# TERN DECOMMISSIONING

## Tern Topsides
## Decommissioning Environmental Appraisal


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# Abbreviations

| Abbreviation | Meaning |
|---|---|
| AIS | Automatic Identification System |
| ALARP | As low as reasonably practicable |
| AtoN | Aid to Navigation |
| AWMP | Active Waste Management Plan |
| BEIS | Department for Business, Energy and Industrial Strategy |
| CNS | Central North Sea |
| COP | Cessation of Production |
| $CO_2$ | Carbon Dioxide |
| CPR | Continuous Plankton Reader |
| DECC | Department for Energy and Climate Change |
| DFPV | Drained, Flushed, Purged and Vented |
| DP | Decommission Programme |
| DR MPA | Demonstration and Research Marine Protected Areas |
| EA | Environmental Appraisal |
| EDC | Engineering Down and Cleaning |
| EMS | Environmental Management System |
| EPS | European Protected Species |
| ERL | Effects Range Low |
| ES | Environmental Statement |
| EU | European Union |
| EUNIS | European Nature Information System |
| EWC | European Waste Catalogue Codes |
| FOCI | Feature of Conservation Importance |
| GJ | Giga Joules |
| HLV | Heavy Lift Vessel |
| HSSE | Health, Safety, Security and Environment |
| ICES | International Council for the Exploration of the Sea |
| IDS | Integrated Deck Structure |
| IEMA | Institute of Environmental Management and Assessment |

| | |
|---|---|
| IUCN | International Union for Conservation of Nature |
| JNCC | Joint Nature Conservation Committee |
| MarLIN | Marine Life Information Network |
| MCZ | Marine Conservation Zone |
| MDAC | Methane-Derived Authigenic Carbonate |
| MMO | Marine Management Organisation |
| MSF | Module Support Frame |
| $M^3$ | Cubic Metre |
| NC MPA | Nature Conservation Marine Protected Area |
| NDE | Non-destructive evaluation |
| NFFO | National Federation of Fishermen's Organisations |
| NLB | Northern Lighthouse Board |
| NMPI | National Marine Plan Interactive |
| NNS | Northern North Sea |
| OGA | Oil and Gas Authority |
| OPEP | Oil Pollution Emergency Plan |
| OPRED | Offshore Petroleum Regulator for Environment and Decommissioning |
| OSPAR | The Oslo Paris Convention |
| PETS | Portal Environmental Tracking System |
| PEXA | Practice and Exercise Areas |
| PMF | Priority Marine Feature |
| POB | Personnel on Board |
| ROV | Remotely Operated Underwater Vehicle |
| SAC | Special Areas of Conservation |
| SCOL | Self-Contained Offshore Lighthouse |
| SCOS | Special Committee on Seals |
| SEA | Strategic Environmental Assessment |
| SFF | Scottish Fishermen's Federation |
| SLV | Single Lift Vessel |
| SMRU | Sea Mammal Research Unit |
| SNH | Scottish Natural Heritage |
| SOPEP | Shipboard Oil Pollution Emergency Plan |

| | |
|---|---|
| SOSI | Seabird Oil Sensitivity Index |
| SPA | Special Protection Area |
| TAQA | TAQA Bratani Limited |
| Te | Tonnes |
| THC | Total Hydrocarbon |
| UK | United Kingdom |
| UK BAP | UK Biodiversity Action Plan |
| UKCS | United Kingdom Continental Shelf |
| VMS | Vessel Monitoring System |

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# EXECUTIVE SUMMARY

## Introduction and Background

This summary provides a non-technical overview of findings from the Environmental Appraisal (EA) conducted by TAQA Bratani Limited (TAQA), for the proposed decommissioning of the Tern installation topsides[1], located in Block 210/25 of the northern North Sea (NNS), approximately 104 km north east of Shetland and 47 km west of the UK/Norway median line (Figure i).

