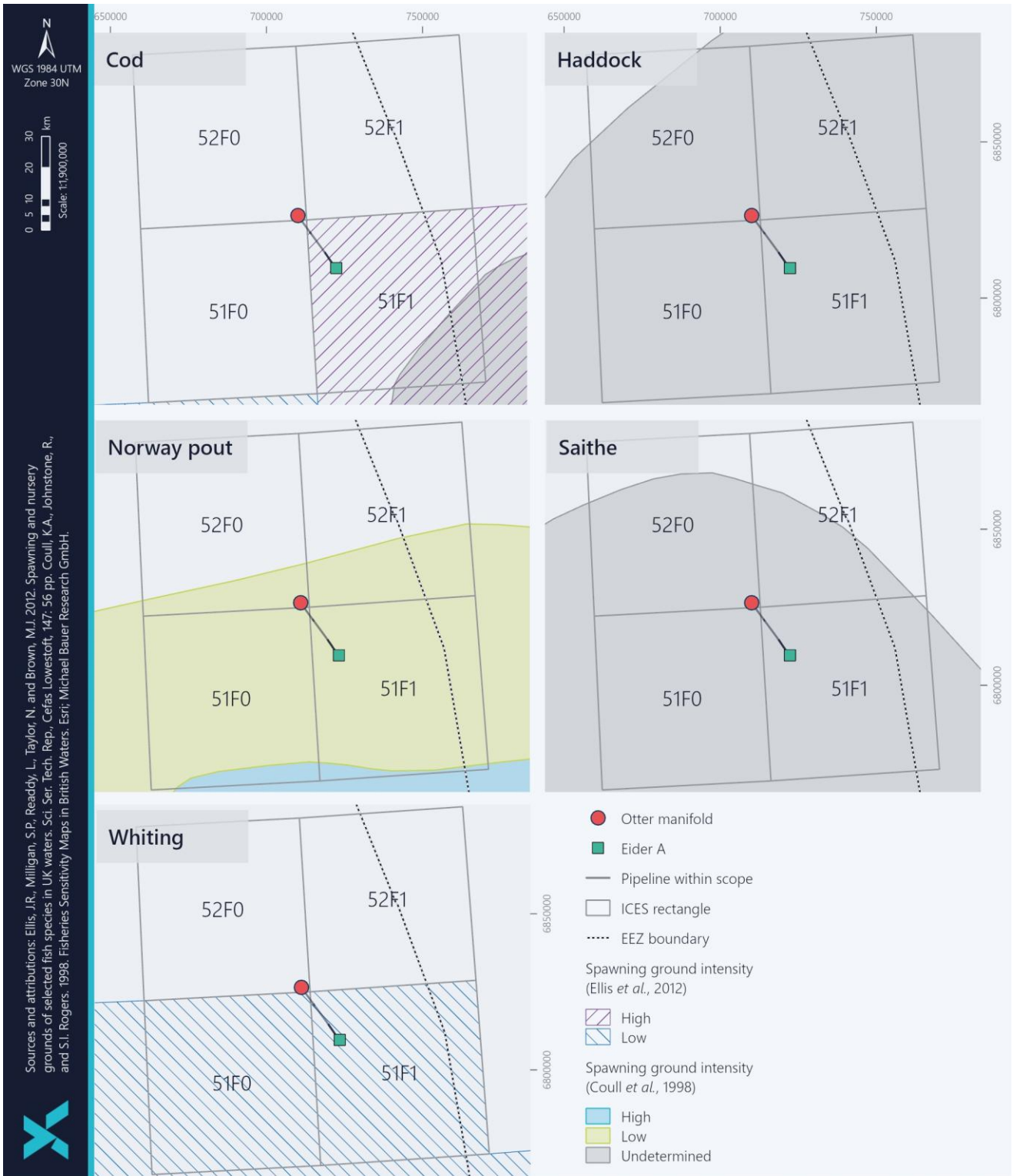


Figure 4-6 Potential Fish Spawning Grounds (Ellis *et al.*, 2012; Coull *et al.*, 1998)

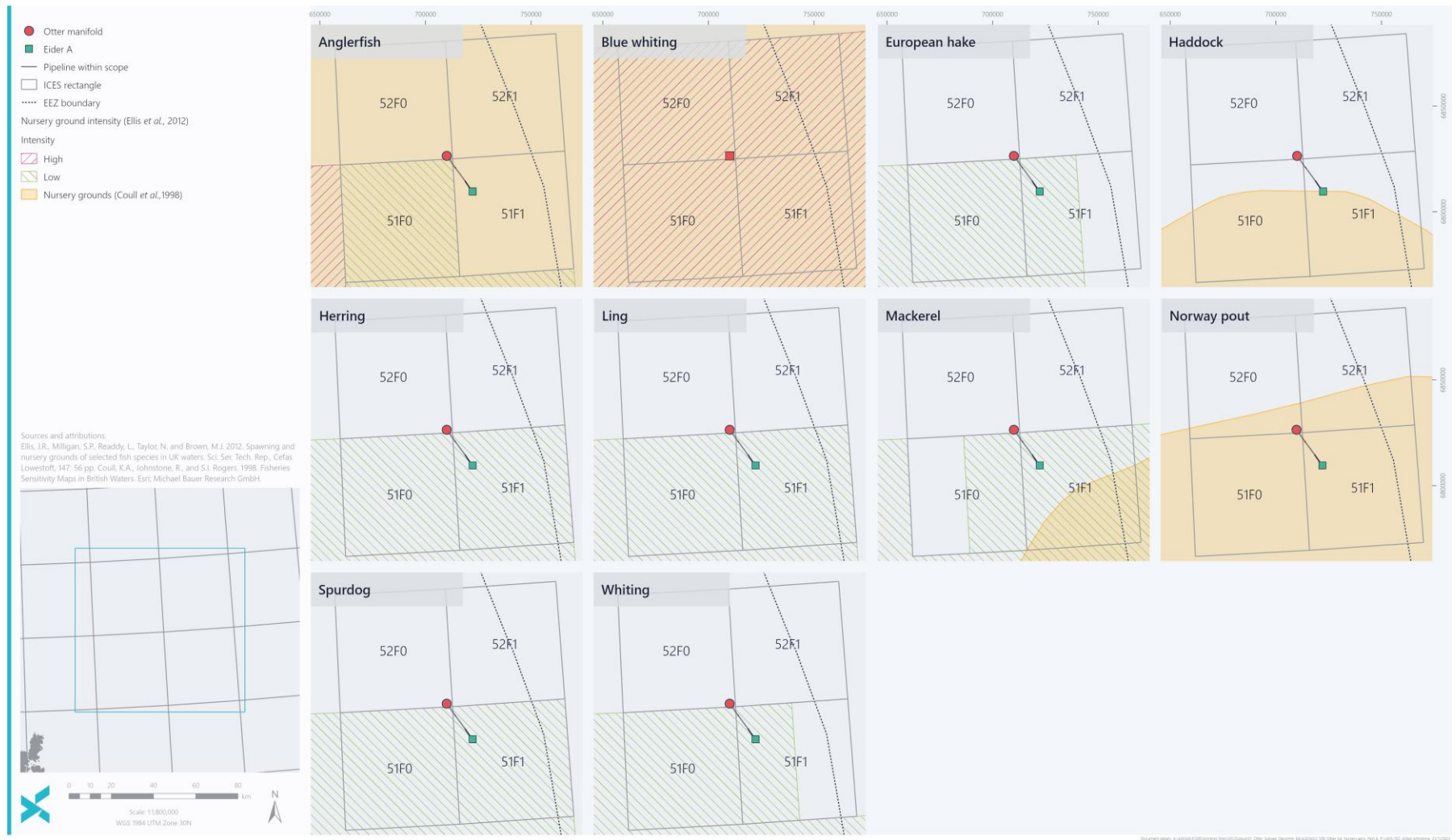


Figure 4-7 Potential Fish Nursery Habitats Adapted from Ellis *et al.* (2012)

4.2.6 Seabirds

Much of the North Sea and its surrounding coastline is an internationally important breeding and feeding habitat for seabirds. In the NNS, the most numerous species present are likely to be the northern fulmar *Fulmarus glacialis*, black-legged kittiwake *Rissa tridactyla* and common guillemot *Uria aalge* (DECC, 2009; DECC, 2016; BEIS, 2022). In the unlikely event of an oil release during decommissioning operations, birds would be vulnerable to oiling from surface pollution, which could cause direct toxicity through ingestion, and hypothermia as a result of the birds' inability to waterproof their feathers. Birds are most vulnerable in the moulting season when they become flightless and spend a large amount of time rafting on the water surface.

After the breeding season ends in June, large numbers of moulting auks (common guillemot, razorbill *Alca torda* and Atlantic puffin *Fratercula arctica*) disperse from their coastal colonies and into the offshore waters from July onwards. These high numbers of rafting birds are particularly vulnerable to oil pollution. In addition to auks; black-legged kittiwake, northern gannet *Morus bassanus*, and northern fulmar are present in sizable numbers during the post breeding season.

According to Kober *et al.* (2010), the following species have been recorded in the Otter Area: northern fulmar, sooty shearwater, European storm petrel *Hydrobates pelagicus*, northern gannet, long-tail skua *Stercorarius longicaudus*, great skua *Stercorarius skua*, black-legged kittiwake, great black-backed gull *Larus marinus*, common gull *Larus canus*, lesser black-backed gull *Larus fuscus*, herring gull *Larus argentatus*, glaucous gull *Larus hyperboreus*, common guillemot, razorbill, little auk *Alle alle* and Atlantic puffin.

The Seabird Oil Sensitivity Index (SOSI) (Webb *et al.*, 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution. SOSI values across the Otter Area (red highlight) is given in Table 4-2. Overall, seabird sensitivity to oil pollution in the region of the Otter Area is considered low (score of 5) throughout most of the year except for winter months. The SOSI value is medium (score of 4) for November through to February inclusive in Block 210/15; November to January in Block 211/16 and November and December to increase to high (score of 3) for January in Block 210/20. In addition, the area of the proposed operations is located approximately 119 km from the northeast coast of Shetland and is therefore remote from sensitive seabird breeding areas on the coast.

Table 4-2 Seabird Oil Sensitivity in the Otter Area (Webb *et al.*, 2016)

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
210/9	1*	5*	5	5	5	5	5	5	5*	N	N	4*
210/10	3*	3	5	5	5	5	5	2	2*	N	N	3*
211/6	3*	3	5	5	5	5	5	5*	N	N	N	3*
210/14	2	5	5	5	5*	5*	5	5	5*	N	N	2*
210/15	4*	4	5	5*	5*	5*	5	5	5*	N	4*	4
211/11	3*	5	5	5*	5*	5*	5	5	5*	N	3*	3
210/19	1	5	5	5*	5*	5*	5	5	5	5*	N	1*
210/20	3	5	5	5*	N	5*	5	5	5	5*	4*	4
210/24	1	5	5	5*	5*	5*	5	5	5	5*	5*	5
210/25	5	5	5	5*	N	5*	5	5	5	5*	5*	5
211/21	5	5	5	5*	N	5*	5	5	5	5*	5*	5
211/12	3*	5	4	5	5*	5*	5	5	5*	N	3*	3
211/16	4*	5	5	5*	N	5*	5	5	5	5*	4*	4
211/17	3*	5	5	5*	N	5*	5	5	5*	N	3*	3
211/22	5	5	5	5*	N	5*	5	5	4	4*	4*	4
Key	1 = Extremely high		2 = Very high		3 = High		4 = Medium		5 = Low		N = No data	

4.2.7 Marine Mammals

4.2.7.1 Cetaceans

The NNS has a moderate to high diversity and density of cetaceans, with a general trend of increasing diversity and abundance with increasing latitude. Harbour porpoise *Phocoena phocoena* and white-beaked dolphin *Lagenorhynchus albirostris* are the most widespread and frequently encountered species, occurring regularly throughout most of the year. Minke whales *Balaenoptera acutorostrata* are frequently recorded as seasonal visitors. Coastal waters of the Moray Firth and the east coast of Scotland support an important population of bottlenose dolphins *Tursiops truncatus*, while killer whales *Orcinus orca* are sighted with increasing frequency towards the north of the Moray Firth. Atlantic white-sided dolphin *Lagenorhynchus acutus*, Risso's dolphin *Grampus griseus* and long-finned pilot whale *Globicephala melas* can be considered occasional visitors (BEIS, 2022).

White-sided dolphin, harbour porpoise, white beaked dolphin and minke whale have been recorded in the Otter Area (Reid *et al.*, 2003). Harbour porpoise and minke whale have been recorded at high densities (approximately 0-10 individuals cited per hour) in May, July through to September and July respectively (Reid *et al.*, 2003). All cetacean species recorded in the area are listed as European Protected Species (EPS) under Annex IV of the Habitats Directive and are listed as PMFs (NatureScot, 2020). The harbour porpoise and the bottlenose dolphin are currently protected under Annex II of the EU Habitats Directive.

The fourth series of Small Cetaceans in European Atlantic waters and the North Sea (SCANS-IV) was conducted in 2022. This involved a large-scale ship and aerial survey to study the distribution and abundance of cetaceans. Harbour porpoise, white beaked dolphin and minke whale were the most abundant species recorded in the survey block (NS-F) covering the Otter Area, with specific densities listed in Table 4-3 (Gilles *et al.*, 2023).

Table 4-3 Densities of Cetaceans in the Otter Area (Gilles *et al.*, 2023)

Species	Density of Cetaceans in the Survey Block NS-F (Animals per km ²)
Harbour porpoise	0.4393
White beaked dolphin	0.3056
Minke whale	0.0271

4.2.7.2 Seals

Two species of seals live and breed in the UK, namely the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina* (Jones *et al.*, 2015; BEIS, 2022). Both grey and harbour seals are listed under Annex II of the EU Habitats Directive and are PMFs (NatureScot, 2020; BEIS, 2022). Approximately 36% of the world's grey seals breed in the UK (of these, 84% breed at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney). Approximately 30% of the world's harbour seals are found in the UK, however, this proportion has declined from approximately 40% in 2002. Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles (Special Committee on Seals, 2020; BEIS, 2022). On the east coast, the distribution is more restricted with concentrations in the major estuaries, including the Moray Firth).

Grey and harbour seals feed in inshore and offshore waters depending on the distribution of their prey, which changes seasonally and yearly. Both species tend to be concentrated close to shore, particularly during the pupping and moulting seasons. Grey seals typically pup in the autumn and moult in the winter whereas harbour seals pup in the early summer and moult from July-September. Seal tracking studies from the Moray Firth have indicated that the foraging movements of harbour seals are generally restricted to 40–50 km from haul-out sites (Special Committee on Seals, 2020). The movements of grey seals can involve larger distances than those of the harbour seal and tracking of individual seals has shown that most foraging probably occurs within 100 km of a haul-out site although they can feed up to several hundred kilometres offshore (Special Committee on Seals, 2020).

Since the Otter Area is located approximately 119 km offshore, grey and harbour seals may be encountered from time to time, but it is not likely that they use the area with any regularity or in great numbers. This is confirmed by the grey and harbour seal density maps published by Carter *et al.* (2022), which are provided in the NMPI (2025). Figure 4-8 presents density of grey and harbour seal within the Otter Area, which is 0 – 1 grey seal per 25 km² (Carter *et al.*, 2022).

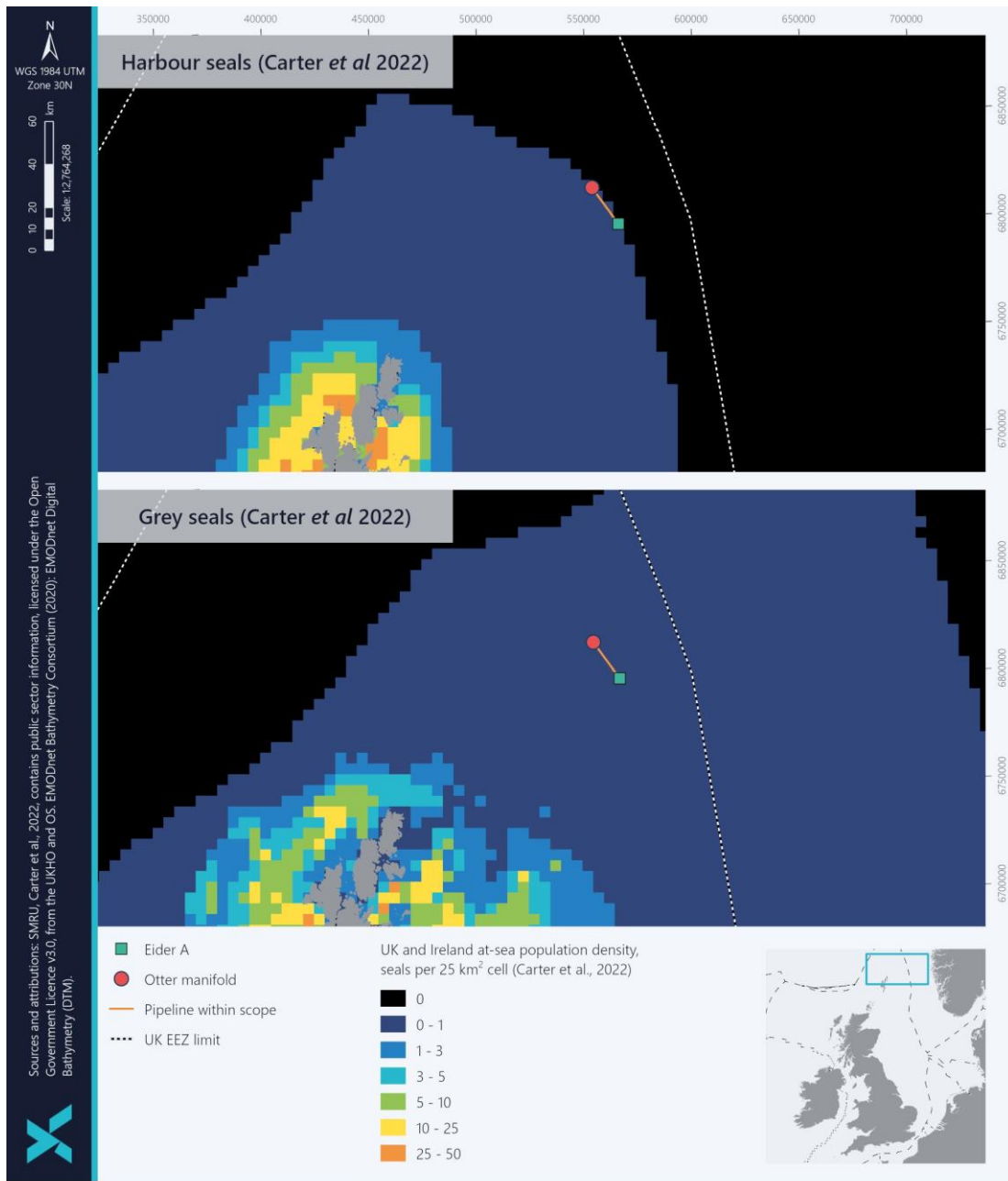


Figure 4-8 Harbour and Grey Seals Population in Otter Area Vicinity (Carter *et al.*, 2022)

4.3 Conservation

4.3.1 Offshore Conservation Sites

There are no Nature Conservation Marine Protected areas (NCMPAs), Special Areas of Conservation (SACs) or Special Protection areas (SPAs) within 40 km of the Otter Area. The closest protected site is the Pobie Bank Reef SAC, approximately 96 km southwest of the Otter manifold which is designated due to the presence of the Annex I habitat of reefs.

The closest Special Protection Area (SPA) is Hermaness, Saxa Vord and Valla Field SPA, approximately 119 km west of the Otter manifold (Figure 4-9).