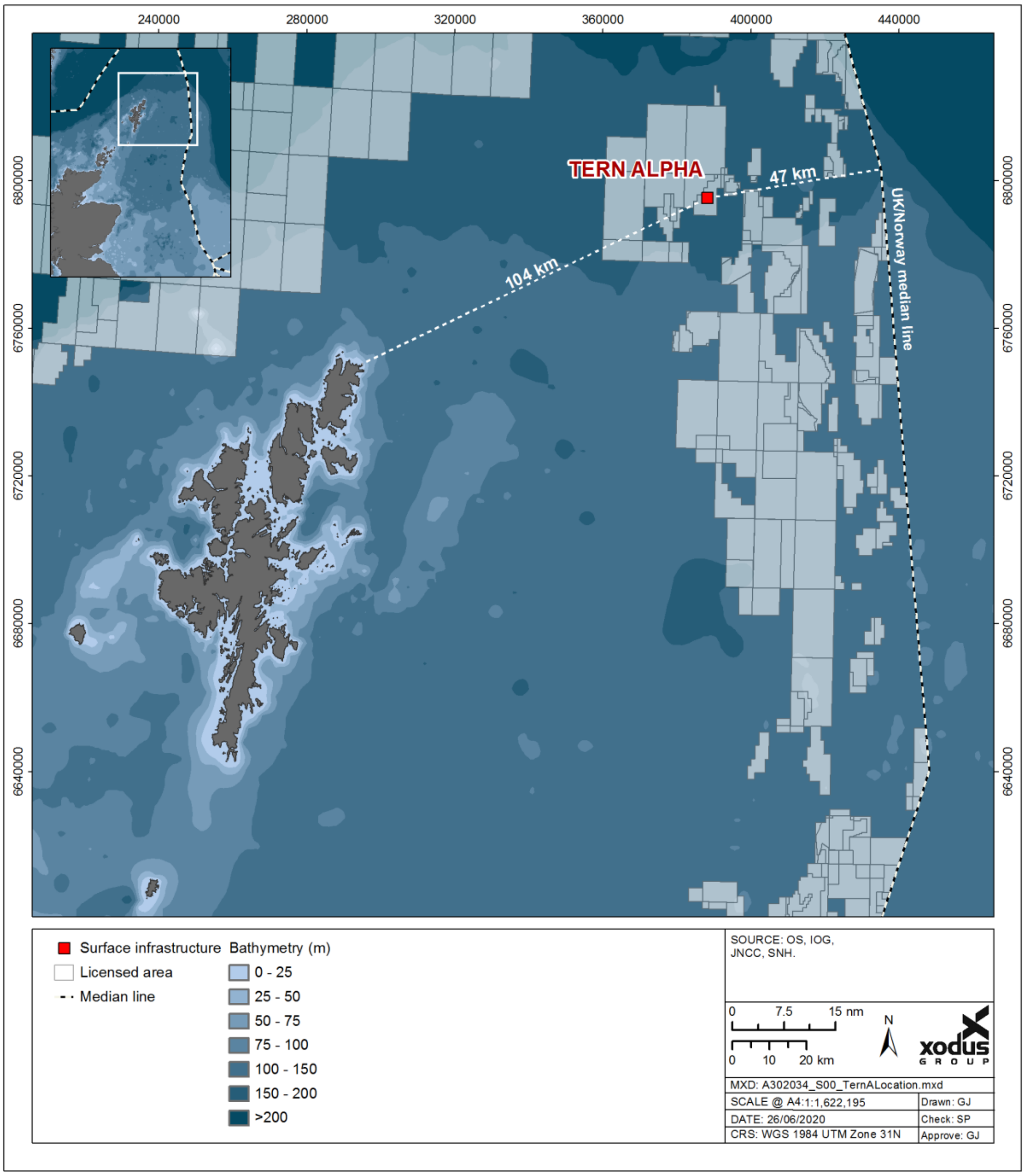


**Figure i Location of the Tern Installation**

[1] On an offshore installation, the topsides are the deck and all the modular facilities on it including accommodation, drilling unit, processing equipment, cranes and helideck.