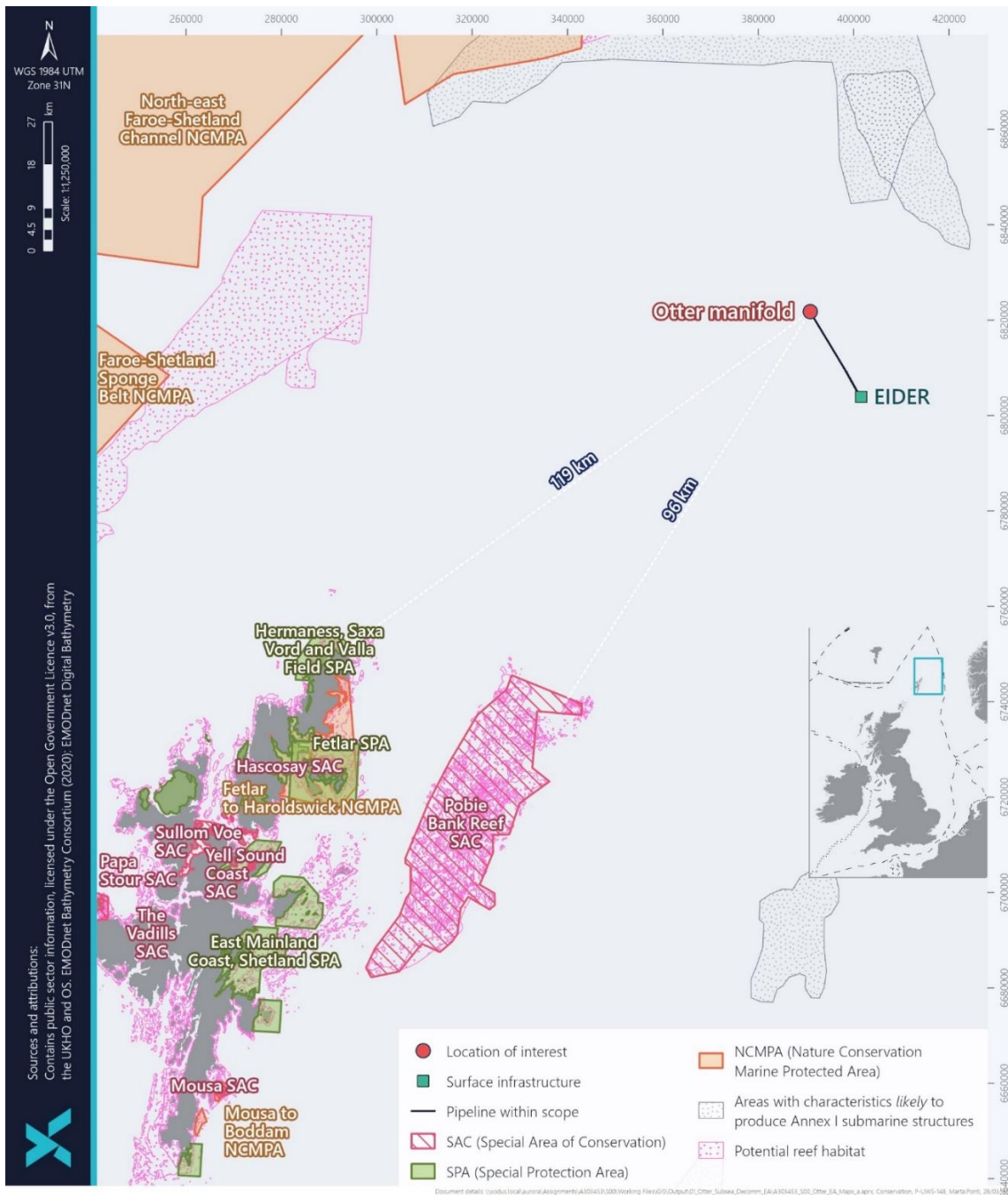


Figure 4-9 Location of the Otter Area Relative to Protected Sites

The seabed around the Otter Area is within a wider area of 'subtidal sand and gravels' (NMPI, 2025), a seabed type designated as a PMF in Scottish waters (Tyler-Walters *et al.*, 2016). Whilst this feature is present within the Otter Area, it is expected as this subtidal habitat is common throughout the North Sea (NMPI, 2025). 'Subtidal sands and gravels' also support internationally important commercial fisheries e.g., scallops, flatfish, sandeels, and are important nursery grounds for juvenile commercial fish species such as sandeels, flatfish, bass, skates, rays and sharks (SNH, 2014).

4.3.2 Onshore Conservation Sites

The Otter Area is located approximately 119 km from the northeast coast of Shetland. Due to this distance, no impacts to onshore conservation sites are expected from decommissioning activities at this location.

4.3.3 Protected Species

Four species listed under Annex II of the EU Habitats Directive are found in UK waters; harbour porpoise, bottlenose dolphin, grey seal and harbour seal. Grey and harbour seals are unlikely to be observed near the Otter Area with any regularity as both species have very low densities in these areas as shown by the seal density maps produced by the Sea Mammal Research Unit in NMPI (2025). There is a resident population of bottlenose dolphins in the Moray Firth (approximately 480 km from the Otter manifold), but this population typically remains close to the coast. This species is however transient and therefore can occur in other areas around the North East of Scotland and into NNS waters but they have not been recorded in the vicinity of the proposed operations. Harbour porpoise is the only Annex II species which is likely to be present in the vicinity of the Otter Area.

All species of cetacean recorded within the Otter Area are listed as EPS and are also PMFs. These species are listed as Annex IV on the EU Habitats Directive, and bottlenose dolphin and harbour porpoise are also Annex II species. Other marine species listed as EPSs include turtles and sturgeon (*Acipenser sturio*), which are not likely to be present within this area of the North Sea.

In addition to the above species and habitats, mobile fauna recorded during the surveys included ling, anglerfish and cod (Benthic Solutions, 2019; 2020). Ling, anglerfish and cod are Scottish PMF species'. Cod is also an OSPAR listed threatened and/or declining species.

Ocean quahog *A. islandica* is listed as PMF in Scottish waters (Tyler-Walters *et al.*, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). The distribution of *A. islandica* is relatively widespread in the North Sea (OSPAR, 2009). As described in Section 4.2.3.3, five individuals of *A. islandica* were identified in the vicinity of the Eider platform during site-specific surveys; however, the abundances do not constitute an aggregation (Benthic Solutions, 2019).

All species of conservation concern which were identified in the Otter Area are described in Section 4.2.3.

4.3.4 National Marine Plan

The NMP covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The aim of the NMP is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the NMP areas. The proposed operations described in this EA have been assessed against the Marine Plan General Planning Principles, specifically GEN 1, 4, 5, 9, 12, 14 and 21 (Section 4.3.4.1 to Section 4.3.4.8) and OIL AND GAS 2, 3 and 6 (Section 4.3.4.9 to Section 4.3.4.11) (Scottish Government, 2015).

Assessment of compliance against relevant policies has already been achieved through the impact assessment in Section 6 in support of this EA. The proposed operations do not compromise any of the NMP objectives and policies. TAQA will comply with all policies associated with the NMP, with particular attention being paid to the following policies:

4.3.4.1 GEN 1 – General Planning Principle

Development and use of the marine area should be consistent with the Marine Plan, ensuring activities are undertaken in a sustainable manner that protects and enhances Scotland's natural and historic marine environment.

All activities which may lead to seabed disturbance will be planned, managed and implemented in such a way that minimises that disturbance. Decommissioning of the Otter Area will result in the removal of around 17,547 Te of infrastructure from the marine environment.

4.3.4.2 GEN 4 – Co-existence

Where conflict over space or resource exists or arises, marine planning should encourage initiatives between sectors to resolve conflict and take account of agreements where this is applicable.

Potential impacts to other users of the sea during the decommissioning activities will be managed through existing safety zones, United Kingdom Hydrographic Office (UKHO) standard communication channels (including Kingfisher, Notice to Mariners and radio navigation warnings) and the use of Automatic Identification Systems (AIS) as well as other navigational controls. Upon completion of the decommissioning activities, the area of sea from which other users have been excluded throughout the decommissioning activities phase of the project area will be made available to them once again.

4.3.4.3 GEN 5 – Climate Change

Marine planners and decision makers should seek to facilitate a transition to a low carbon economy. They should consider ways to reduce emissions of carbon and other greenhouse gasses.

TAQA has developed a draft Emissions Reduction Strategy which supports their commitment to Net Zero and the NSTA Stewardship Expectation 11. This strategy defines TAQA's asset portfolio, including decommissioning activities, and is intended to drive increased energy efficiencies and reduced emissions. TAQA plans several improvements under the Emissions Reduction Strategy including working with the supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

TAQA will ensure that the minimal number of vessels will be deployed to undertake the Otter Area decommissioning activities and that activities are streamlined through planning to reduce the time required for vessels to undertake the activities and, in doing so, will support the drive to reduce emissions. Each vessel will have a Shipboard Energy Efficiency Management Plan (SEEMP) which contains information on minimising fuel consumptions.

4.3.4.4 GEN 9 – Natural Heritage

Development and use of the marine environment must:

- *Comply with legal requirements for protected areas and protected species.*
- *Not result in significant impact on the national status of PMF.*
- *Protect and, where appropriate, enhance the health of the marine area.*

Legal requirements will be adhered to throughout the duration of the Otter Area decommissioning activities, including those relating to the protected species which may be present within the Otter Area. There are no protected areas within 40 km of the Otter Area. There a number of PMFs (habitat and species) expected within the Otter Area however the proposed decommissioning activities will not result in significant impact on their national status (see Section 6).

4.3.4.5 GEN 12 – Water Quality and Resource

Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply.

All pipelines and subsea infrastructure will be cleaned and flushed prior to decommissioning. Therefore, any residual discharges during decommissioning activities will be negligible and

managed / risk assessed under the existing permitting regime. Discharges from vessels are typically well controlled activities that are regulated through vessel and machinery design, management and operation procedures. Controls will be in place, as required, through compliance with the Offshore Chemical Regulations and the Oil Pollution Prevention and Control Regulations.

4.3.4.6 GEN 13 – Noise

Development and use in the marine environment should avoid significant adverse effects of anthropogenic noise and vibration, especially on species sensitive to such effects.

TAQA will ensure that any potential impacts via underwater noise associated with the decommissioning of the Otter subsea facilities will be kept to a minimum. Vessel presence and cutting activities will be limited in duration. The cutting technique is likely to be diamond wire, or possibly abrasive water jet. Recently published DESNZ (2023) guidance states that, “Sound radiated from the diamond wire cutting of a conductor or abrasive water jets is not easily discernible above the background noise.”

4.3.4.7 GEN14 – Air Quality

Development and use of the marine environment should not result in the deterioration of air quality and should not breach any statutory air quality limits. Some development and use may result in increased emissions to air, including particulate matter and gasses. Impacts on relevant statutory air quality limits must be taken into account and mitigation measures adopted, if necessary, to allow an activity to proceed within these limits.

TAQA will ensure that the minimal number of vessels will be deployed to undertake the Otter Area decommissioning activities and that these activities are streamlined through planning to reduce vessel time and, in doing so, will support the drive to reduce emissions. Each vessel will have a SEEMP which contains information on minimising fuel consumptions. As previously mentioned, TAQA has developed a draft Emissions Reduction Strategy which inclusive of decommissioning activities, and which is intended to drive increased energy efficiencies and reduced emissions. TAQA plans several improvements under the Emissions Reduction Strategy including working with the supply chain, collating emission/energy savings initiatives across the business and reviewing emissions sources.

4.3.4.8 GEN 21 – Cumulative Impacts

Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation.

In terms of air and water quality, TAQA’s approach and project-specific mitigation measures will minimise the potential negative aspects contributing towards cumulative impacts as detailed in the responses to GEN 12 (Section 4.3.4.5) and GEN 14 (Section 4.3.4.7). In terms of seabed disturbance, it is reasonable to presume that the proposed operations are not of significant magnitude to have any discernible contribution to cumulative impacts in the broader context though this presumption is qualified in Section 6.3.

4.3.4.9 OIL AND GAS 2 – Decommissioning End-Points

Where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets from the seabed will be fully supported where practicable and adhering to relevant regulatory process.

TAQA is committed to establishing and maintaining environmentally acceptable methods for managing wastes and is developing a project-specific Waste Management Plan in line with the Waste Framework Directive and principles of the Waste Hierarchy. In line with the waste hierarchy and the principles of the circular economy, TAQA will continue to review reuse options for elements of the subsea infrastructure.

4.3.4.10 OIL AND GAS 3 – Minimising environmental and Socio-Economic Impacts

Supporting marine and coastal infrastructure for oil and gas developments, including for storage, should utilise the minimum space needed for activity and should consider environmental and socio-economic constraints.

TAQA will identify appropriately authorised disposal contractors and fit for purpose facilities through a selection process that will ensure that the chosen facility(ies) demonstrate a proven track record of waste stream management throughout the deconstruction process, the ability to deliver innovative reuse / recycling options, and thus minimises the space required to process recovered items.

4.3.4.11 OIL AND GAS 6 – Risk Reduction

Consenting and licensing authorities should be satisfied that adequate risk reduction measures are in place, and that operators should have sufficient emergency response and contingency strategies in place that are compatible with the National Contingency Plan and the Offshore Safety Directive.

TAQA has the relevant risk reduction measures in place for the proposed decommissioning activities and will demonstrate this appropriately through this DP/EA process, through stakeholder engagement and ultimately through the submission of notifications and applications for the authorisations, permits, licences, consents and emergency response processes required to execute the work.

4.4 Socio-Economic Environment

4.4.1 Commercial Fisheries

To provide the fullest picture of fisheries within the Otter Area, and the associated landings and effort trends, data from 2019 to 2023 are considered (see Figure 4-10 and Table 4-5). The Otter Area is within ICES rectangles 52F0, 51F0 and 51F1, which are targeted primarily for demersal species in terms of both landed weights and value.

In ICES rectangle 52F0, demersal fish accounted for 99% to 100% of the total landed value and landed weight between 2019 and 2023. In these same years shellfish species accounted for <1% of the value and the landed weight with exception of 2020 when pelagic fish also contributed <1% to total landed weight. (Marine Directorate, 2024).

The landings value and weight in ICES rectangle 51F0 were similarly weighted towards demersal, pelagic and shellfish, although the dominant species type varied by year. Demersal fish accounted for 99% to 100% of the landed value and 99% to 100% of the landed weight for 2019 – 2020 and 2022. In 2021 and 2023, there was a higher proportion of landed weight and value attributed to pelagic fish, which accounted for 33% and 25% of landed weight and 16% and 18% of landed value respectively. There are very little shellfish fisheries in ICES rectangle 51F0 with <1% of the landed weight and value across 2019 – 2023 (Marine Directorate, 2024).

Similarly, demersal fish were dominant for ICES rectangle 51F1, accounting for 100% for landed weight and value in 2020 and 2022. In 2019, 2021 and 2023 there was a higher proportion of landed weight and value attributed to pelagic fish, which accounted for 13%, 16% and 10% of landed weight and 3%, 7% and 4% of landed value respectively. There is little evidence of shellfish

fisheries in ICES rectangle 51F1, with only <1% of the landed weight and value across 2019 – 2023 representing this group (Marine Directorate, 2024).

In 2023, the three most valuable species in ICES rectangle 52F0 were megrim, monks or anglers and saithe since in ICES 51F1 haddock, whiting and saithe. These three species also made the largest contribution to landed weight and value in 2023. In ICES 51F0 the largest contributors to landed value were megrim, mackerel and haddock, while to landed weight were mackerel, haddock and whiting (Marine Directorate, 2024).

The average landed value and weight in ICES rectangles 52F0, 51F0 and 51F1 in 2023 was broadly comparable to those observed in other high-performing rectangles in the UKCS. To put the landings into context, catches amounting to 545,648 Te with a value of £801 million were landed across the UK in 2023. Specifically, demersal fishing in the UK accounted for catches of 46,135 Te and a value of £180 million. Therefore, ICES rectangles 52F0, 51F0 and 51F1 accounted for 1.2%, 2.9% and 3.4% of the total landed weight respectively and 0.65%, 1.4% and 1.6% of the total commercial value respectively of the UK's overall demersal fishing activity in 2023. When compared to other ICES rectangles in the UKCS, ICES rectangles 52F0, 51F0 and 51F1 contributed a moderate to high proportion of total UK demersal fishing activity in 2023 (Marine Directorate, 2024). Pelagic fishing in the UK accounted for catches of 372,452 Te and a value of almost £365 million. Therefore, ICES rectangles 52F0, 51F0 and 51F1 accounted for 0%, 0.1% and 0.05% of the total landed weight respectively and 0%, 0.2% and 0.03% of the total commercial value respectively of the UK's overall pelagic fishing activity in 2023. When compared to other ICES rectangles in the UKCS, ICES rectangles 51F0 and 51F1 contributed a moderate proportion of total UK pelagic fishing activity in 2023 (Marine Directorate, 2024).

Table 4-5 presents the fishing effort in ICES rectangles 52F0, 51F1 and 51F0 in days per month, between 2019-2023. Fishing effort in ICES rectangle 52F0 is dominated by demersal (trawl) activities and is relatively low in comparison to rectangles 51F0 and 51F1. Fishing effort in 2023 amounted to 103, 277 and 260 days in ICES rectangles 52F0, 51F0 and 51F1 respectively. Trends indicate that fishing effort has increased in the Otter Area since 2019, with the highest fishing effort days for 2020 for ICES rectangle 51F0 (302 days) and 2021 for rectangle 52F0 (168 days) and 51F1 (252 days). The decline in fishing effort days in 2022 can be associated with the end of transition from the EU and Covid (MMO, 2023) and was also driven by a decline in effort in the demersal trawl and seine nets segment. In 2023, fishing days were the highest in May.

Although some fishing activities were identified between 2019 and 2023, the data are disclosive and are therefore not shown in Table 4-5 (Marine Directorate, 2024).

Trawls were the dominant gear types used in ICES rectangles 52F0, 51F1 and 51F0 (accounting for approximately 92, 237 and 167 days respectively in 2023). Hooks and lines were also operated across all years in ICES rectangle 51F0 and seine nets in ICES rectangle 51F0 and 51F1. It is likely that most of the trawl effort in ICES rectangle 52F0, 51F0 and 51F1 is attributed to demersal fish, due to the higher proportion of demersal catch, however, some pelagic fishing effort is likely to occur.

Table 4-4 Live Weight and Value of Fish and Shellfish from ICES Rectangle 52F0, 51F0 and 51F1 from 2019-2023 (Marine Directorate, 2024)

Species type	2023						2022						2021						2020						2019					
	Live Weight (Te)			Value (£)			Live Weight (Te)			Value (£)			Live Weight (Te)			Value (£)			Live Weight (Te)			Value (£)			Live Weight (Te)			Value (£)		
	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1
Demersal	560	1,325	1,577	1,185,694	2,578,890	2,796,679	924	899	1,327	1,513,859	1,788,193	2,398,088	823	911	1,701	1,383,888	1,703,481	2,923,354	722	1,187	887	1,154,792	1,949,517	1,321,277	775	1,841	1,205	917,502	3,533,642	2,137,572
Pelagic	-	434	179	-	557,232	116,103	-	0	-	-	309	-	-	454	324	-	16,176	1	0	0	0	263	19	199	-	0	175	-	178	59,457
Shellfish	2	4	3	10,302	21,298	16,363	1	2	2	5,940	10,736	9,137	1	3	3	1,530	7,242	10,631	1	3	2	696	10,532	5,734	0	3	3	1,113	12,252	12,510
Total	562	1,763	1,759	1,195,995	3,157,420	2,929,145	926	902	1,329	1,519,799	1,799,238	2,407,225	823	1,367	2,028	1,385,418	1,726,899	2,933,986	723	1,190	889	1,155,750	1,960,068	1,327,210	776	1,844	1,383	918,615	3,546,072	2,209,539

Table 4-5 Number of Fishing Days per Month (All Gears) in ICES Rectangle 52F0, 51F1, 51F0 from 2019-2023 (Marine Directorate, 2024)

Year	Jan			Feb			March			April			May			June			July			Aug			Sep			Oct			Nov			Dec			Total		
	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1	52F0	51F0	51F1			
2019	D	5	11	D	10	18	D	17	14	D	D	32	D	25	9	D	D	9	D	10	D	D	60	18	D	23	38	-	28	21	D	57	6	-	6	D	D	243	167
2020	D	9	D	D	23	9	D	14	11	D	29	16	24	47	D	54	76	D	30	13	24	D	25	14	19	27	7	D	21	12	D	18	11	D	D	D	127	302	115
2021	-	4	9	D	18	D	D	10	13	19	15	46	32	23	68	80	25	68	37	23	35	D	24	10	D	33	18	D	22	D	D	17	15	D	D	7	168	214	252
2022	D	D	10	D	7	D	D	13	37	11	33	23	45	48	25	39	34	25	D	D	D	D	16	9	D	14	21	-	D	24	D	11	20	-	11	14	95	187	197
2023	-	D	D	D	10	D	D	14	47	28	14	47	15	53	62	20	52	17	D	35	17	24	40	16	16	21	13	D	22	21	-	16	14	D	D	9	103	277	260

Note: Monthly fishing effort by UK vessels landing into Scotland: Blank = no data, D = Disclosive data (indicating very low effort)², green = 0 – 100 days fished, yellow = 101 – 200, orange =201-300, red = ≥301

² The term 'disclosive' is used when fewer than five vessels have been recorded fishing in an area, meaning that detailed data cannot be shown in order to preserve data privacy. It therefore indicates very low levels of effort within the area.

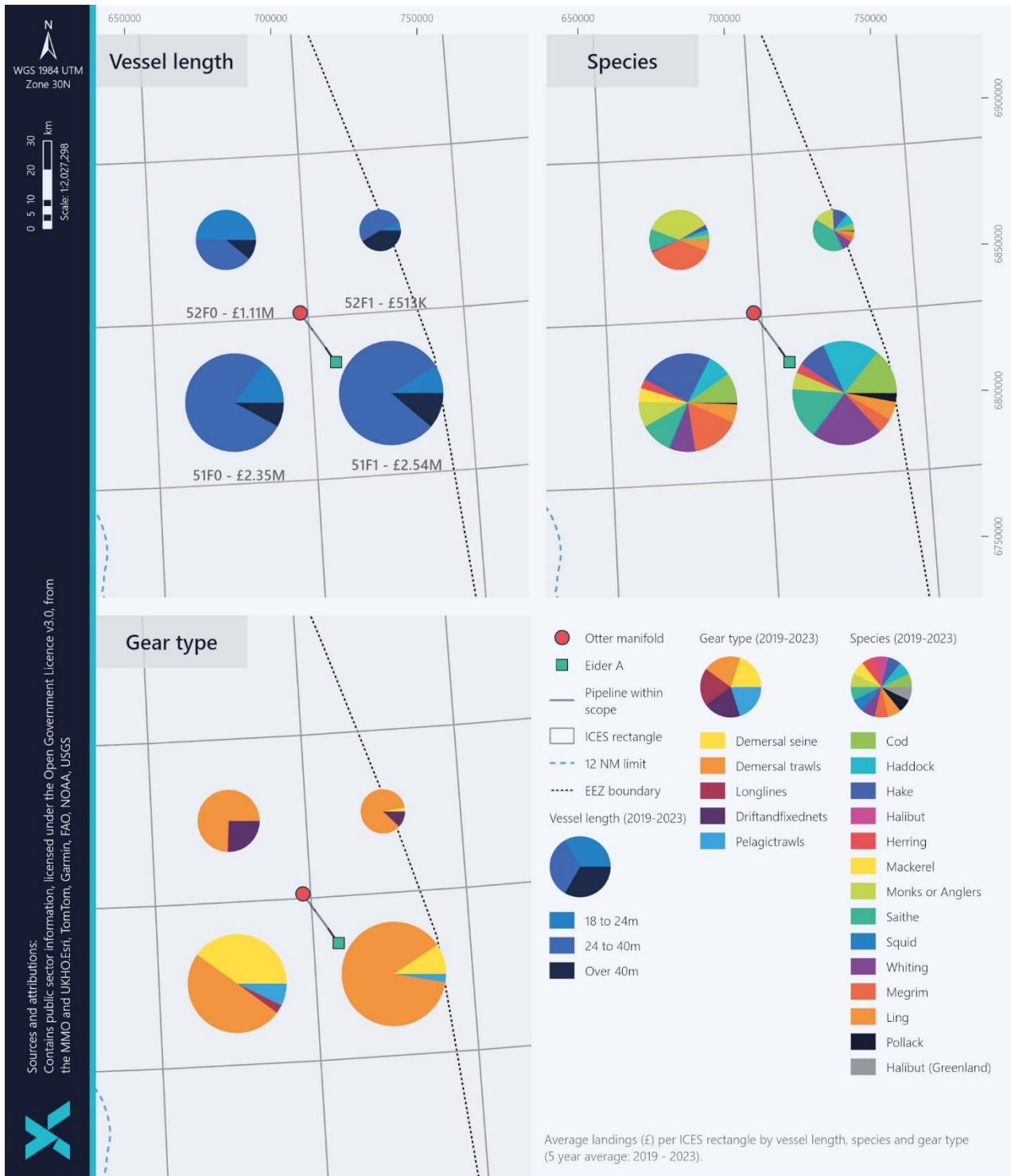


Figure 4-10 Average Landings Values (£) by Vessel Length, Species and Gear Type in the Otter Area (5 year average: 2019-2023)

4.4.2 Shipping

The North Sea contains some of the world's busiest shipping routes, with significant traffic generated by vessels trading between ports at either side of the North Sea and the Baltic. North Sea oil and gas fields generate moderate vessel traffic in the form of support vessels, principally operating from Peterhead, Aberdeen, Montrose and Dundee in the north and Great Yarmouth and Lowestoft in the south (BEIS, 2022). However, the nature of shipping traffic in the North Sea is evolving. As oil and gas activities diminish, there is a rise in decommissioning operations and the installation of renewable energy infrastructure, leading to a dynamic shift in maritime activity in the North Sea.

The level of shipping activity is considered very low in Block 210/15, 210/20 and low in Block 211/16 (OGA, 2016). The average weekly density of vessels (all combined) in 2019 using automatic identification systems (AIS) data is relatively low in the Otter Area (Figure 4-11). Near the Otter manifold, average vessel transit density is between 0 and 10 per 4 km² yr⁻¹ (MMO, 2020). Localised increases in vessel activity at the Eider platform and along the pipeline route (10 – 50 per 4 km² yr⁻¹) can be attributed to the transit and presence of operational and maintenance vessels (Figure 4-11).

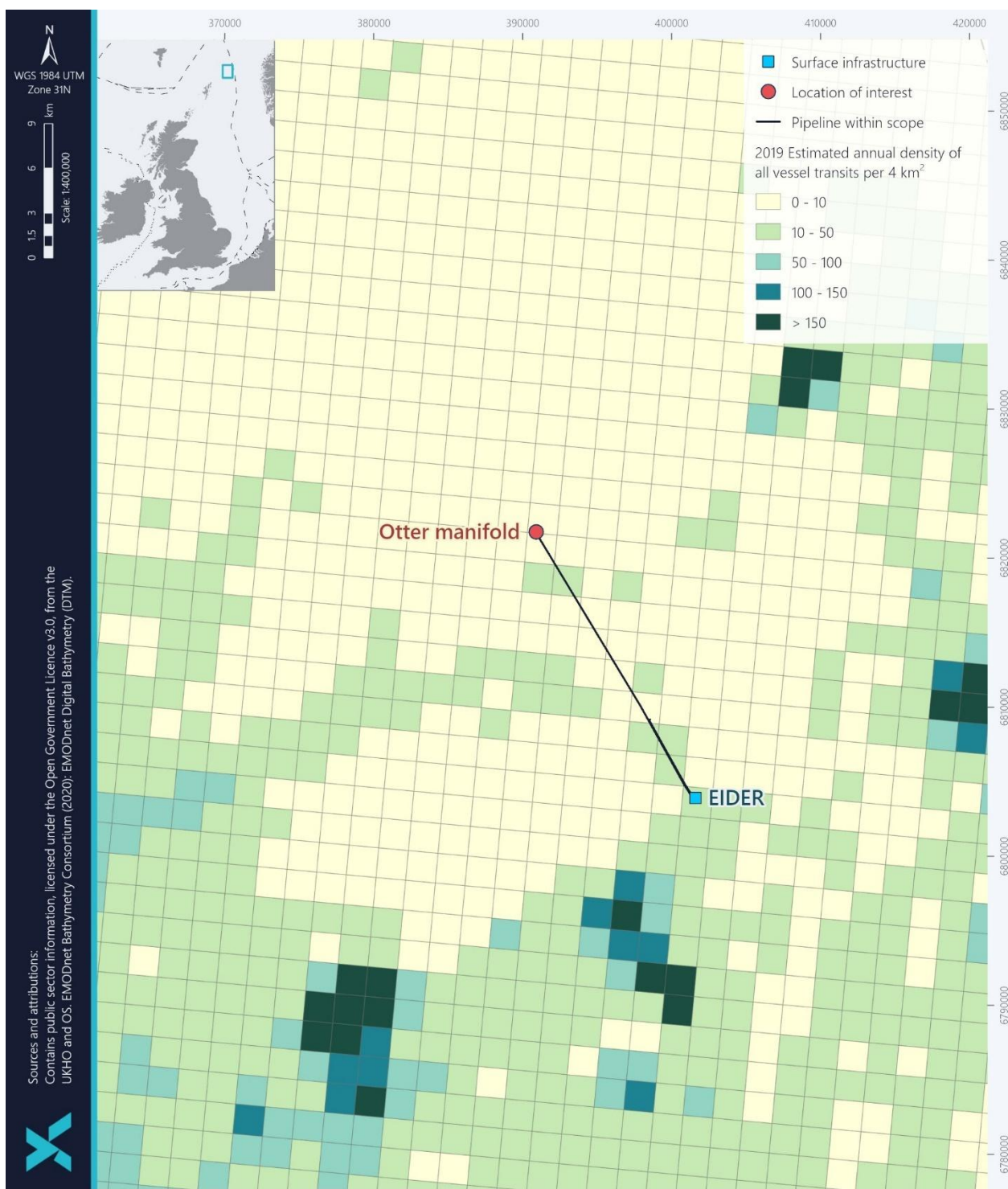


Figure 4-11 Annual Density of Vessel Transits Around the Otter Area in 2019 (MMO, 2020)

4.4.3 Oil and Gas Activity

The closest piece of surface infrastructure to the Otter manifold is the EnQuest operated Magnus platform, 22 km to the east northeast. The TAQA operated Tern and North Cormorant platforms are located 26.9 km south and 32.5 km southeast of the Otter manifold respectively (Figure 4-12, Table 4-6). Several of the Otter pipelines cross the Magnus Field to Sullom Voe pipeline, PL1762. The decommissioning of these crossings will be managed in consultation with the Magnus

Operator. The connections to the TAQA operated Eider, Tern and North Cormorant platforms will be managed as part of the wider TAQA NNS decommissioning approach. The eventual decommissioning of nearby oil and gas installations, some of which may overlap with the decommissioning of the Otter Area, will alter the profile of ongoing oil and gas activities in the region.

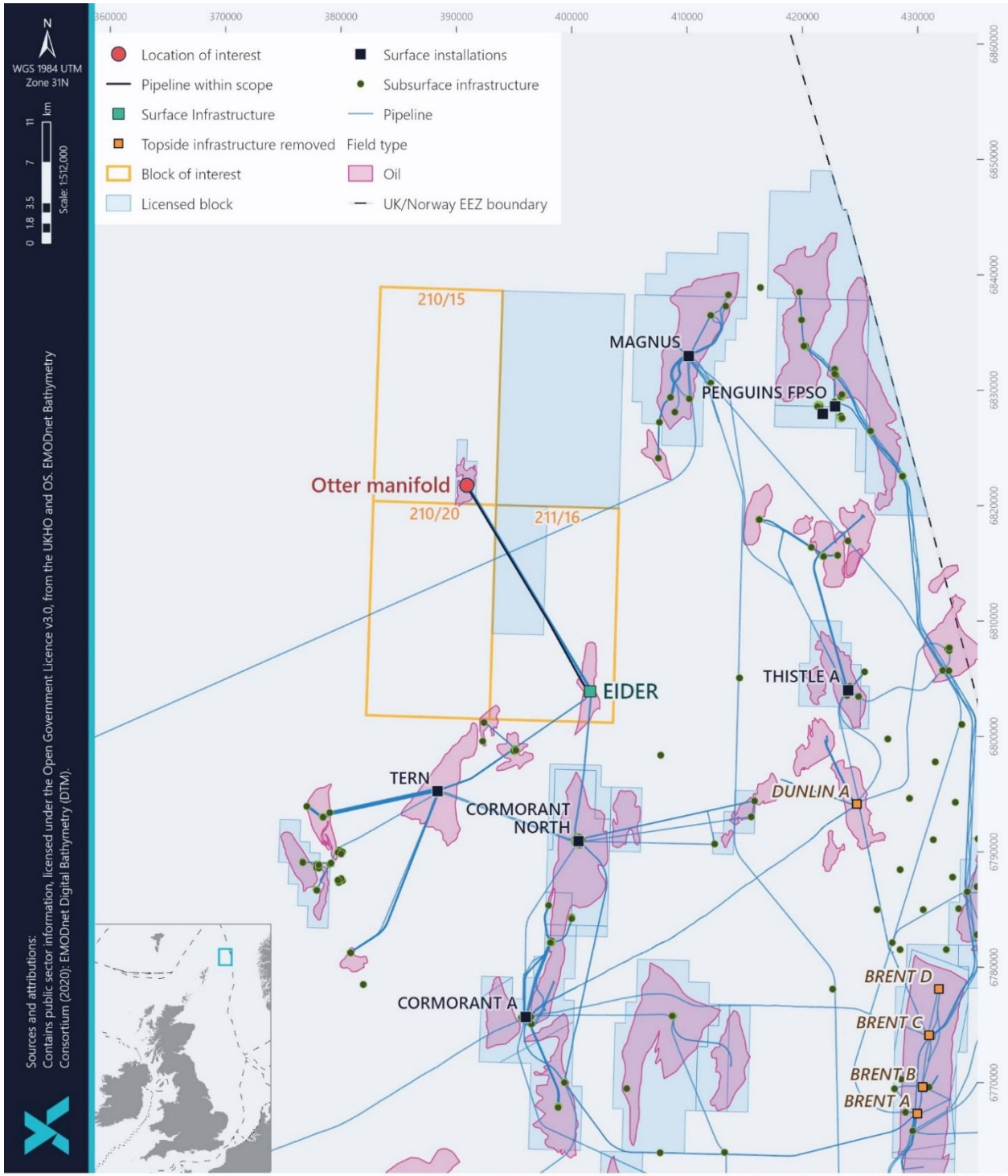


Figure 4-12 Oil and Gas Activity in the Vicinity of the Otter Area

Table 4-6 Surface Installations Located within 40 km of the Otter Manifold

Installation	Status	Operator	Distance from Otter manifold (km)	Direction from Otter manifold
Eider	Non-Operational	TAQA	21	South southeast
Magnus	Non-Operational	EnQuest	22	East northeast
Tern	Non-Operational	TAQA	26.9	South southwest
North Cormorant	Non-Operational	TAQA	32.5	South southeast
Penguins FPSO	Operational	Shell	33	East northeast
Thistle	Non-Operational	EnQuest	39	East southeast

4.4.4 Military Activities

Blocks 210/15, 210/20 and 211/16 are not areas of interest to the Ministry of Defence (MoD) (OGA, 2019).

4.4.5 Renewable Energy

There are no planned or operating renewable energy sites within 40 km of the Otter Area. The closest renewable energy site is a Tidal farm in Bluemull Sound, located 137 km west southwest from the Otter manifold. The closest Sectoral Marine Plan (SMP) ScotWind area is NE1 approximately 119 km to the south-west (NMPI, 2025).

The Otter Area is partially within areas identified under the Innovation and Targeted Oil and Gas (INTOG) scheme which targets smaller-scale OWF developments designed to reduce to oil and gas platform emissions. The Otter manifold is located within INTOG area NE-b and approximately 2 km to the south of INTOG area NE-a. The nearest INTOG application is for Cerulean Winds, located approximately 399 km to the south-east (NMPI, 2025).

4.4.6 Telecommunication Cables

There are no planned or operating telecommunication cables within 40 km of the Otter Area. The nearest telecom cable is the Cantat 3 Faroese, located 77 km east northeast of the Otter manifold (KIS-ORCA, 2021).

4.4.7 Wrecks

There are no wrecks within close vicinity of the Otter Area, as identified by the UK Hydrographic Office (UKHO). There are four non-dangerous wrecks located between 30 and 40 km from the Otter Area (UKHO, 2020). The closest wreck is located 31 km East Northeast of the Otter manifold (UKHO, 2020).

5 IMPACT ASSESSMENT APPROACH

This EA is designed to:

- Identify potential impacts to environmental and societal receptors from the proposed decommissioning activities;
- Evaluate the potential significance of any identified impacts in terms of the threat that they pose to these receptors; and
- Assign measures to manage the risks in line with industry BAT and BEP; and address concerns or issues raised by stakeholders through consultation.

The impact assessment was undertaken using the following approach:

- The potential environmental issues arising from subsea decommissioning activities were identified through a combination of the expert judgement of project engineers and marine environmental specialists, and from previous consultation on the wider area with OPRED, Marine Directorate, Joint Nature Conservation Committee (JNCC) and Scottish Fishermen’s Federation (SFF). The potential environmental issues were grouped under the following key receptor risk groups:
 - Emissions to air;
 - Disturbance to the seabed;
 - Planned discharges to sea;
 - Physical presence of vessels in relation to other sea users
 - Physical presence of infrastructure decommissioned *in situ* in relation to other sea users;
 - Underwater noise;
 - Resource use;
 - Onshore activities/ waste; and
 - Unplanned events.
- An initial scoping based on a high-level consideration of these aspects against the evaluation criteria was then undertaken which screened aspects in or out of further detailed assessment. Justification statements were compiled detailing the rationale for screening out any aspects from further assessment (Section 6.1).
- For aspects which were considered potentially significant, their significance of potential impacts against impact criteria definitions was evaluated (Sections 6.2, 6.3 and 6.4); and
- For any potentially significant impact, any potential mitigation and/or control measures to be used to further reduce any impact to ‘As Low As Reasonably Practicable’ (ALARP) were captured.

5.1 Stakeholder Engagement

Consultation for the Otter Field Subsea Decommissioning has been largely based on sharing project expectations from the wider project area approach and overall NNS subsea infrastructure-specific considerations with the key stakeholders (Marine Scotland, JNCC and SFF).

5.2 EA Methodology

5.2.1 Overview

The impact assessment methodology was developed by reference to the Institute of Ecology and Environmental Management (IEEM) guidelines for marine impact assessment (IEEM, 2010), the Marine Life Information Network (MarLIN) species and ecosystem sensitivities guidelines (Tyler-Walters *et al.*, 2004) and guidance provided by Scottish National Heritage (SNH), now NatureScot, in the handbook on environmental impact assessment (SNH, 2013) and by The Institute of Environmental Management and Assessment (IEMA) in the guidelines for Environmental Impact Assessment (EIA; IEMA, 2015; 2016).

EIA provides an assessment of the environmental and societal effects that may result from a project's impact on the receiving environment. The terms impact and effect have different definitions in EIA and one drives the other. Impacts are defined as the changes resulting from an action, and effects are defined as the consequences of those impacts.

In general, impacts are specific, measurable changes in the receiving environment (volume, time and/or area); for example, the number of marine mammals to be disturbed following exposure to vessel noise emissions. Effects (the consequences of those impacts) consider the response of a receptor to an impact; for example, the effect of the marine mammal/noise impact example given above might be exclusion from an area caused by disturbance, leading to a population decline. The relationship between impacts and effects is not always so straightforward; for example, a secondary effect may result in both a direct and indirect impact on a single receptor. There may also be circumstances where a receptor is not sensitive to a particular impact and thus there will be no significant effects/consequences.

For each impact, the assessment identifies a receptor's sensitivity and vulnerability to that effect and implements a systematic approach to understand the scale of the effect. The process considers the following:

- Identification of receptor and impact (including duration, timing and nature of impact);
- Definition of sensitivity, vulnerability and value of receptor;
- Definition of magnitude and likelihood of impact; and
- Assessment of consequence of the impact on the receptor, considering the probability that it will occur, the spatial and temporal extent and the importance of the impact. If the assessment of consequence of impact is determined as moderate or major, it is considered a significant impact.

Once the consequence of a potential impact has been assessed it is possible to identify measures that can be taken to mitigate impacts through engineering decisions or execution of the project. This process also identifies aspects of the project that may require monitoring, such as a post-decommissioning survey at the completion of the works to inform inspection reports.