Tern is a fixed installation which consists of a 4-legged steel jacket sub-structure, anchored by piles to the seabed This supports an 8-legged module support frame (MSF), and two levels of modules including accommodation and drilling facilities. The installation topsides were installed in 1988 and production started in 1989. The total weight of the installed topsides is approximately 22,173 te. A CoP (Cessation of Production) application for Tern was submitted to the Oil & Gas Authority (OGA) in Q4 2019 and the date of CoP is set to Q4 2023.

The Tern installation is designed to fulfil four main functions:

- To provide a production facility for Tern, Hudson, Kestrel, Falcon and Cladhan fields;
- To provide a well engineering facility for the Tern Field;
- To provide gas lift facilities for the Tern, Hudson, Kestrel, Falcon and Cladhan fields; and
- To provide water injection facilities for Tern, Hudson, Kestrel, Cladhan and Otter fields (TAQA, 2018a).

A schematic illustrating Tern in relation to other installations in the vicinity, together with connecting infrastructure including pipelines, umbilicals and power cables, is shown in Figure ii.

## Decommissioning Overview

As part of the planning for decommissioning and to obtain regulatory approval for the activities, further Decommissioning Programmes (DPs) will be prepared, each supported by an EA:

- Topsides decommissioning, covered by this EA; and
- Substructure decommissioning, to be carried out at a time yet to be confirmed and covered by a separate DP and supporting EA;
- Jacket and subsea infrastructure decommissioning, including the Tern substructure, associated pipelines, power cables and umbilicals, to be prepared at a time yet to be confirmed and to be covered by a separate DP and supporting EA.

This EA does not cover well plugging and abandonment, or the flushing and cleaning operations that will be undertaken on the topsides. These activities will be carried out as part of the preparatory work preceding decommissioning, under existing field operational permits.

## Proposed Schedule

The precise timing of the topside decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements. Once the Tern Field reaches the end of its economic life and ceases to produce hydrocarbons, it is intended to shut down and isolate the installation. Topsides will be cleaned to a standard that allows them to be deemed ‘Hydrocarbon Free’, so that removal activities can safely proceed (TAQA, 2018a).

Since topsides integrity degrades rapidly following the installation becoming unoccupied, TAQA has decided that the most effective management option is to remove the topsides infrastructure as soon as possible. The removal of the Tern topsides will not impede any decommissioning options for the remaining substructure. This will minimise the period between CoP and the removal of the topsides. This has safety and environmental benefits, as it reduces the length of time that people and equipment are mobilised to the installation to perform maintenance of the topsides to ensure they are in a safe condition for dismantling.