For some impacts, significance criteria are standard or numerically based. For others, for which no applicable limits, standards or guideline values exist, a more qualitative approach is required. This involves assessing significance using professional judgement.

Despite the assessment of impact significance being a subjective process, a defined methodology has been used to make the assessment as objective as possible and consistent across different topics. The assessment process is summarised below. The terms and criteria associated with the impact assessment process are described and defined; details on how these are combined to assess consequence and impact significance are then provided.

5.2.2 Baseline Characterisation and Receptor

To assess potential impacts on the environment it was necessary to firstly characterise the different aspects of the environment that could potentially be affected (the baseline environment). The baseline environment has been described in Section 4 and is based on desk studies combined with additional site-specific studies such as surveys and modelling where required.

The EA process requires identification of the potential aspects and receptors that could be affected by the decommissioning activities (e.g. other users of the sea, water quality). High level and sensitive receptors are identified and described in Section 4.

5.2.3 Impact Definition

5.2.3.1 Impact Magnitude

Determination of impact magnitude requires consideration of a range of key impact criteria including:

- Nature of impact, whether it be beneficial or adverse;
- Type of impact, be it direct or indirect;
- Size and scale of impact, e.g. the geographical area;
- Duration over which the impact is likely to occur e.g. less than a year, a few years, etc.;
- Seasonality of impact, i.e. is the impact expected to occur all year or at specific times; and
- Frequency of impact, i.e. how often the impact is expected to occur.

Each of these variables is expanded upon in Table 5-1 to Table 5-5 to provide consistent definitions across all EA topics. In each impact assessment, these terms are used in the assessment summary table to summarise the impact and are expanded upon as necessary in any supporting text. With respect to the nature of the impact (Table 5-1), it should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

Table 5-1 Nature of Impact

Nature of Impact	Definition
Beneficial	Advantageous or positive effect to a receptor (i.e. an improvement).
Adverse	Detrimental or negative effect to a receptor.

Table 5-2 Type of Impact

Type of Impact	Definition
Direct	Impacts that result from a direct interaction between the Otter Area decommissioning activities and the receptor. Impacts that are actually caused by the activities.
Indirect	Reasonably foreseeable impacts that are caused by the interactions with the Otter Area decommissioning activities but which occur later in time than the original, or at a further distance. Indirect impacts include impacts that may be referred to as 'secondary', 'related' or 'induced'.
Cumulative	Impacts that act together with other impacts (including those from any concurrent or planned future third-party activities) to affect the same receptors as the Otter Area decommissioning activities. Definition encompasses "in-combination" impacts.

Table 5-3 Duration of Impact

Duration	Definition
Short-term	Impacts that are predicted to last for a short duration (e.g. less than one year).
Temporary	Impacts that are predicted to last a limited period (e.g. a few years). For example, impacts that occur during the decommissioning activities and which do not extend beyond the main activity period for the works or which, due to the timescale for mitigation, reinstatement or natural recovery, continue for only a limited time beyond completion of the anticipated activity.
Prolonged	Impacts that may, although not necessarily, commence during the main phase of the decommissioning activity and which continue through the monitoring and maintenance, but which will eventually cease.
Permanent	Impacts that are predicted to cause a permanent, irreversible change.

Table 5-4 Geographical Extent of Impact

Geographical Extent	Description
Local	Impacts that are limited to the local area surrounding the Otter Area decommissioning activities footprint and associated working areas. Alternatively, where appropriate, impacts that are restricted to a single habitat or biotope or community.
Regional	Impacts that are experienced beyond the local area to the wider region, as determined by habitat/ecosystem extent.
National	Impacts that affect nationally important receptors or protected areas, or which have consequences at a national level. This extent may refer to either Scotland or the UK depending on the context.
Transboundary	Impacts that could be experienced by neighbouring national administrative areas.
International	Impacts that affect areas protected by international conventions, European and internationally designated areas or internationally important populations of key receptors (e.g. birds, marine mammals).

Table 5-5 Frequency of Impact

Frequency	Description
Continuous	Impacts that occur continuously or frequently.
Intermittent	Impacts that are occasional or occur only under a specific set of circumstances that occurs several times during the course of the Otter Area decommissioning activities. This definition also covers such impacts that occur on a planned or unplanned basis and those that may be described as 'periodic' impacts.

5.2.3.2 Impact Magnitude Criteria

Overall impact magnitude requires consideration of all the impact parameters described above. Based on these parameters, magnitude can be assigned following the criteria outlined in Table 5-6. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement.

Table 5-6 Impact Magnitude Criteria

Magnitude	Criteria
Major	Extent of change: Impact occurs over a large scale or spatial geographical extent and/or is long term or permanent in nature. Frequency/intensity of impact: high frequency (occurring repeatedly or continuously for a long period of time) and/or at high intensity.
Moderate	Extent of change: Impact occurs over a local to medium scale/spatial extent and/or has a prolonged duration. Frequency/intensity of impact: medium to high frequency (occurring repeatedly or continuously for a moderate length of time) and/or at moderate intensity or occurring occasionally/intermittently for short periods of time but at a moderate to high intensity.
Minor	Extent of change: Impact occurs on-site or is localised in scale/spatial extent and is of a temporary or short-term duration. Frequency/intensity of impact: low frequency (occurring occasionally/intermittently for short periods of time) and/or at low intensity.
Negligible	Extent of change: Impact is highly localised and very short term in nature (e.g. days/few weeks only).
Positive	An enhancement of some ecosystem or population parameter.
Notes: Magnitude of an impact is based on a variety of parameters. Definitions provided above are for guidance only and may not be appropriate for all impacts. For example, an impact may occur in a very localised area (minor to moderate) but at very high frequency/intensity for a long period of time (major). In such cases informed judgement is used to determine the most appropriate magnitude ranking and this is explained through the narrative of the assessment.	

5.2.3.3 Impact Likelihood for Unplanned and Accidental Events

The likelihood of an impact occurring for unplanned/accidental events is another factor that is considered in this impact assessment. This captures the probability that the impact will occur and the probability that the receptor will be present and is based on knowledge of the receptor and professional judgement.

5.2.3.4 Receptor Definition

As part of the assessment of impact significance it is necessary to define a receptor’s sensitivity, vulnerability, and value. The sensitivity of a receptor is defined as ‘the degree to which a receptor is affected by an impact’ and is a generic assessment based on factual information whereas an assessment of vulnerability, which is defined as ‘the degree to which a receptor can or cannot cope with an adverse impact’ is based on professional judgement taking into account a number of factors, including the previously assigned receptor sensitivity and impact magnitude, as well as other factors such as known population status or condition, distribution and abundance. The value of a receptor can be defined as the benefits from use of the natural environment. These benefits may be direct or indirect and they may be from present use and/ or future use.

5.2.3.4.1 Receptor Sensitivity

These range from negligible to very high and definitions for assessing the sensitivity of a receptor are provided in

Table 5-7.

Table 5-7 Sensitivity of Receptor

Receptor Sensitivity	Definition
Very high	Receptor with no capacity to accommodate a particular effect and no ability to recover or adapt.
High	Receptor with very low capacity to accommodate a particular effect with low ability to recover or adapt.
Medium	Receptor with low capacity to accommodate a particular effect with low ability to recover or adapt.
Low	Receptor has some tolerance to accommodate a particular effect or will be able to recover or adapt.
Negligible	Receptor is generally tolerant and can accommodate a particular effect without the need to recover or adapt.

5.2.3.4.2 Receptor Vulnerability

Information on both receptor sensitivity and impact magnitude is required to determine receptor vulnerability. These criteria, described in Table 5-6 and

Table 5-7 are used to define receptor vulnerability as per Table 5-8.

Table 5-8 Vulnerability of Receptor

Receptor Vulnerability	Definition
Very high	The impact will have a permanent effect on the behaviour or condition on a receptor such that the character, composition or attributes of the baseline, receptor population or functioning of a system will be permanently changed.
High	The impact will have a prolonged or extensive temporary effect on the behaviour or condition on a receptor resulting in long term or prolonged alteration in the character, composition or attributes of the baseline, receptor population or functioning of a system.
Medium	The impact will have a short-term effect on the behaviour or condition on a receptor such that the character, composition, or attributes of the baseline, receptor population or functioning of a system will either be partially changed post development or experience extensive temporary change.
Low	Impact is not likely to affect long term function of system or status of population. There will be no noticeable long-term effects above the level of natural variation experience in the area.
Negligible	Changes to baseline conditions, receptor population or functioning of a system will be imperceptible.

It is important to note that the above approach to assessing sensitivity and vulnerability is not appropriate in all circumstances and in some instances professional judgement has been used in determining sensitivity. In some instances, it has also been necessary to take a precautionary approach where stakeholder concern exists regarding a particular receptor. Where this is the case, this is detailed in the relevant impact assessment in Section 6.

5.2.4 Receptor Value

The value or importance of a receptor is based on a pre-defined judgement based on legislative requirements, guidance, or policy. Where these are absent, it is necessary to make an informed judgement on receptor value based on perceived views of key stakeholders and specialists. Examples of receptor value definitions are provided in Table 5-9.

Table 5-9 Value of Receptor

Receptor Value	Definition
Very high	<p>Receptor of international importance (e.g. United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site).</p> <p>Receptor of very high importance or rarity, such as those designated under international legislation (e.g. EU Habitats Directive) or those that are internationally recognised as globally threatened (e.g. IUCN red list).</p> <p>Receptor has little flexibility or capability to utilise alternative area, receptor obtains all its income from the Otter Area.</p> <p>Best known or only example and/or significant potential to contribute to knowledge and understanding and/or outreach.</p>
High	<p>Receptor of national importance (e.g. , Marine Conservation Zone (MCZ)).</p> <p>Receptor of high importance or rarity, designated under national legislation, and/or ecological receptors such as UKBAP priority species with nationally important populations in the study area, and species that are near-threatened or vulnerable on the IUCN red list.</p> <p>Receptor obtains the majority of income from the Otter Area .</p> <p>Above average example and/or high potential to contribute to knowledge and understanding and/or outreach.</p>
Medium	<p>Receptor of regional importance.</p> <p>Receptor of moderate value or regional importance, and/or ecological receptors listed as of least concern on the IUCN red list, but which form qualifying interests on internationally designated sites, or which are present in internationally important numbers.</p> <p>Receptor which is active in the Otter Area and utilises it for up to half of its annual income/activities.</p> <p>Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.</p>
Low	<p>Receptor of local importance.</p> <p>Receptor of low local importance and/or ecological receptors such as species which contribute to a national site, is present regionally.</p> <p>Receptor which is active in the Otter Area and reliant upon it for some income/activities.</p> <p>Below average example and/or low potential to contribute to knowledge and understanding and/or outreach.</p>
Negligible	<p>Receptor of very low importance, no specific value or concern.</p> <p>Receptor of very low importance, such as those which are generally abundant around the UK with no specific value or conservation concern.</p> <p>Receptor of very low importance and activity generally abundant in other areas/ not typically present in the Otter Area.</p> <p>Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach.</p>

5.2.5 Consequence and Significance of Potential Impact

Having determined impact magnitude and the sensitivity, vulnerability and value of the receptor, it is then necessary to evaluate impact significance. This involves:

- Determination of impact consequence based on a consideration of sensitivity, vulnerability and value of the receptor and impact magnitude;
- Assessment of impact significance based on assessment of consequence;
- Mitigation; and
- Residual impacts.

5.2.5.1 Assessment of Consequences and Impact Significance

The sensitivity, vulnerability and value of receptors are combined with magnitude (and likelihood, where appropriate) of impact using informed judgement to arrive at a consequence for each impact, as shown in Table 5-10. The significance of impact is derived directly from the assigned consequence ranking. The assessment of consequence considers mitigation measures that are embedded within the proposed activities.

Table 5-10 Assessment of Consequence

Assessment consequence	Description (consideration of receptor sensitivity and value and impact magnitude)	Impact significance
Major consequence	Impacts are likely to be highly noticeable and have long term effects, or permanently alter the character of the baseline and are likely to disrupt the function and status/value of the receptor population. They may have broader systemic consequences (e.g. to the wider ecosystem or industry). These impacts are a priority for mitigation in order to avoid or reduce the anticipated effects of the impact.	Significant
Moderate consequence	Impacts are likely to be noticeable and result in prolonged changes to the character of the baseline and may cause hardship to, or degradation of, the receptor population, although the overall function and value of the baseline/ receptor population is not disrupted. Such impacts are a priority for mitigation in order to avoid or reduce the anticipated effects of the impact.	Significant
Low consequence	Impacts are expected to comprise noticeable changes to baseline conditions, beyond natural variation, but are not expected to cause long term degradation, hardship, or impair the function and value of the receptor. However, such impacts may be of interest to stakeholders and/or represent a contentious issue during the decision-making process and should therefore be avoided or mitigated as far as reasonably practicable.	Not significant
Negligible	Impacts are expected to be either indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not anticipated to be a stakeholder concern and/or a potentially contentious issue in the decision-making process.	Not significant
Positive	Impacts are expected to have a positive benefit or enhancement. These impacts do not require mitigation and are not anticipated to be a stakeholder concern and/or a potentially contentious issue in the decision-making process.	Not significant

5.2.6 Cumulative Impact Assessment

While the scope of this impact assessment is restricted to the decommissioning of the Otter Area as outlined in Section 3, there will be other marine activities which have the potential to interact with the activities completed under the decommissioning work scope. The impact assessments presented in the following sections consider the potential for significant cumulative impacts to occur because of overlapping activities.

5.2.7 Transboundary Impact Assessment

For most potential impacts from decommissioning, the likelihood of transboundary impact is low. However, where impacts on mobile receptors are of concern, the likelihood of a transboundary impact is higher. The impact assessments presented in the following sections have identified the potential for transboundary impacts and the potential for transboundary impact is considered within the definition of significance.

5.2.8 Mitigation

Where potentially significant impacts (i.e. those ranked as being of moderate impact level or higher in Table 5-10) are identified, additional mitigation measures are considered. The intention is that such measures should remove, reduce or manage the impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation is also proposed in some instances to ensure impacts that are predicted to be not significant remain so.

6 IMPACT ASSESSMENT AND JUSTIFICATION

An impact assessment scoping discussion was undertaken to discuss the proposed decommissioning activities and any potential impacts these may pose. This discussion identified ten potential impact areas based on the proposed removal methods. Of these ten potential impact areas, seven were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. The potential impacts are tabulated in Section 6.1, together with justification statements for the scoping decisions and proposed mitigation. The remaining three impact areas: emissions to air, disturbance to the seabed and physical presence of infrastructure decommissioned *in situ* in relation to other sea users were scoped in for further assessment and are discussed in Sections 6.2, 6.3 and 6.4, respectively.

6.1 Assessment of Potential Impacts

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Emissions to air	Yes	<p>Scoping discussions centred around the inevitability of the activities which lead to the production of emissions and the potential magnitude of these emissions. Anticipated emissions were placed in context with cumulative emissions on the UKCS whilst also considering the bigger Net Zero picture.</p> <p>Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur following CoP. Emissions generated by infrastructure, equipment and vessels associated with operation of the assets will be replaced by those from vessel use as well as the recycling of decommissioned materials.</p> <p>TAQA acknowledges the contribution of all GHG emissions to global climate change, and in line with the NSTA's (2021) expectations (in particular, Stewardship Expectation 11 relating to Net Zero). TAQA is dedicated to minimising GHG emissions from decommissioning operations, as far as is reasonable for each project. TAQA is committed to working with the supply chain and joint ventures as part of meeting these commitments. Direct project emissions are considered to be of low consequence (not significant), however, due to stakeholder, scientific and public concern around the cumulative impact of GHGs, atmospheric emissions resulting from project activities are assessed further in Section 6.2.</p>	See Section 6.2

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Disturbance to the seabed	Yes	<p>Scoping discussions for disturbance to the seabed focussed on the high likelihood and moderate magnitude of the potential activities and the uncertainty around the temporary and permanent impacts of these on sensitive and protected receptors, including:</p> <ul style="list-style-type: none"> • Submarine structures made by leaking gases; • Ocean quahog; • ‘Seapens and burrowing megafauna in circalittoral mud’; and • Blue carbon sequestration <p>There is potential for decommissioning activities to generate disturbance to the seabed including areas of contamination associated with the Eider drill cuttings pile; these include activities associated with decommissioning of pipelines <i>in situ</i> (rock placement), the removal of subsea structures and the surface laid pipelines and umbilicals and pipeline ends.</p> <p>Impacts to the seabed from project activities are considered to be of a moderate consequence (significant) and are therefore assessed further in Section 6.3.</p> <p>Marine growth may be removed to aid access for cutting or may also fall from the Otter subsea structures during removal activities. A small quantity of marine growth may land on the seabed within, or very close to the footprint left by the subsea structures. Any such discharges are unlikely to cause significant disturbance to the seabed or any sensitive receptors.</p> <p>Scoping discussions led to the conclusion that the potential impact associated with falling marine growth is of a negligible magnitude and ultimately of negligible consequence and is therefore not assessed further</p>	See Section 6.3.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Planned discharges to sea	No	<p>Discharges to sea were considered during a scoping workshop where discussion focussed on the highly regulated processes established through monitoring and permitting regimes.</p> <p>Pipelines will be flushed prior to decommissioning where feasible. Where this is not possible, this will be discussed with OPRED and a mutual solution will be agreed. As far as practicable any condensate liquids (light hydrocarbons) in the pipelines will be flushed to the North Cormorant platform, and ultimately to the Cormorant Alpha platform and thence to Sullom Voe. The Oil Discharge Permit for these operations will detail the measures to be used.</p> <p>Discharges from vessels are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures.</p> <p>Discharges to sea are considered to be of a negligible consequence (not significant) and are therefore not assessed further.</p>	<ul style="list-style-type: none"> • MARPOL compliance. • Treatment and maceration to IMO standards. • Bilge management procedures. • Vessel equipment maintained according to manufacturer's recommendations. • Vessel assurance procedures. • Contractor management procedures. • Compliance with the Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005. • Compliance with the Offshore Chemical Regulations 2002 (as amended). • Regulator engagement on potential residual pipeline and subsea system discharges.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Physical presence of vessels in relation to other sea users	No	<p>The presence of a small number of vessels for pipeline and umbilicals and subsea installation decommissioning activities will be relatively short-term in the context of the life of the assets involved. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. The small number of vessels required will also generally be in use within the existing 500 m safety zones at the individual field sites and will not occupy any new areas.</p> <p>Other sea users will be notified in advance of activities occurring meaning those stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations.</p> <p>The decommissioning of the Otter Area is estimated to require up to five vessel types, however these would not all be on location at the same time (anticipated maximum of two at any one time).</p> <p>The physical presence of vessels in relation to other sea users is considered to be of a negligible consequence (not significant) and is therefore not assessed further.</p>	<ul style="list-style-type: none"> • Safety zones (where / when applicable and being mindful that arrangements will change at certain stages of the project). • UKHO standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings. • Use of AIS and other navigational controls

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Physical presence of infrastructure decommissioned <i>in situ</i> in relation to other sea users	Yes	<p>Scoping conversations focussed on the low likelihood of an interaction but the possible major (significant) consequences should a snagging event occur, accounting for the concerns of the fishing industry.</p> <p>Subsea installations and surface-laid pipelines will be fully removed other than small sections of surface laid pipelines in close proximity to the Eider platform footings, which may be decommissioned <i>in situ</i> if derogation is granted to decommission the footings in place. "Close proximity" is considered within approximately 75 m of the platform footings. Logical break points between portions decommissioned in situ and portions removed will be selected, e.g., pipeline crossings, etc.</p> <p>Seabed disturbance from the removal of infrastructure has the potential to modify the habitat in a way which might impact upon other sea users which utilise the seabed. The seabed typical of this area of the NNS may lend itself to the formation of clay mounds in areas of occasionally muddy benthic habitat. Clay mounds may pose a potential snagging hazard to commercial fishing gears which contact the seabed. As such, the seabed will be subsequently surveyed and remediated as required.</p> <p>Pipelines to be decommissioned <i>in situ</i> are currently trenched with areas of exposure and shallow burial along most of their length. At present, these will be surveyed prior to decommissioning to determine the most current status of burial and will be remediated if required. All exposed pipeline ends following cutting activities will be remediated with rock.</p> <p>Due to the presence of cuttings contamination at Eider, there is the potential for demersal fishing gear to interact and disturb the contaminated sediment. Field studies designed to trawl over a known cuttings pile and measure the dispersion of cuttings resulting from the trawling activities were conducted by the Fisheries Research Services in 2000 (OSPAR, 2019). The results indicated that trawling activities disturbed relatively little material to a significant height into the water column.</p>	See Section 6.4

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
		<p>To address any Stakeholder concerns, Section 6.4 provides more detail regarding survey of the seabed and seabed remediation following decommissioning of the Otter Area subsea facilities.</p>	
Underwater noise emissions	No	<p>Scoping discussions for underwater noise focussed on the high likelihood potential noise-producing activities, the concurrent (cumulative) nature of these activities and the potential for disturbance to sensitive species, in particular marine mammals.</p> <p>Aside from vessel noise and cutting activities, there will be no other noise-generating activities. Cutting techniques will either be diamond wire or abrasive water jet. The recently published DESNZ 2023 guidance on The Use and Environmental Impact of Explosives in the Decommissioning of Offshore Wells and Facilities states that “<i>Sound radiated from the diamond wire cutting of a conductor or abrasive water jets is not easily discernible above the background noise.</i>”</p> <p>Vessel presence will be limited in duration. Diamond wire and hydraulic shear cutting operations are not readily discernible above background noise levels. Thus, vessel presence during the cutting process will mask the cutting noise generated (Pangerc <i>et al.</i>, 2016). As a result, noise generated during the decommissioning activities will be largely undetectable. Furthermore, the project is not located within an area protected for marine mammals.</p> <p>With industry-standard mitigation measures and JNCC guidance, EAs for offshore oil and gas decommissioning projects typically show no injury, or significant disturbance associated with these projects (e.g. Shell, 2017, Marathon, 2017).</p> <p>Underwater noise emissions are considered to be of minor consequence (not significant) and are therefore not assessed further.</p>	<ul style="list-style-type: none"> • Vessel management. • Minimal vessel use/movement. • Vessel sharing where possible. • Cutting activities will be minimised and carried out in isolation where possible.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Resource use	No	<p>Scoping discussions highlighted that resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. The estimated total energy usage for the decommissioning activities is 442,348 GJ. Most of this energy use is related with the remanufacture of steel decommissioned <i>in situ</i> (230,247 GJ). A large amount (190,727 GJ) of the total is value associated with vessel operations.</p> <p>Material will be returned to shore as a result of project activities. The project aspiration is that all ferrous and non-ferrous metals, concrete and plastics will be recycled where possible, in line with the waste hierarchy and a circular economy approach, and TAQA will work closely with waste contractors to ensure that this is the case to minimise landfill requirements.</p> <p>Resource use is considered to be of a negligible consequence (not significant) and is therefore not assessed further.</p>	<ul style="list-style-type: none"> • Minimal number of vessels deployed. • Use of low sulphur diesel. • Vessel equipment maintained according to manufacturer's recommendations.
Onshore impacts/ Waste	No	<p>Waste management is often cited as a stakeholder concern across DPs. The waste to be brought to shore will be managed in line with TAQA's Waste Management Strategy and the Waste Hierarchy, as part of the project AWMP, using approved waste contractors and in liaison with the relevant Regulators.</p> <p>Waste management was considered to be of a minor consequence during scoping discussions due to the highly regulated and routine nature of the activity. On this basis, onshore impacts and waste are not assessed further.</p>	<ul style="list-style-type: none"> • 'Duty of Care' obligations. • Adherence to Waste Management Strategy. • Active waste tracking including close-out reporting. • Adherence to the Waste Hierarchy. • Selection of suitably authorised contractor(s) and facilities. • Communication with relevant Regulator(s) - e.g., SEPA. • Project Waste Management Targets. • Supply Chain Action Plan.

Impact Area	Further Assessment	Rationale	Proposed Mitigation and Best Practice
Unplanned events	No	<p>Scoping discussions centred around the potential damage to sensitive receptors from an oil or diesel spill and the very low likelihood of an unplanned event, given the established mitigation measures in place.</p> <p>Pipeline flushing will be undertaken prior to decommissioning activities. The remaining risk for a hydrocarbon release relates to loss of diesel from a vessel involved in decommissioning activities. A maximum of five vessels will be deployed over the course of the decommissioning activities, but not all at one time. These may include a CSV, DSV, guard vessel, a rock placement vessel (if remediation is not carried out by DSV) and a survey vessel.</p> <p>Although the risk of oil spill is remote, the North Cormorant Oil Pollution Emergency Plan (OPEP; TAQA, 2023a) will be updated to cover the Otter Area decommissioning activities. Any spills from vessels in transit and outside the 500 m zones are covered by separate Shipboard Oil Pollution Emergency Plan(s) (SOPEPs).</p> <p>Any potential from dropped objects whilst in transit, onto active subsea facilities, would be covered within 'Dropped object procedures', which are industry-standard. There is only a very remote probability of any interaction with any live infrastructure. The in situ decommissioning of some infrastructure will also limit the potential for dropped objects or dislodged materials/objects.</p> <p>Considering the above, the potential impacts from accidental chemical/hydrocarbon releases or dropped objects during decommissioning activities are considered to be of low consequence (not significant) and are not assessed further.</p>	<ul style="list-style-type: none"> • Safety zones (where / when applicable and being cognisant that arrangements will change at certain stages of the project). • UKHO standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings. • Use of AIS and other navigational controls. • OPEP in place for operations. • SOPEP on all vessels. • Navigational warnings in place. • Spill response procedures. • Contractor management and communication. • Lifting operations management of risk. • PON1 / PON2 submissions. • Careful planning, management, and implementation of activities. • The location of any dropped or dislodged material will be accurately recorded and reported via Hydrographic Office and Kingfisher notification system.

6.2 Emissions to Air

6.2.1 Approach

On a global scale, concern regarding atmospheric emission of GHGs (including water vapour, carbon dioxide (CO₂), methane (CH₄), nitrous oxides (NO_x), ozone (O₃), chlorofluorocarbons (CFCs)) and volatile organic compounds (VOCs) is focused on the impact they have on global climate change. The IPCC in its sixth assessment report (AR6) states that it is unequivocal that the increase of CO₂, CH₄ and NO_x in the atmosphere over the industrial era is the result of human activities. Human influence is the principal driver of many changes observed across the atmosphere, ocean, cryosphere and biosphere (IPCC, 2021). Climate change estimates in the AR6 report state that each of the last four decades have been successively warmer than any decade that preceded it since 1850. IPCC (2021) reports a 47% increase in CO₂ concentrations since 1750 which far exceeds the natural multi-millennial changes between glacial and interglacial periods over at least the past 800,000 years, and states that fossil fuel combustion is the primary contributor to the observed climate change.

The information on the quantification and impact assessment of the emissions is presented in this chapter of the EA represents atmospheric emissions associated with:

- Offshore vessel use for decommissioning activities; and
- Lifecycle emissions (onshore transport, recycling, new manufacture of recyclable material decommissioned *in situ*)

6.2.2 Sources of Potential Impacts

Emissions during decommissioning activities (largely comprising fuel combustion gases) will occur following CoP. Emissions generated by infrastructure, equipment and vessels associated with operation of the assets will be replaced by those from vessel use as well as the recycling of decommissioned materials. Reviewing historical EU Emissions Trading Scheme data and comparison with the likely emissions from the proposed work scope suggests that emissions relating to decommissioning will be small relative to those during production.

Where available, carbon dioxide equivalent (CO₂e) values are presented. CO₂e is a unit of measurement that compares the global warming potential of different GHGs to the amount of carbon dioxide (CO₂) that would have the same effect. Estimated CO₂e emissions have been calculated using data from various sources (DESNZ, 2016; IoP, 2000).

The total emissions estimate of 38,209 Te CO₂e (Table 6-1) includes an estimate of the emissions associated with new manufacture to replace recyclable materials decommissioned *in situ*, which represents the largest CO₂e contribution (17,190 Te). A significant proportion of the emissions are also related to the operation of vessels offshore (14,061 Te; Table 6-2). Vessel emissions have been calculated assuming a worst case of 190 (24h) vessel days across the duration of the decommissioning activities. This vessel time is split across five types of vessels which will participate in a variety of activities including: structure removal, pipeline/umbilical end cutting, rock placement and a post decommissioning monitoring.

Table 6-1 Total Energy Use and Atmospheric Emissions by Project Activity

Planned Activity	Energy (GJ)	Emissions CO ₂ e (Te)
Onshore transportation of materials	1,357	10
Onshore dismantling of materials	7,793	249
Onshore recycling of materials	12,225	6,699
New manufacture to replace recyclable materials	230,247	17,190
Operation of vessels offshore (Table 6-2)	190,727	14,061
TOTAL	442,348	38,209

Table 6-2 Offshore Vessel Activities Energy Use and Atmospheric Emissions

Vessel Type	Duration (Days)*				Energy (GJ)	CO ₂ e (Te)
	Mob/ Demob	Transit	Working	TOTAL		
DSV	5.00	4.67	18.17	27.83	19,591	1,444
CSV	2.43	7.18	103.37	112.99	122,247	9,012
ROVSV	2.00	2.00	5.70	9.70	8,671	639
Rock vessel	3.00	1.25	7.78	12.03	6,182	456
Survey Vessel	2.00	2.00	23.55	27.55	34,035	2,509
			TOTAL	190	190,727	14,061

*Worst case durations also account for waiting on weather.

6.2.3 Effects on Sensitive Receptors

To determine the significance level of impacts resulting from atmospheric emissions, there is a requirement to understand the sensitive receptors. Gaseous emissions from the proposed decommissioning activities include CO₂, carbon monoxide (CO), NO_x, nitrous oxide (N₂O), sulphur oxide (SO_x), CH₄ and VOCs. These have the potential to impact sensitive receptors in the area. The direct effect of the emission of CO₂, CH₄, N₂O and VOCs is the implication for climate change due to low-level ozone (IPCC, 2021). The direct effect of NO_x, SO_x and VOC emissions is the formation of photochemical pollution in the presence of sunlight. Low level ozone is the main chemical pollutant formed, with by-products that include nitric and sulphuric acid and nitrate particulates, contributing to acid rain formation. The indirect effects of low-level ozone include deleterious health effects, as well as damage to ecosystems.

The exposed offshore conditions will promote the rapid dispersion and dilution of these emissions. Review of available decommissioning EAs suggests that atmospheric emissions in highly dispersive offshore environments are not considered to present significant impacts in the context of UKCS and global emissions. Most submissions also note that emissions from short-term decommissioning activities are small compared to those previously arising from the asset over its operational life.

Outside the immediate vicinity of the decommissioning activities, all released gases would only be present in low concentrations. No impact is expected on ecosystem components (benthos, fish and shellfish, marine mammals, seabirds) including habitats and species of conservation significance. In the open conditions that prevail offshore, the atmospheric emissions generated during the decommissioning activities would be quickly dispersed.

6.2.4 Cumulative and Transboundary Impacts

6.2.4.1 Global Climate Change

The potential cumulative effects associated with the atmospheric emissions produced by the vessels includes global warming (greenhouse gases), acidification (acid rain) and local air pollution. Localised impacts may include elevated levels of atmospheric emissions in the immediate area of the vessels. Atmospheric emissions from fuel supply (of which production of oil and gas is a part) was 33 million Te CO₂e in 2022, which represents 7% of the UK total emissions for that year, according to the Committee on Climate Change (CCC) latest Progress report to Parliament (CCC, 2023). The provisional emissions for 2022 show that the emissions from refineries and oil and gas production increased from 2021 (CCC, 2023). Emissions from refineries contributed 37% of UK fuel supply emissions in 2022. Total oil and gas production emissions show a similar pattern to refineries with emissions aligned with production (CCC, 2023). The total UKCS oil and gas emissions in 2022 were 20.6 million Te CO₂e (OEUK, 2023; DESNZ, 2023). The total of 20.6 million Te CO₂e is split as follows: 14.3 million Te of oil and gas CO₂e emissions (OEUK, 2023) and 6.3 million Te CO₂e of shipping emissions (DESNZ, 2023). This means that the emissions associated with the Otter Area decommissioning activities (38,209 Te) will amount to approximately 0.19% of the CO₂e generated in UK in 2022 (OEUK, 2023; DESNZ, 2023). Any releases will be limited to the duration of the decommissioning activities in contrast to the continuous emissions associated with live production operations and will be minimised as far as possible following the mitigation approaches outlined in Section 6.2.4.2. It can therefore be concluded that the projected emissions do not represent a significant proportion of the UK offshore emissions and therefore are not considered significant in cumulative terms.

In addition, the temporary nature of the emissions along with the remote geographic location and winds within the offshore environment means that the atmospheric emissions would be rapidly dispersed and are not likely to be detectable within a short distance from the source. Given the

distance from the UK / Norway median line (38 km), transboundary impacts are also deemed negligible.

6.2.4.2 Mitigation Measures

Most emissions in these phases will be the result of combustion of hydrocarbons for power generation related to vessel activities. Vessels will be owned by a 3rd Party and the activities are therefore subject to supply chain processes of contract selection and management. Minimisation of emissions from vessels will form part of the selection criteria for the installation vessels through the tendering and selection process.

- Each vessel will have a Shipboard Energy Efficiency Management Plan (SEEMP) which contains information of minimising fuel consumptions e.g., economical speeds when operationally appropriate.
- Green dynamic positioning or economical speeds when operationally appropriate.
- Developing a decommissioning plan, which includes the possibility of combining Otter Area decommissioning activities with other decommissioning projects, to minimise the number of vessel deployments, mobilisations and demobilisations.
- Opportunity to incorporate post-decommissioning surveys as part of wider NNS decommissioning programmes.
- Streamlining of activities through planning to reduce the time required for vessels will be required for these activities and will support the drive to reduce emissions.

6.2.5 Emissions to Air Residual Impact

Receptor	Magnitude	Sensitivity	Vulnerability	Value
Global climate change	Minor	Low	Medium	Low
<p>The total emissions estimate for the Otter Area decommissioning activities is 38,209 Te CO₂e, representing approximately 0.19 % of the CO₂e generated in the UK in 2022.</p> <p>TAQA acknowledges the contribution of these emissions (however small) to global climate change, and has assigned a Minor magnitude, low sensitivity, high vulnerability and low value score based on this premise. Overall consequence is anticipated to be low for global climate change.</p> <p>In line with the NSTA's (2021) expectations (in particular, Stewardship Expectation 11) TAQA is dedicated to minimising GHG emissions from decommissioning operations, as far as is reasonable for each project. TAQA is committed to working with the supply chain and joint ventures as part of meeting these commitments.</p>				
Consequence		Significance		
Global Climate Change: Low		Not significant		

6.3 Disturbance to the Seabed

6.3.1 Approach

The two seabed impact pathways associated with the proposed activities are direct and indirect disturbance. Direct disturbance is the physical disturbance of natural and potentially contaminated seabed sediments and habitats. Direct disturbance has the potential to cause temporary or permanent changes to the marine environment, depending upon the nature of the associated activity. Permanent impacts are generally considered to represent a worst-case where required. Activities which contribute to the direct disturbance impact pathway include the removal of infrastructure and remediation of snagging hazards, either from re-burial or placement of material (rock armour) on the seabed. The total area of seabed expected to be impacted by direct physical disturbance has been calculated by adding together the individual areas of physical disturbance estimated for each activity.

Indirect disturbance is that which occurs outside of the direct disturbance footprint. It may be caused by the suspension and re-settlement of natural seabed sediments and cuttings pile materials disturbed during activities. This secondary impact pathway is considered temporary in all instances. The scale of indirect disturbance due to re-suspension and re-settlement of natural and potentially contaminated sediment has been estimated based on the expected area of direct disturbance from any activity. The indirect disturbance area is estimated to be double the direct disturbance area for all installations and activities taking place.

The seabed impacts resulting from the activities associated with the Otter Area are classified here as temporary or permanent. Temporary impacts are defined here as those which have transient impacts lasting a few days to a few years. Permanent impacts are those which will continue to have an impact for decades to centuries following decommissioning. In the following sections, potential impacts will be defined either as temporary or permanent.

6.3.2 Sources of Potential Impacts

The following activities have been identified as potential sources of direct or indirect seabed disturbance:

- Subsea infrastructure removal:
 - Removal of piled driven structures at Otter: Multiphase Pump Station Structure and adjoining spools jumpers and protection materials (Figure 6-1 and Figure 6-2);
 - Removal of suction piled structures including Otter Template Protection Structure, Otter Template Base Structure and Water injection WHPS and adjoining spools jumpers and protection materials (Figure 6-1 and Figure 6-2); and
 - Remediation of depressions following removal of infrastructure.
- Decommissioning of pipelines and umbilicals:
 - Removal of pipeline, umbilicals ends and surface-laid pipeline spools and jumpers; and (Figure 6-1);
 - Removal of mid-line surface laid PL1868 production spool pieces and associated protection/ stabilisation materials (Figure 6-2); and
 - Potential remediation of future formation of mid-line spans/exposures.

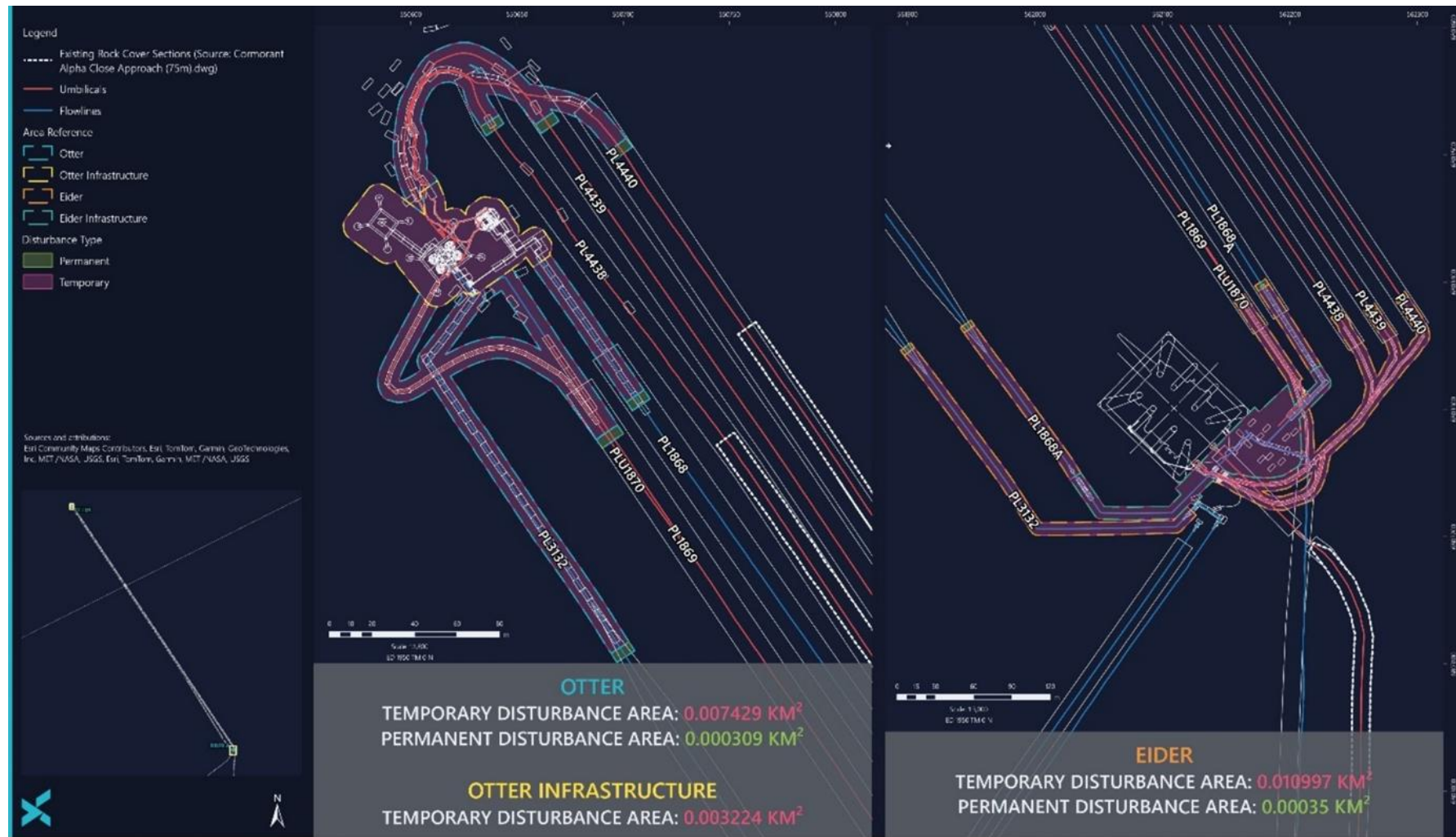


Figure 6-1 Worst-case Seabed Disturbance at the Otter Area Manifold and Eider Platform

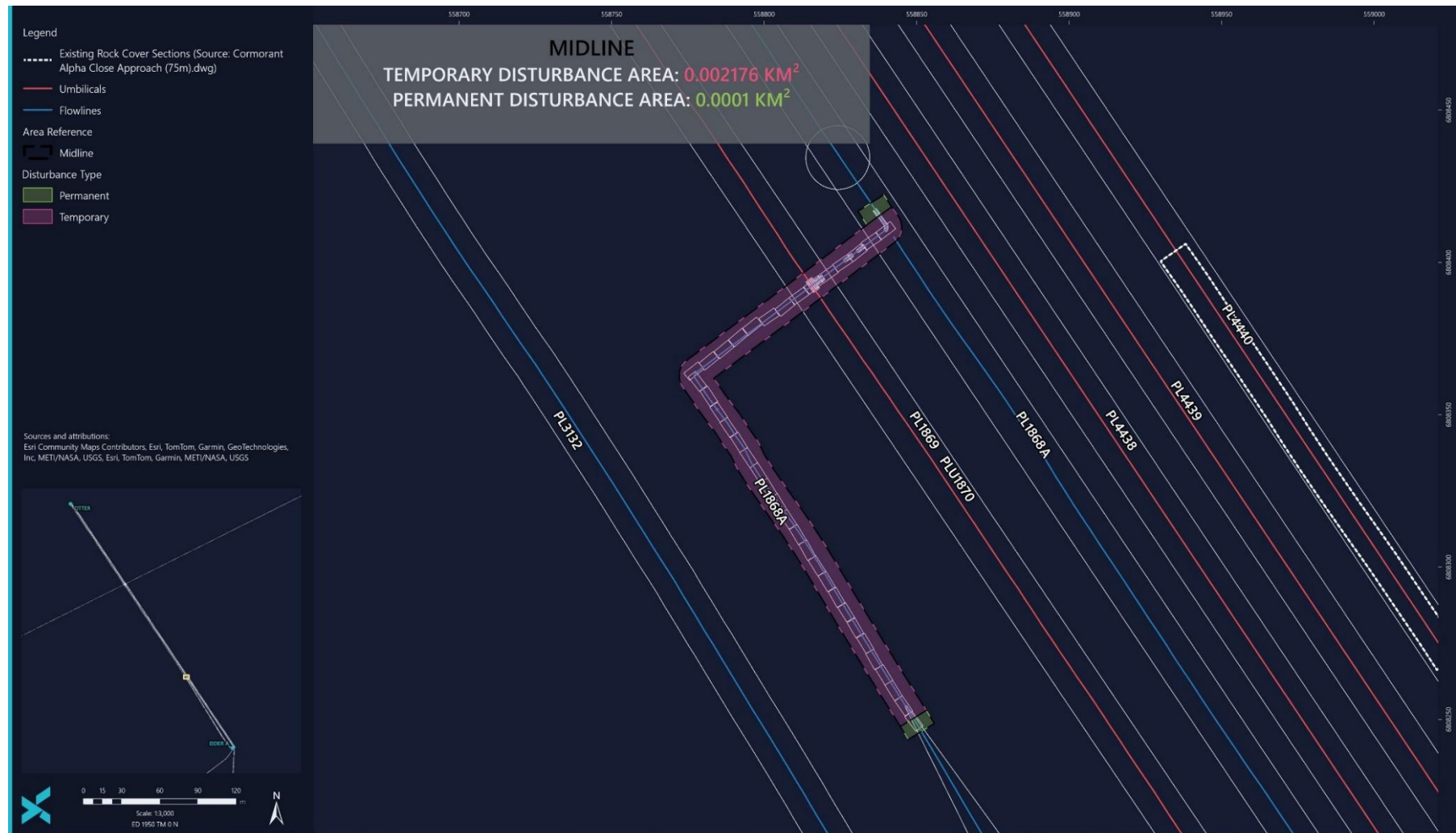


Figure 6-2 Worst-case Seabed Disturbance along the Otter Manifold to Eider Platform Pipeline Corridor

6.3.2.1 Subsea Structures

All subsea structure will be fully removed (as described in Section 3.3.2). Decommissioning of the Otter wells is outwith the scope of the decommissioning activities addressed by this EA and a complete impact assessment will be undertaken as part of the permit applications associated with Well Decommissioning activities. Direct impacts may include dredging around any piled infrastructure to clear the way for external cutting if internal pile cutting is not possible. For structures with suction pile foundations, it is expected that these shall be fully removed from the seabed by pressurising the pile cans against the seabed (reverse installation). Cutting would be carried out using abrasive water jet technology and an inert garnet cutting medium. Such jet cutters are routinely used subsea for cutting piles and provide an efficient method with little localised and very short-term noise impacts for the surrounding environment.

This direct seabed disturbance from dredging will be temporary but may also represent a long term impact should clay berms form. Rock may be used as local remediation for depressions in the seabed following the removal of the Otter structures. A maximum seabed area of 20 m² has also been included in the seabed footprint for this activity. The impact of the associated permanent disturbance is discussed in section 6.3.3.1.2.

An estimate has been made (using an inhouse Xodus methodology) of the possible indirect disturbance due to re-suspension and settlement of sediment. Most re-suspended sediment will settle within the initial disturbance area, but it has been assumed that some will land beyond that area. As a conservative estimate, the area of indirect disturbance has been assumed to be double the area of direct disturbance. This disturbance will be temporary, and resettlement will only occur when activities are underway and shortly afterwards.

The direct and indirect disturbance areas associated with these proposed operations are summarised in Table 6-3.

6.3.2.2 Removal of Pipeline and Umbilical Ends and Protection/Stabilisation Material

The following removal activities are expected to have a temporary direct and indirect impact:

- Surface laid umbilicals will be fully removed by reverse installation, either onto a back deck mounted reel, or carousel, or cut on deck into short sections for storage before return to shore.
- Where mid-line sections of pipelines are being decommissioned *in situ*, pipeline ends, spools and jumpers will be cut and removed.
- Concrete mattresses, grout bags and concrete blocks support structures have previously been deployed across the Otter Area to stabilise and protect the seabed infrastructure. The intention is that, where possible and if condition of material allows, all of these will be recovered.

The cutting equipment used to cut the rigid pipeline and spools will typically be either a diamond wire saw or hydraulic shears. In terms of environmental impact and the time taken to complete the cutting operation(s), there is little difference between the two methods, especially given the relatively small diameters of the pipelines.

The area of seabed temporarily and directly disturbed by recovery of the pipeline ends and associated remediation (concrete mattresses, grout bags and concrete blocks) has been estimated using Geographical Information Systems (GIS) to define the outer extent of all the pipelines due for removal. A 5 m buffer width was added to ensure that all direct pipeline remediation had been incorporated in the disturbance footprint (Figure 6-1 and Figure 6-2). The dimensions of the concrete mattresses (6 m by 3 m) were used to determine the area of wet stored mattresses not captured by 5 m buffer (see Figure 6-1 and Table 6-3).

Indirect disturbance has been assumed to be twice that of the direct area. This accounts for the resuspension of sediment generated (both natural and potentially contaminated) due to direct disturbance, most of which will settle within the direct footprint. However, in light of the medium silt to fine sand sediment composition of the top layers of the Eider cuttings pile, the resettlement of sediment is likely to be minimal. If contaminated sediment is disturbed, it is likely that only the unconsolidated (looser) layers of sediment in the top layers will be dispersed beyond the immediate area. The contaminant content of the top (approximately 100 mm) layer of a cuttings pile is often relatively low, as the contaminants from this layer will have leached into the water column over time and biodegraded (Genesis, 2014).

6.3.2.3 Pipelines Decommissioned *In Situ*

6.3.2.3.1 Approach at the Eider platform

Limited sections of surface laid pipelines and umbilicals in close proximity to the Eider platform footings may be decommissioned *in situ*, subject to derogation and agreement with OPRED. 'Close proximity' is considered to be within approximately 75 m of the platform footings. Logical break points between portions decommissioned *in situ* and portions removed will be selected, e.g., pipeline crossings, etc. This option represents a reasonable balance between the level of risk associated with removing the facilities, the degree of disturbance of the seabed, the use of resources during decommissioning, and following decommissioning, the loss of amenity for other sea users. If derogation to decommission the footings in place is not granted, all surface laid pipelines and umbilicals will be recovered and taken to shore for appropriate re-use, recycling, or disposal.

6.3.2.3.2 Remediation

Where pipelines are decommissioned *in situ* and pipeline ends become exposed above the seabed level during pipeline end removal activities (e.g. where spools are removed either side of existing rock placement) they will be covered by an overtrawlable (1:3 slope) rock berm. As any remediation activities will overlie the temporary impact footprint of the activities associated with the cutting of pipelines, the area of impact only relates to the permanent direct and temporary indirect impact due to the placement of rock. The area of rock placed per end will equate to a worst-case footprint of 100 m² per pipeline end. Permanent seabed disturbance and temporary impact for the pipeline/umbilical removal activities in this area was defined using Computer-Aided Design (CAD) drawings and Geographical Information Systems (GIS) (Figure 6-1 and Figure 6-2).

Pipelines and umbilicals will have the ends removed and remediated via rock placement to prevent snag risk. TAQA will conduct pre-decommissioning survey within the Otter Area prior to the commencement of the DP scope and any fishing critical spans identified will be remediated. The approach to remediation will be assessed on case-by-case basis and rock cover represents a worst-case scenario. The worst-case scenario (presented in Table 6-3) is a contingency estimate for the remediation of future formation of mid-line spans and exposures. The approach considers rock remediation of spans measuring less than 20 m or cut and lift of spans measuring more than 20 m. Subject to the outcome of future surveys, additional rock cover required for remediation activities will be covered by relevant environmental permits. OPRED will be informed of the outcome of these surveys in advance of decommissioning activities commencing. The permanent and temporary indirect disturbance areas associated with these proposed operations are summarised in Table 6-6 and shown in Figure 6-1 and Figure 6-2. Again, the indirect disturbance is conservatively estimated to be twice that of the direct area and this is also shown in Table 6-6.

Structural degradation of the pipelines (including flowlines and umbilicals) will be a long-term process caused by corrosion, and eventual collapse of the pipelines under their own weight and that of the overlying sediment. During this process, degradation products derived from the exterior and interior of the pipe and umbilical will breakdown and potentially become bioavailable to benthic

fauna in the immediate vicinity. Pathways from the pipelines to the receptors would be via the interstitial spaces in seabed sediments.

6.3.2.4 Summary of Disturbance to the Seabed

The seabed disturbance from all decommissioning activities is summarised in Table 6-4 and within Figure 6-1 and Figure 6-2. This illustrates a worst-case scenario for seabed disturbance, in which most of the temporary seabed impact is associated with the removal of existing remediation materials and the permanent seabed impact is associated with rock remediation over inadequately buried pipelines decommissioned *in situ*.

Otter Area decommissioning activities will result in temporary direct and indirect disturbance to the seabed. Temporary direct disturbance has the potential to impact 0.024 km² of seabed. Temporary indirect disturbance has the potential to impact 0.093 km². There will be a 0.022 km² area of permanent disturbance because of new rock placement (for pipeline ends, depression remediation, and estimated future formation of mid-line spans and exposures). These are considered conservative estimations of the likely impact of the proposed decommissioning activities, as the buffers added to the structures are likely to overestimate the range of impact generated by various removal methods.

Table 6-3 Seabed Disturbance Associated with the Otter Decommissioning Activities

Activity	Temporary Direct Disturbance Area (km ²)	Permanent Direct Disturbance Area (km ²)	Temporary Indirect Disturbance Area (km ²)
Removal of structures (Figure 6-1)	0.0032		0.0064
Removal of pipelines/umbilicals ends, and mid-line PL1868 spool (Figure 6-1 and Figure 6-2)	0.021		0.041
Mattress removal (outside 5m buffer)	0.00067		0.0013
Remediation of pipeline ends (Figure 6-1 and Figure 6-2)		0.00076	0.0015
Remediation of depressions		0.00002	0.00004
Estimation of remediation of future formation of mid-line spans / exposures ¹		0.021	0.043
Total (km²)	0.024	0.022	0.093

Notes:

1. Rock cover represents an indicative worst-case scenario. The remediation approach will be assessed on a case-by-case basis. Subject to future surveys, additional rock cover required for remediation activities will be covered by relevant environmental permits.

*Please note, any apparent discrepancy in the totals is due to rounding within the table.

6.3.3 Effects on Sensitive Receptors

6.3.3.1 Direct Disturbance

Decommissioning activities are expected to lead to two types of direct physical disturbance. The first is temporary disturbance, which will result from the removal of pipelines and infrastructure from the seabed. Sediment will be disturbed during the retrieval of equipment from the seabed and rock placement, but once decommissioning is complete, this disturbance will cease.

In the case of rock placement, temporary disturbance will only apply to the wider area impacted by suspended sediments, not the area covered by rock. Temporary disturbance should allow recovery

in line with natural processes such as sediment re-suspension and deposition, movement of animals into the disturbed area from the surrounding habitat, and recruitment of new planktonic individuals.

The second type of direct disturbance will be permanent disturbance caused by the deposition of additional rock armour on the seabed to protect infrastructure decommissioned *in situ*. This type of disturbance will effectively change the seabed type in the affected areas from the naturally occurring silty sand to a hard substrate. These materials will be permanently decommissioned on the seabed and potentially become fully buried by the deposition of new natural sediment. While the seabed will eventually recover and the substrate will return to pre-disturbance conditions, the time frame over which this occurs is so long-term that the disturbance is considered permanent. The temporary and permanent seabed effects associated with direct disturbance are discussed in the subsections below.

6.3.3.1.1 Temporary Direct Disturbance

Temporary direct disturbance will occur due to placing further rock cover on the seabed in perpetuity. Decommissioning disturbance will cause mortality, due to injuries arising from the crushing of benthic and epibenthic fauna which are sedentary or unable to move quickly. Mobile fauna will likely also be disturbed. The sediment structure, including the burrows of any animals present, will be affected. Past surveys of the Otter Area consistently report infauna to be prolific and consist mainly of polychaetes and bivalve molluscs (Gardline, 2012b; Benthic Solutions, 2020). The epifauna present in all areas is generally noted as sparse and typically features mobile species that have wide distributions throughout the North Sea. These include, for example, sea urchins and cushion stars.

The primary features of conservation and environmental concern in the wider Otter Area include:

- Submarine structures made by leaking gases' Annex I Habitat
- Ocean quahog *Arctica islandica* – OSPAR list of threatened and/or declining species and habitats (Region II – Greater North Sea)
- 'Seapens and burrowing megafauna in circalittoral mud' – OSPAR list of threatened and/or declining species and habitats (Region II – Greater North Sea), a component of which is the Scottish PMF habitat 'Burrowed mud'
- Blue carbon sequestration

Submarine structures made by leaking gases

Numerous seabed depressions that resembled pockmarks were also observed throughout the Otter Area, notably in the north and west of the Otter survey area, along the Otter to Eider pipeline route, in the vicinity of the Eider platform. However, none were thought to be associated with MDAC. The lack of MDAC present in pockmarks identified across the Otter Area indicates that Annex I 'Submarine structures caused by leaking gases' are not present (Gardline, 2012a, Benthic Solutions, 2019; 2020).

Ocean Quahog

No ocean quahog were observed around the Otter manifold (Gardline, 2012a, b) or along the Otter to Eider platform (Benthic Solutions, 2020). However, the survey conducted around the Eider platform (Benthic Solutions, 2019) recorded five individuals of ocean quahog. Four were found at stations 295 m and 500 m to the northwest of the platform (two at each station) and another individual was found 250 m to the southeast of Eider platform (Benthic Solutions, 2019).

Ocean quahogs live at the surface of sediments while feeding but can burrow to depths of 14 cm, therefore they are vulnerable to physical abrasion from removal of infrastructure and smothering from placement of rock cover. They are long-lived bivalves which take 5 – 15 years to reach sexual maturity and spawn over a short period in the year. Recruitment is sporadic and variable (Tyler-Walters & Sabatini, 2017). Considering these, the recoverability of ocean quahog to physical abrasion is very low. While ocean quahog has been shown to occur in the Otter Area surveys, there is no evidence of aggregations within the areas surveyed. While scattered individuals of ocean quahog may occur in the Otter Area, they would not be expected to occur either in significant densities or in communities of specific conservation value.

Seapens and Burrowing Megafauna

‘Seapen and burrowing megafauna communities’ also have the potential to be found within the Otter Area. Benthic Solutions (2020) estimated the density of burrow openings at the seabed using representative video transects from sampling stations within the Otter Area and found that the density of small and large burrows ranged from a SACFOR scale of ‘rare’ to ‘occasional’. However, burrow density was classified as ‘frequent’ on the top of the trenching pipeline mounds located at stations O-E_R_05 and O-E_R_07 (located at 9.6km and 13.3km along the pipeline respectively). These sections of the transects could therefore be considered as the ‘*Seapen and Burrowing Megafauna Communities*’ habitat (Benthic Solutions, 2020). The EBS report mentions that this is likely to be an overestimate by counting multiple burrow openings which may in fact relate to a single burrow or burrowing individual. For example, the burrows of the mud shrimp (*Callinassa subterranea*) are known to consist of a multi-branched network of tunnels connected by various inhalant shafts, each terminating in a funnel shaped opening to the surface, which will further complicate the relationship between the number of burrow openings and the number of burrowing fauna.

Seapens have some resistance to being disturbed and generally can reinsert themselves into the sediment if removed, as long as they remained undamaged. However, damaged individuals show poor recovery, and therefore resilience is considered low, giving an overall sensitivity of medium (Hill, Tyler-Walters and Garrard, 2020). As such, temporary disturbance is expected to cause some mortality to any seapens that are physically damaged during operations, but this is expected to be extremely localised and not have any effect on the viability of the local population. Replacement of damaged individuals would be expected to occur either from plankton or from “adult” seapens moving in from the surrounding area. Where there has been a disturbance but the seapens remain undamaged, recovery may be rapid (<2 years; Hill, Tyler-Walters and Garrard, 2020). The nature of the activities is such that the removal of subsea structures should only have a highly localised impact on the seabed and there will be no placement of items thus the crushing of benthos is unlikely. Given the extent of their habitat across the North Sea, the recovery of seapens and burrowing megafauna would be swift.

Blue Carbon

The percentage carbonate in the top 10 cm of superficial sediments in UKCS Blocks 211/26 ranges from 0 to 20% (NMPI, 2025) which is above average compared to the UKCS more generally (UKCS average value is 10.1%; Burrows *et al.*, 2014; NMPI, 2025). The variation in carbonate sequestration can be attributed to the sediment composition across the fields, with sandy and muddy (fine) sediment generally exhibiting a higher percentage uptake of carbonate (Burrows *et al.*, 2014). Under the European Nature Information System (EUNIS) habitat classification, the most widespread seabed type around the Otter Area is predicted to be MD52 “Atlantic offshore circalittoral sand” with areas of MD62 “Atlantic offshore circalittoral mud” and MD32 “Atlantic offshore circalittoral coarse sediment”.

Where there is direct impact to contaminated sediments (i.e. the Eider cuttings pile) this impact is likely to be negligible for any of the environmental receptors of concern given the low species numbers and diversity associated with the Eider cuttings pile. Indirect impact may be more of a

concern where contaminated sediments are released into a relatively 'natural' sedimentary environment and as such this is addressed in Section 6.3.3.2.1.

As noted in Table 6-3, approximately 0.024 km² of seabed would be affected by temporary direct disturbance. The scale of the disturbance is minimal when compared to other forms of disturbance that occur in the area, such as commercial trawling. A commercial trawler with a 12 m wide beam trawl trawling at its slowest rate of approximately 4.7 km h⁻¹ would cover an area of roughly 0.06 km² per hour so would therefore take approximately 24 minutes to cover the anticipated direct disturbance area (FAO, 2019).

6.3.3.1.2 Permanent Direct Disturbance

The immediate effect of the introduction of new rock cover will be mortality and injury of immotile benthic and epibenthic fauna, as well as disturbance of motile fauna. Following the introduction of the rock cover, the ongoing effect will be the change of an area of softer habitat to a hard substrate, and a related change in the types of organisms that can use the habitat. Organisms such as sea pens and burrowing bivalves, anemones and crustaceans will no longer be able to use the area affected, while new habitat will be created for other groups such as encrusting sponges and anemones.

The 'Seapens and burrowing megafauna in circalittoral fine mud' habitat has no resistance to physical loss or change of substrate – where the soft sediment is no longer available, the community ceases to exist. Seapens themselves show poor recovery when physically damaged (Hill, Tyler-Walters and Garrard, 2020). While the habitat could be affected by the remediation activities, this represents a highly localised impact. Furthermore, the removal of infrastructure in the Otter Area will increase the availability of suitable seabed habitat, which can facilitate the recovery of impacted seapen communities by providing alternative areas for recolonisation and habitat establishment.

Permanent direct disturbance will occur due to placing further rock cover on the seabed in perpetuity. Based on current understanding, a worst-case of 0.022 km² of seabed will be subject to permanent direct disturbance due to the introduction of rock placement on the pipeline ends, seabed depressions and future spans and exposures as detailed in Table 6-4. TAQA is committed to undertaking a pre-decommissioning burial depth survey along the Otter pipelines to inform the requirement for remediation activities.

6.3.3.2 Temporary Indirect Disturbance

Indirect disturbance (being twice the area of direct disturbance) is projected to have a total impact footprint impact of 0.093 km². The increased natural (and potentially contaminated) sediment in the water column because of the seabed activities is expected to dissipate rapidly. Given the muddy nature of the sediments, the overall level of re-suspended sediment will be low.

6.3.3.2.1 Drill Cuttings Impacts and Effects

There is potential for the decommissioning activities planned, namely the removal of pipeline ends, to interact and disturb seabed sediment impacted by drill cuttings outwith, but proximate to, the physical boundary of the Eider cuttings pile (Figure 4-5). This disturbance may be minimised as limited sections of surface laid pipelines and umbilicals in close proximity (75 m) to the jacket footings may be decommissioned in place, should derogation be granted.

The Eider cuttings pile is deemed to be 'medium' (NorOG, 2016) and falls below OSPAR thresholds (OSPAR, 2006a; b). The 50 µg g⁻¹ ecological effects threshold, which extends beyond the physical boundary of the pile, amounts to an area of 0.214 km². The indirect seabed disturbance occurring from activities in the vicinity of the Eider platform and within the 50 µg g⁻¹ ecological effect threshold (Figure 4-5) is anticipated to be a maximum of 0.02 km² resulting from the direct temporary impact

of removal activities and 0.0007 km² resulting from the direct permanent impact of rock placement (Figure 6-1).

Contaminants within cuttings piles generally have low solubility and are mainly bound to particulate matter (OSPAR, 2016). Therefore, most of the contaminants follow the solids to the seabed where they settle. A proportion of each disturbed cuttings pile is likely to resettle on seabed sediment that has not been previously impacted by cuttings. Environmental impacts resulting from deposition or re-deposition of cuttings include smothering, grain size changes, deoxygenation, and toxicity, which in turn can result in changes to the benthos and other organisms.

The time needed for sediment to recover following deposition of mud and cuttings is influenced by several processes (Rye *et al.*, 2001):

- The depth of deposition;
- Particle size;
- The rates of biodegradation of organic chemicals in the sediment;
- The resuspension and redistribution of matter on the sea floor due to currents and wave action; and
- The time for recolonization of the biota after disturbance on the sea floor.

The evidence indicates that short term uptake of contaminants in zoobenthos is to be expected, including crustaceans and molluscs. Demersal fish that feed on the zoobenthos may take up contaminants in the short term, but they are likely to be able to metabolise oils quickly and are unlikely to be significantly affected in the medium or long term. The majority of impacts from cuttings piles are noted within 100 m of the centre of the pile and generally beyond 500 m there is little discernible impact (UKOOA, 2002; ERT, 2004; DNV, 2008; BMT Cordah, 2013; OSPAR, 2019). Given the small area of disturbance in comparison to the overall size of the cuttings pile, and the highly localised activities which will be occurring to remove the subsea infrastructure, it is unlikely that the activities will pose significant environmental impact.

Any localised benthic communities impacted will recover initially through the recruitment of new colonising organisms and the migration from adjacent undisturbed sediments. Recovery will occur successively, and different species will dominate at various time intervals during the restitution of the sediment. Estimated times for re-colonization vary and are in the order of five years maximum (Rye *et al.*, 2006). It is therefore concluded that any potential impacts from temporary indirect disturbance from the cuttings pile on seabed species and habitats will be negligible and not significant.

6.3.3.2.2 Sensitive Receptors Effects

MarLIN (2024) sets 5 cm of fine material added to the seabed in a single discrete event as the benchmark for 'light deposition'. Considering the proposed operations described above it is assumed that smothering and siltation rate changes from proposed operations should be grouped under 'light deposition'. Ocean quahogs are not sensitive to light deposition while it has high resistance and high resilience (MarLIN, 2024). Knowledge around the impact of contaminated sediment on ocean quahogs is limited. They are however not sensitive, and have high resistance and resilience to chemical pressures (MarLIN, 2024)

Considering the very limited presence of ocean quahog in the site-specific surveys, the very localised potential effects from the proposed operations as well as that this species is not sensitive to light smothering and siltation rate changes, it is concluded that any potential impacts from temporary indirect disturbance on ocean quahog will be negligible and not significant.

Though not well studied, the bioturbation associated with burrows will naturally generate sediment resuspension, thus implying that species typical of the 'Sea pen and burrowing megafauna communities' habitat may have some natural tolerance to sedimentation (Hill *et al.*, 2023).

The habitat 'Seapens and burrowing megafauna communities' in circalittoral fine mud is not sensitive to 'smothering and siltation rate change (light or heavy)' while it has high resistance and high resilience (MarLIN, 2024). Both species observed in the area (*P. phosphorea* and *V. mirabilis*) are tolerant to heavy smothering and siltation. *V. mirabilis* are capable of retracting into their burrows thereby cleaning themselves of excess sediment by the production of mucous within the burrow (Hill *et al.*, 2023). As no evidence of bioturbation or burrowing megafauna communities were found close to the Eider platform, the effects of drill cuttings contamination on this receptor is not considered here.

Considering the localised potential effects from the proposed operations as well as the sensitivity, resilience, and recovery of the habitat to the pressures it is concluded that the any potential impacts from temporary indirect disturbance on 'Sea-pen and burrowing megafauna communities' will be negligible and not significant.

6.3.3.3 Impact of Pipelines Decommissioned *In Situ*

The decommissioning of items *in situ* has associated legacy impacts. This arises from the gradual breakdown of materials decommissioned *in situ*. In this instance, the pipelines and umbilicals will undergo long-term structural degradation caused by corrosion, leading to the eventual collapse of the pipelines under their own weight and that of overlying pipeline coating material, scale, and sediment. During this process, degradation products derived from the exterior and interior of the pipe will breakdown and potentially become bioavailable to benthic fauna in the immediate vicinity.

The primary degradation products will originate from the following pipeline components:

- Pipeline scale
- Steel, and
- Plastic coating.

Otter pipeline flushing operations were completed in June 2024. The pipelines and umbilicals were flushed to facilitate abandonment scopes utilising topsides facilities and vessels as required. The subsea production pipelines were flushed, and left water filled. Spools, jumpers and cables were disconnected to allow for future decommissioning activities.

Any discharges offshore were managed, and risk assessed under the existing permitting regime. Any effluent shipped to shore was treated and disposed of according to relevant regulations and guidance. Therefore, the impact of the contents of the pipelines and umbilicals decommissioned *in situ* is not considered further in this EA.

6.3.3.3.1 Heavy Metals

Metals with a relatively high density or a high relative atomic mass are referred to as heavy metals. It is expected that these metals will be released into the sediments and water column during the breakdown of the components of the pipeline scale, steel and sacrificial anodes.

The toxicity of a given metal varies between marine organisms for several reasons, including their ability to take up, store, remove or detoxify these metals (Kennish, 1997). Concentrations of the metals are not expected to exceed acute toxicity levels at any time owing to the decommissioning. However, chronic toxicity levels may be reached for short periods within the interstitial spaces of the sediments or close to the pipelines. At these levels, heavy metals act as enzyme inhibitors, adversely affect cell membranes, and can damage reproductive and nervous systems. Changes in feeding behaviour, digestive efficiency and respiratory metabolism can also occur. Growth inhibition may also occur in crustaceans, molluscs, echinoderms, hydroids, protozoans and algae (Kennish, 1997). It is expected that any toxic impacts will be short lived (DEFRA, 2010) and localised with minimal potential to impact populations of marine species. The potential for uptake and concentration of metals would also be limited to the local fauna and due to the slow release of these chemicals not likely to result in a significant transfer of metals into the food chain.

The slow release of the metals associated with the pipeline steel is expected to have a negligible impact on the local environment. However, it is anticipated that both degradation and resultant failure of the pipelines would be an exceedingly slow process, with failure only estimated to occur after many years (HSE, 1997).

Along buried pipeline corridors heavy metals may accumulate in the sediments as the pipelines degrade. The finer fraction of these sediments (silts and clays) are likely to form bonds with these metals, making them less bioavailable to marine organisms. The sandy (coarser fraction) of the sediments surrounding the pipelines are less likely to retain metals (Ministry of Petroleum and Energy (MPE, 1999). The seabed within the Otter Area is largely composed of silty sand and is therefore likely to retain any metals, prolonging their release to the surrounding seawater.

Degradation is unlikely to occur at a constant rate and across the entire length of the pipeline. Therefore, due to the highly localised nature of any degradation products and the low concentrations of contaminants being released over an elongated period it is highly unlikely that these products will be detectable above current background conditions (UKOOA, 2001).

6.3.3.3.2 *Plastics*

There are plastic components within the composition of the Otter pipelines and umbilicals. However, as no micro-organisms have evolved to utilise chemically resistant polymer chains as a carbon source, these plastics can be expected to persist in the environment for centuries (OGUK, 2013). As the rate of biodegradability in the marine environment is also low, it can be assumed that the environmental effect of leaving these plastics in place is insignificant (MPE, 1999). Recent studies indicate that plastic coatings on pipelines located on the seabed may take 100s of years to fully degrade (Oluwoye *et al.*, 2023; Testoff *et al.*, 2022). The rate of degradation is influenced by a range of environmental factors, including temperature, solar irradiance, salinity, pH, microbial activity and abrasive erosion. These variables can significantly alter the physical and chemical breakdown of plastic materials. Furthermore, plastics buried beneath the seabed are likely to degrade at an even slower rate due to reduced exposure to oxygen, light, and microbial communities (Oluwoye *et al.*, 2023; Cetiner *et al.*, 2000).

Opportunity also exists for microplastics to enter the food chain. Adverse effects of microplastics on marine organisms can potentially arise from the physical obstruction or damage of feeding appendages or digestive tract or other physical harm. In addition, microplastics can act as vectors for chemical transport into marine organisms causing chemical toxicity (Hylland *et al.*, 2021). Zooplankton, for example, have been shown to ingest microplastics, raising concerns about the broader ecological impacts of plastic pollution in marine environments. Adverse effects have been reported on key biological functions including feeding behaviour, growth and development, reproduction, and lifespan. These disruptions can impair energy intake and reduce their reproductive capability, ultimately threatening population dynamics and the stability of marine food webs (Botterell *et al.*, 2019). However, the pipeline degradation process which facilitates the availability of plastics to marine organisms will occur very gradually over a highly protracted timeframe. Studies have concluded that, even under conservative assumptions, degradation of subsea plastic-containing flowlines does not pose a significant risk to local marine communities (e.g. Testoff *et al.*, 2022).

Due to the highly localised nature of any degradation products, the burial status of the pipelines and the low concentrations of contaminants being released over an elongated period it is highly unlikely that these products will show concentrations beyond the existing background levels (Bakir *et al.*, 2023) in the North Sea.

6.3.4 **Cumulative and Transboundary Impacts**

Decommissioning activities may be integrated with the wider NNS decommissioning scope to maximise synergies, optimise the use of resources and minimise disturbance to the environment. Most of the surrounding NNS oil and gas assets will be subject to decommissioning in the coming

years, however the timescale of those decommissioning operations has yet to be defined. Therefore, cumulative impacts are difficult to assess.

The Otter decommissioning activities will not be occurring in close proximity to any other third-party oil and gas installations; the closest installation is the Magnus platform which is located 22 km east northeast from the proposed Otter manifold. In addition, given that the total area of seabed disturbance (0.12 km², Table 6-3) of the Otter Area decommissioning operations amounts to less than 0.0025% of the 5,027 km² of seabed available within that 40 km radius, it is reasonable to presume that the impact is not of significant magnitude to have any discernible contribution to cumulative impacts in the broader context. Therefore, cumulative impacts to the seabed caused by these decommissioning activities are considered to be negligible.

The Otter Area is located approximately 38 km from the UK/Norway median line. Given this distance, and the area of indirect temporary disturbance being 0.093 km², there is no potential for sediment to travel beyond the immediate vicinity of the decommissioning area and into neighbouring territorial waters. Transboundary impacts are highly unlikely.

6.3.5 Mitigation Measures

The following measures will be adopted to ensure that seabed disturbance and its impacts are minimised to a level that is ALARP.

- Pre-decommissioning status surveys will be carried out to enable planning for the decommissioning activities;
- TAQA will undertake a pre-decommissioning pipe-tracker (DoB) survey along the Otter Area pipelines to assess the extent of natural backfill since the previous surveys used to inform this EA were undertaken and inform the requirement for remediation activities. TAQA will ensure that focussed rock placement is undertaken and is limited to the pipeline lengths still showing evidence of spanning, exposure above the level of their respective trenches. OPRED will be informed of the results prior to decommissioning activities commencing.
- All activities which may lead to seabed disturbance will be planned, managed and implemented in such a way that disturbance is minimised;
- A debris survey will be undertaken at the completion of the decommissioning activities. Any debris identified as resulting from oil and gas activities will be recovered from the seabed where possible;
- Rock will be placed by a fall pipe vessel equipped with an underwater camera on the fall pipe or the positioning of rock bags monitored by ROV. This will ensure accurate placement of the rock armour and reduce unnecessary spreading of the rock armour footprint and ensuring that minimum safe quantity of rock is used; and
- Clear seabed verification will ensure there is no residual risk to other sea users. Non-intrusive verification techniques will be considered in the first instance. Post-decommissioning survey specifications will be agreed in advance with OPRED to ensure that any protected species or areas of conservational importance are not inadvertently compromised in any way by any clear seabed trawling activities or other intrusive methods.

6.3.6 Seabed Disturbance Residual Impact

Receptor (Impact Type)	Magnitude	Sensitivity	Vulnerability	Value
Seabed habitats and fauna	Minor	High	Low	Low
Otter Area decommissioning activities will result in temporary direct and indirect disturbance to the seabed. Temporary direct disturbance has the potential to impact up to 0.024 km ² of seabed. There will be a 0.022 km ² area of direct permanent disturbance because of new rock placement (for pipeline ends, seabed depression and potential contingency rock on mid-lines). Temporary indirect disturbance of natural and				

potentially contaminated sediment could impact up to 0.093 km². These are considered conservative estimations of the likely impact of the proposed decommissioning activities, as the buffers added to the structures are likely to overestimate the range of impact generated by various removal methods. TAQA is committed to undertaking a pre-decommissioning pipe-tracker (DoB) survey along the Otter pipelines to inform the requirement for remediation activities.

Overall, given the localised nature of the seabed disturbance, and the very small area of seabed that will be permanently impacted, the magnitude of the impacts on seabed habitats and fauna is considered magnitude. Surveys of the Otter Area indicated the presence of potentially sensitive habitats and species, including the OSPAR protected species, indicated the presence of several potentially sensitive habitats and species, including the Annex I protected habitat 'Submarine structures made by leaking gases' (pockmarks), the OSPAR and UK BAP protected habitat 'Seapen and burrowing megafauna communities' and the OSPAR protected habitat, Ocean quahog.

The lack of MDAC present in pockmarks identified across the Otter Area indicates that Annex I 'Submarine structures caused by leaking gases' are not present.

For all direct impacts (temporary or permanent) the sensitivity and vulnerability of these receptors is anticipated to be high. Considering the extent of the 'Seapen and burrowing megafauna communities' and ocean quahog the magnitude and the value (in the context of the localised nature of the decommissioning activities) and expected to be low. Overall consequence for direct impacts is therefore low and not significant.

For all indirect impacts the sensitivity and vulnerability of these receptors is anticipated to be low. In the context of the localised nature of the decommissioning activities, magnitude and value are expected to be negligible. Overall consequence for indirect impacts is therefore negligible and not significant.

Due to the highly localised nature of any degradation products, the burial status of the pipelines and the low concentrations of contaminants being released over an elongated period it is highly unlikely that these products will be detectable above current background conditions in the area and would have a low and non-significant impact on any sensitive receptors.

Overall, the impacts on the seabed sensitive receptors are expected to be low overall and therefore not significant.

Consequence	Significance
Negligible	Not significant

6.4 Physical Presence of Infrastructure Decommissioned *In Situ* in Relation to Other Sea Users

6.4.1 Approach

The proposed Otter Area decommissioning activities have the potential to impact upon other users of the sea, namely commercial fisheries. This may happen during the decommissioning activities themselves or after, should any infrastructure decommissioned *in situ* interact with fishing gear. Sea users, other than commercial fisheries are unlikely to be affected by the proposed decommissioning. These aspects are assessed throughout the rest of this Section.

6.4.2 Sources of Potential Impacts

In this instance, only the mid-line sections of the Otter Area trenched pipelines/umbilicals are proposed to be decommissioned *in situ* and the remaining infrastructure will be removed, with a clear seabed to be confirmed following remediation and removal activities. The cuttings piles located at the base of the Eider platform will also be decommissioned *in situ* and there is a potential for interaction with demersal trawlers. Generally, interactions between oil and gas infrastructure and fishing gear are most prevalent in the NNS where demersal fishing effort is relatively high (Rouse, Hayes, and Wilding, 2018). Demersal fishing gears which interact with the seabed are most vulnerable to snagging. Snagging may lead to loss or damage of catch or fishing gear and may result in vessel loss in extreme circumstances.

The long-term presence of the subsea pipelines decommissioned *in situ* has the potential to interfere with other sea users. The greatest identified risk to commercial fisheries is the potential snagging of fishing gear on exposures or free spans associated with infrastructure decommissioned *in situ*, as well as any clay mounds or depressions generated by the removal of infrastructure. These potential snagging risks may arise during initial decommissioning and/ or over the longer-term. In addition to the physical presence of the pipelines decommissioned *in situ*, local pipeline remediation (i.e., rock placement) may increase the potential for interaction with fishing gear. The length of rock placement being decommissioning *in situ* was calculated based on the pipeline surveys data. Total weight of existing rock placement along the pipelines is 77,155 Te (Table 3-10) and the seabed footprint amounts to 0.071 km². This value is determined by multiplying the length of rock cover by 5.1 m to represent the maximum rock cover scenario. This approach likely represents overestimate.

Limited sections of surface laid pipelines, umbilicals, and protection/stabilisation material in close proximity to the Tern platform jacket/sub-structure footings may be decommissioned in place, subject to derogation agreement with OPRED. "Close proximity" is considered within approximately 75 m of the platform footings. Logical break points between portions decommissioned *in situ* and portions removed will be selected, e.g., pipeline crossings, etc. This option represents a reasonable balance between the level of risk associated with removing the facilities, the degree of disturbance of the seabed, the use of resources during decommissioning, and, following decommissioning, the loss of amenity for other sea users. If derogation is not granted, all surface laid pipelines and umbilicals will be recovered and taken to shore for appropriate re-use, recycling, or disposal.

6.4.3 Effects on Sensitive Receptors

The Otter Area is located in ICES rectangles 52F0, 51F0 and 51F1, which in general are targeted primarily for demersal species and are deemed to be of moderate to high contribution to the total UK landings values and weights.

Fishing effort in 2023 amounted to 103, 277 and 260 days in ICES rectangles 52F0, 51F0 and 51F1, respectively. Fishing effort has increased in the Otter Area in comparison to 2022. The increase in effort is driven by an incline in effort in the demersal trawl and seine nets segment

(Table 4-5). In all ICES rectangles, demersal fish accounted for most of the total landed value and weight between 2019 and 2023 (Table 4-4).

Trawls were the dominant gear types used in ICES rectangles 52F0, 51F1 and 51F0. It is therefore clear that most of the trawl effort in ICES rectangle 52F0, 51F1 and 51F0 is attributed to demersal fish, due to the higher proportion of demersal catch, however, some pelagic fishing effort is likely to occur.

The most recent AIS vessel track data (Figure 6-3) shows the density of demersal fishing vessels between 2007-2015. The density of vessels is very low around the Otter manifold (6-10 transits annually per 1 km²), highest across some of the mid-line sections (31-46 transits annually per 1 km²) and relatively high close to the Eider platform (11 – 30 transits annually per 1 km²). In the context of the North Sea demersal fishing activities, 0 – 46 transits annually per 1 km² is considered to be relatively low.

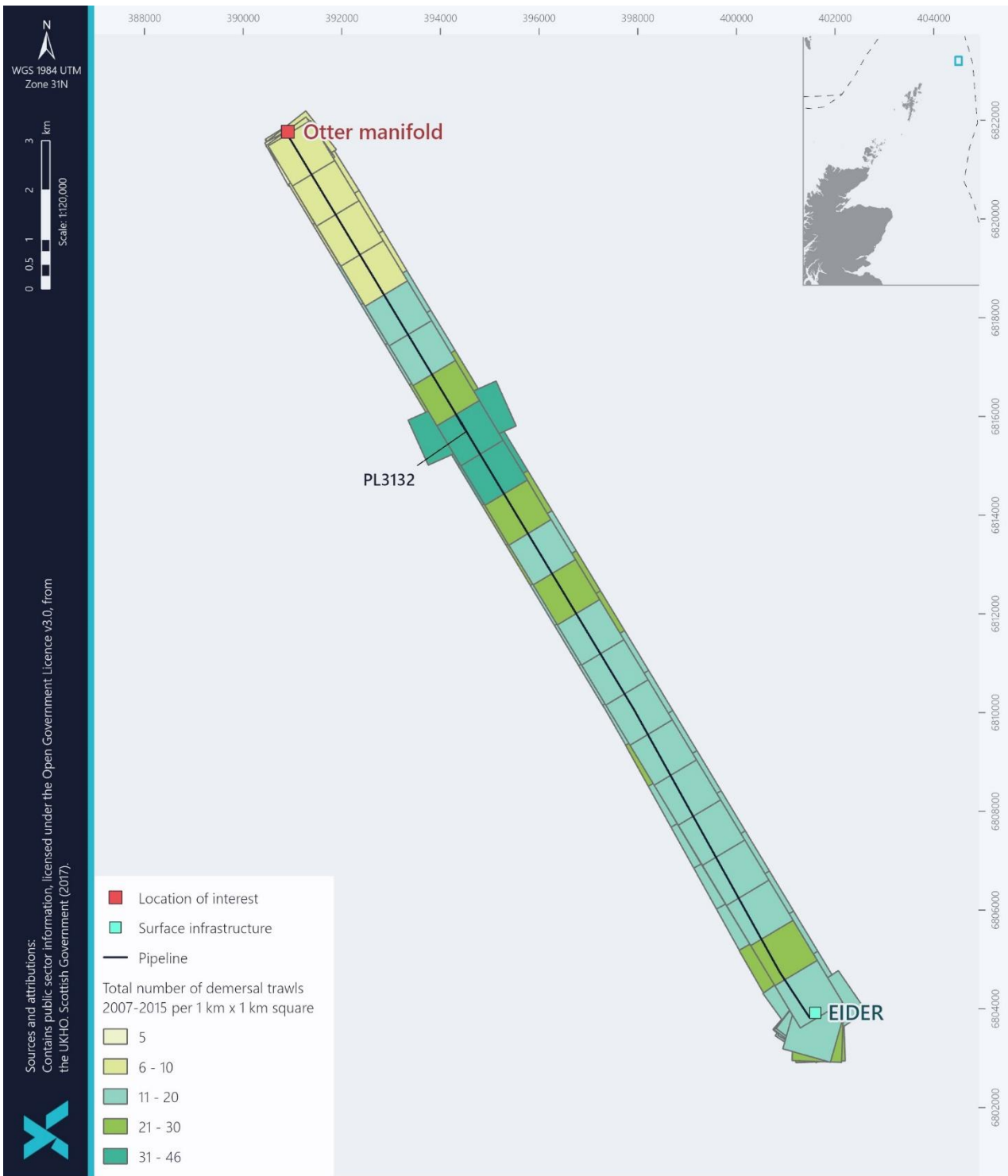


Figure 6-3 Demersal Fishing Intensity Across the Otter Area Pipelines

6.4.3.1 Snagging Risk

Pipelines will be decommissioned *in situ* in accordance with the CA outcome. The pipeline ends will be remediated rock, with a worst-case of 100 Te (100 m²) of rock per cut end. Rock berm profiles will be within a 10 m-wide corridor and will be designed to be overtrawlable with a 1:3 slope. Rock will be laid precisely using a fall pipe vessel or with rock bags.

TAQA will conduct a pre-decommissioning survey of the Otter pipelines prior to the commencement of decommissioning activities. Any fishing critical spans will be surveyed and monitored on a regular basis. Should the survey and monitoring programme provide evidence of an increase in the level of potential risk to other users (i.e., from snagging of demersal fishing gear), the areas of concern shall be remediated on a case-by-case basis. Additional rock cover required for remediation will be covered by relevant environmental permits. Permits will also address associated seabed and emissions impacts (if required).

The removal of the foundation piles associated with subsea structures may leave depressions in the seabed TAQA will also monitor the seabed to assess any seabed depressions and ensure that they are overtrawlable. Rock may also be used as localised remediation locally for depressions where backfill is not possible.

The seabed within the surrounding area is relatively stable, which reduces the risk of exposure over time. Historical exposures have previously been remediated with spot rock cover. Any potential changes in burial status of the pipelines resulting in legacy impacts to commercial fisheries due to degradation over time will be managed through continued monitoring and communication with relevant users of the sea, as detailed in Section 6.4.5.

Overall, the region experiences comparable fishing activity to other high-performing ICES rectangles in the UKCS. Some snagging risks may arise in areas of exposures or free-spans and at the pipeline ends where rock remediation is required and at any clay berms resulting from the removal of subsea structures. All rock cover will be designed with an overtrawlable (1:3) profile to minimise any residual risk to commercial fishers. Considering this, and the low to moderate fishing effort observed at the Otter pipeline areas and the remediation strategies to be put in place, the snagging risks associated with the decommissioning of the pipelines *in situ* is considered minimal.

6.4.3.2 Drill Cuttings Interaction

Trawling is a key mechanism of seabed disturbance, resulting in suspension of sediment in a cloud of particles. This can lead to the release of nutrients, pore water, hydrocarbons, and metals from the sediment into the water column. Independent studies have found that trawling gear typically re-suspends the equivalent of 1 mm depth of seabed sediment. The contaminant content of the top (approximately 100 mm) layer of a cuttings pile is often relatively low, having leached into the water column over time and biodegraded (Genesis, 2014). The amount of sediment disturbed depends primarily on the fishing gear and rigging type, the hydrodynamic conditions, and the sediment type. Results suggest that scallop dredging gear has the greatest potential for sediment disturbance and this is typically not an activity undertaken in proximity to cuttings pile such as those in the Otter Area.

Following over-trawl using demersal nets, drill cuttings contamination will likely spread but this would not be expected to be in amounts or at rates that would pose serious wider contamination or toxicological threats to the marine environment. The act of spreading will encourage, albeit at a slow rate, increased aeration of deposited material which will enable its further degradation by natural processes (OSPAR, 2019).

6.4.4 Cumulative and Transboundary Impacts

The Otter Area is located approximately 38 km from the UK/Norway border. The most recent AIS vessel track data shows the density of vessels in 2019 were generally low across the pipelines (ranging from 0 – 46 transits annually per 2 km²) which suggests that, despite proximity to an international border, there is minimal vessel movement around the Otter pipelines. However, with the proximity of the infrastructure to the UK / Norway border, there are likely to be marginally higher effort levels by foreign fishing compared to other nearshore areas of the UKCS. Given the mitigation of any snagging risks (which could affect foreign fishing fleets), transboundary impacts are also deemed negligible.

In the wake of the decommissioning activities, pipeline exposures will be remediated, and the seabed will be left in a safe overtrawlable condition, so no impacts to any UK and / or foreign fishing fleets are expected to result from the proposed activities.

There is the potential for cumulative impacts to occur with other activities occurring nearby to the Otter Area which could also interfere with commercial fishing activity. Decommissioning activities at the Brae East platform are planned for 2025 - 2031 and decommissioning at the Brae Alpha and Brae Bravo fields are scheduled to take place up until 2029 (Rock Rose, 2020; Marathon Oil UK, 2017). However, it is expected that adequate mitigations will be in place at these fields to minimise snagging risk as far as possible. In addition, snagging risk or interference with commercial fisheries may arise due to well decommissioning activity in the Otter Area and the removal of other infrastructure, however, these will be remediated/ mitigated prior to the removal of any 500 m safety exclusion zones. Overall, considering the low potential for snagging risk along the Otter pipeline and the fact that any rock placement at pipeline ends will be overtrawlable, no cumulative impacts are expected to arise.

6.4.5 Mitigation Measures

The following measures will be adopted to ensure that snagging risks to commercial fisheries as a result of the Otter Area pipelines being decommissioned *in situ* are reduced to ALARP:

- The Otter pipelines are currently shown on Admiralty Charts, the FishSAFE system and the NSTA Infrastructure data systems (NSTA Open Data). Once decommissioning activities are complete, updated information (i.e. which infrastructure remains *in situ* and which has been removed) will be made available to allow Admiralty charts and the FishSAFE system to be updated;
- Any cut pipeline ends will be rock covered to ensure they are overtrawlable by fishing vessels;
- If required, localised rock cover will be added following confirmation of the current burial status of the mid-line sections of the pipelines during pre-decommissioning surveys. This will be minimised wherever possible;
- If clay berms are identified during post decommissioning surveys these will be remediated to ensure there are no potential snagging hazards. The remediation of these depressions using rock will be assessed on a case-by-case basis and in consultation with OPRED where required;
- Any objects dropped during decommissioning activities will be removed from the seabed where appropriate;
- Clear seabed verification will be carried out after decommissioning to ensure there is no residual risk to other sea users. Non-intrusive techniques will be considered in the first instance to identify any remaining debris or seabed obstructions. It is then TAQA's intention that, if present, these would be recovered/removed ensuring no oilfield-related debris that could interfere with future fishing operations remain. If the above cannot be achieved and potential debris or obstructions do remain then mitigations would be discussed with OPRED and fishing representative bodies. Following consultation with OPRED, the use of trawl sweeps or other intrusive means could in this instance be deployed to provide seabed clearance verification;
- Ongoing discussions with fisheries representatives.
- TAQA recognises its obligation to monitor any infrastructure decommissioned *in situ* and therefore intends to set up arrangements to undertake post-decommissioning monitoring. The frequency of the monitoring that will be required will be agreed with OPRED and future monitoring will be determined through a risk-based approach established from the findings of each survey in turn. During the period over which monitoring is required, the burial status

of the infrastructure decommissioned *in situ* would be reviewed and any necessary remedial action undertaken to ensure it does not pose a risk to other sea users.

6.4.6 Physical Presence of Material Decommissioned *In Situ* Residual impact

Receptor	Magnitude	Sensitivity	Vulnerability	Value
Demersal Fisheries	Moderate	Moderate	Low	Low
<p>While the impact magnitude may be considered major owing to the potential severity of a snagging event, the frequency of such an event is relatively unlikely and is therefore considered to be moderate.</p> <p>The Otter Area pipelines sit within a relatively stable seabed. FishSAFE free spans will be removed, a pre-decommissioning pipeline burial survey will be undertaken to assess the latest burial status for all pipelines and any existing exposures and free spans will be monitored and remediated if necessary (subject to permit applications). The drill cuttings pile to be decommissioned <i>in situ</i> fall below the relevant OSPAR threshold values for contamination and surface trawling is not expected to spread contaminants in amounts or at rates that would pose serious wider contamination or toxicological threats to the marine environment.</p> <p>These impacts will be restricted to commercial fisheries that make active contact with the seabed, such as bottom trawls and dredging gears. Commercial fisheries as a receptor are considered to be of moderate sensitivity as the industry is not able to accommodate change. The vulnerability of the receptor is also considered low as the presence of the pipelines are not likely to influence fishing activity in the area beyond current natural variation. The value of commercial fisheries in the Otter Area is also considered low when comparing the financial value and contribution of the catch within the wider regional context. The re-opening of the 500m safety zones around the Otter manifold will also expand the available fishing grounds. Foreign fleets are also not considered to be highly dependent on the area, based on recent AIS data.</p> <p>Following decommissioning, surveys of the Otter Area will identify, remediate and confirm there are no areas of potential snagging risk. Furthermore, a monitoring schedule, in agreement with OPRED, will be produced for any pipeline decommissioned <i>in situ</i>.</p> <p>Coupled with mitigation to undertake a further pipeline burial study, and remove any FishSAFE spans, impacts to commercial fisheries from snagging risk from the decommissioning of the Otter Area are deemed low and not significant.</p>				
Consequence		Significance		
Low		Not significant		

7 CONCLUSIONS

A detailed review of the proposed decommissioning activities, and their impact on the environmental sensitivities characteristic of the Otter Area has been undertaken within this EA. Based on industry experience and consideration of stakeholder concerns, it was determined that emissions to air, disturbance to the seabed, and the physical presence of infrastructure decommissioned *in situ* required further consideration.

The Otter Area is located approximately 119 km offshore in the NNS, remote from coastal sensitivities. There are no NCMPAs, SACs or SPAs within 40 km of the Otter Area. The closest protected site is the Pobie Bank Reef SAC, approximately 96 km west of the Otter manifold.

The total emissions estimate for the Otter Area decommissioning activities is 38,209 Te CO_{2e}, representing approximately 0.18% of the CO_{2e} generated in UK in 2022 (Section 6.2). The lifecycle emissions associated with new manufacture to replace recyclable materials decommissioned *in situ* represents the largest CO_{2e} contribution (17,190 Te). A significant proportion of the emissions also originate from the offshore vessel activity. TAQA acknowledge the contribution of these emissions (however small) to global climate change, and have assigned a Minor magnitude, low sensitivity, high vulnerability and low value score based on this premise. Overall consequence is anticipated to be low for global climate change.

Decommissioning activities will result in temporary direct and indirect disturbance to the seabed in the Otter Area (Section 6.2). Temporary direct disturbance has the potential to impact approximately 0.024 km² of seabed. Temporary indirect disturbance has the potential to impact approximately 0.93 km² of seabed. Rock remediation activities will permanently impact an area of approximately 0.022 km² but this represents a worst-case scenario and should be considered in context with rock placement being decommissioned *in situ* (seabed footprint of 0.071 km²). An estimated 1,600 Te of rock will be added during rock remediation activities to remediate pipeline ends. An additional 33,000 Te has been estimated as a contingency for remediation of future spans and exposures on mid-lines. When added to the existing rock placement (77,155 Te) this bears a total weight of 110,155 Te across seven pipelines. Pre-decommissioning pipe tracker surveys will confirm the latest pipeline burial status for all pipelines to be decommissioned *in situ* and requirement for further remediation. These activities have the potential to cause minor discernible change to the baseline of existing benthic receptors. Considering the temporary and/ or localised nature of the activities and the mitigation measures outlined, the habitat, though sensitive, is not likely to be affected significantly by the decommissioning. Based on the anticipated localised and temporary nature of the disturbance, the proposed decommissioning of the Otter Area subsea infrastructure will have a low impact on seabed receptors.

Activities with the potential to impact upon commercial fisheries were limited to the possible legacy impacts of decommissioning of drill cuttings, pipelines, and associated rock *in situ* (Section 6.4). Such impacts are restricted to commercial fisheries which operate bottom trawl or dredging gears and therefore make contact with the seabed. All pipelines will be adequately protected, either within a trench or with rock remediation where snagging risks are identified. In the wider regional context, fishing activity in the ICES rectangles over which the Otter Area is distributed is broadly comparable to other high-performing rectangles in the UKCS. Based on these observations, the fact that the relevant cuttings piles are below the OSPAR thresholds and coupled with mitigation measures which include focussed surveys and ongoing monitoring for exposures, impacts to commercial fisheries from snagging risk from the decommissioning of the Otter Area subsea infrastructure are deemed negligible.

This EA considered the objectives and marine planning policies of the NMP across the range of policy topics including biodiversity, natural heritage, cumulative impacts and the oil and gas sector. TAQA considers that the proposed decommissioning activities are in alignment with these objectives and policies.

Based on the findings of this EA including the identification and subsequent application of appropriate mitigation measures, and project management according to TAQA's HSSE Policy and EMS, it is considered that the proposed Otter Area decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the UKCS.

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APPENDIX A - TAQA HSSE POLICY



TAQA UK Health, Safety, Security and Environment Policy

The health, safety and security of our employees, contractors and the public is our highest priority; it is more important than any operational priority.

We must also:

- Ensure that our assets are operated safely
- Assure the integrity of our assets
- Respect, protect and understand the natural environment

HSSE = Health, Personal Safety, Major Accident Prevention, Security and Environment

We strongly believe that excellent business performance requires excellent HSSE performance – we recognise this as a core value.

Employees and contractors are required to focus on the four areas below:

Leadership

- Everyone within TAQA demonstrates commitment and accountability to implement this policy and to work in accordance with the TAQA Management System Elements and Expectations
- Everyone within TAQA understands their accountabilities for the management of HSSE
- The structure and resources necessary to achieve and measure HSSE accountabilities are provided
- Requirements of applicable legislation and standards are identified, understood and complied with
- Personnel have the required competencies and are fit for work
- Our workforce is aligned, involved and empowered in the identification and management of HSSE hazards and the achievement of our HSSE goals
- Key stakeholder groups are identified and a good working relationship is maintained with them (understanding and addressing their issues and concerns)

Operational Risk Identification and Assessment

- Risks are identified, assessed and appropriately managed
- Information required to support safe operation is identified, accurate, available and up to date

Operational Risk Management

- The standards, procedures and operating manuals required to support project, maintenance and operational activities are identified, developed, understood and consistently applied
- Process and operational status monitoring and handover requirements are defined, understood and carried out
- Operational interfaces with third parties are identified, assessed and appropriately managed



TAQA UK Health, Safety, Security and Environment Policy

- Risks arising from any form of change are systematically identified, assessed and managed
- A systematic process is in place to verify the safe condition of plant and equipment and to ensure that personnel are appropriately prepared (before start-up or return to normal operations)
- We are appropriately prepared for all necessary actions which may be required for the protection of the public, personnel (including contractors), the environment, plant equipment and reputation in the event of an incident
- We aim to prevent pollution and protect the environment from the impact of our operations

Review and Improvement

- We routinely monitor our activities through internal/external audits and produce key performance indicators – we review these indicators and intervene as necessary
- Compliance with our expectations is routinely reviewed and audited to determine whether this policy remains appropriate and is being implemented effectively
- The management system is routinely reviewed for continual improvement and to enhance HSSE performance
- All incidents, near misses and opportunities for improvement are consistently reported and investigated, and that identified actions and learnings are implemented on a timely basis

We all have a personal responsibility to work safely and protect the environment. We are all safety leaders, irrespective of our role or location. Everyone is empowered to challenge and stop work if they are in any doubt regarding a job they are involved in or observing.

Sandy Hutchison, Managing Director

Brad Youngson,
HSSEQ & Assurance Director

Calum Riddell,
Operations Director

David Wilson,
Decommissioning, Projects &
Engineering Director

Jeremy Kibble,
Finance Director

Corinne Kelt,
Human Resources Director