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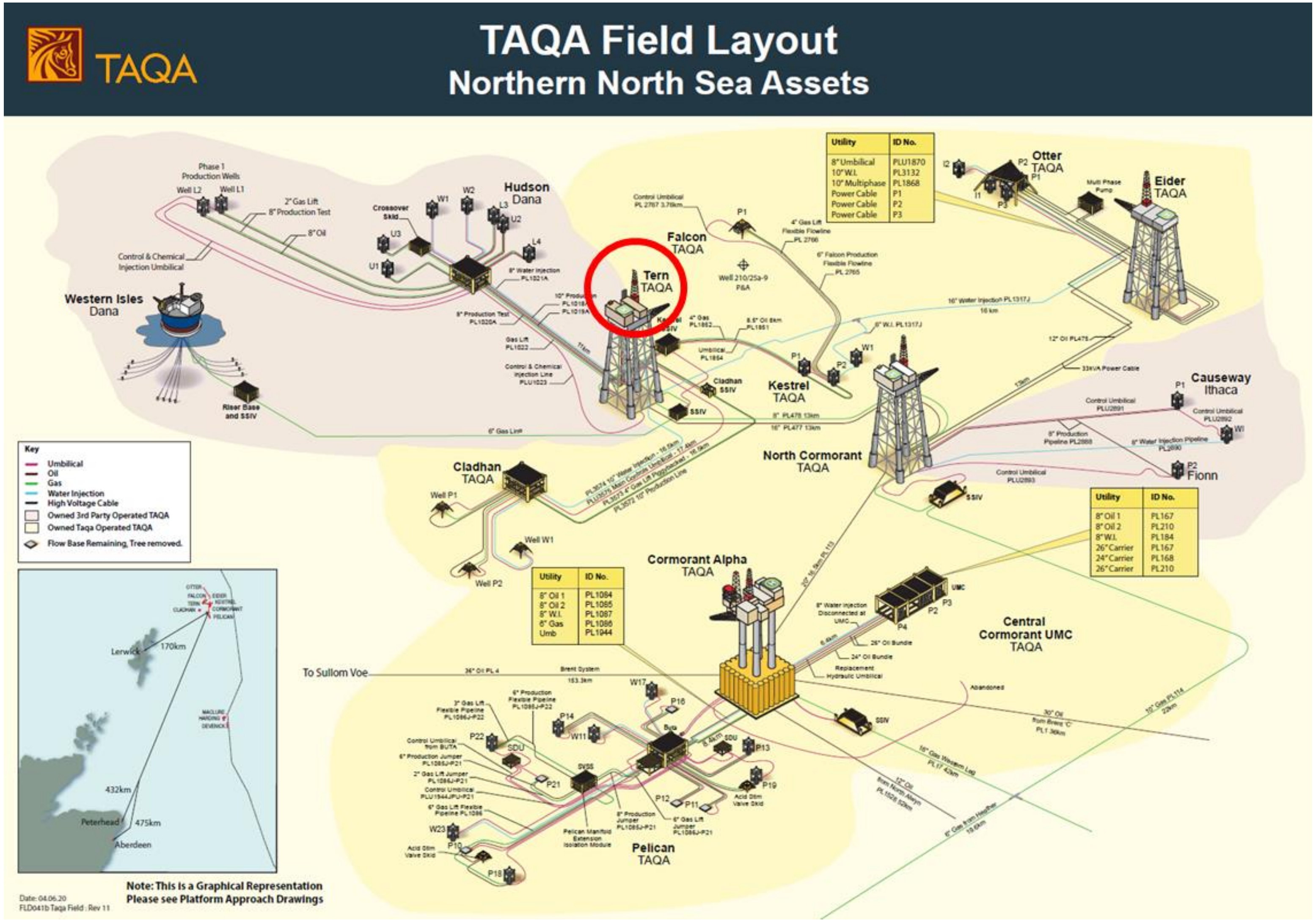


Figure ii Location of the Tern Installation in Relation to Other Installations

## Options for Decommissioning

A study was conducted to assess options for reuse of the Tern installation (TAQA, 2018c). It concluded there were no credible reuse options for the topsides principally due to, the limited remaining life of the jacket structure due to fatigue and obsolescence issues, and economic factors associated with converting the installations for any intended reuse purpose. Components from the installation may be reused if a suitable use can be found.

In line with the OPRED guidelines on decommissioning, it is proposed to fully remove the Tern topsides and transport it to a suitable onshore yard facility for dismantling and recycling.

Three possible methods of removal are under consideration; single lift, modular removal and hybrid removal (including piece small and modular removal). At this stage, the specific method by which the removal will take place has not been determined. All are potentially suitable, however, decisions will depend on the proposals made by the eventual contractor. All three approaches are summarised in Table i, and all will involve the following steps for the preparation for removal:

- Removal of under deck objects and cutting of Risers, J-tubes and caissons;
- Leg cutting for topsides/jacket separation using diamond wire cutting tools;
- MSF strengthening;
- Equipment and loose items sea fastening/removal;
- Installation of clamps and/or beams to provide lifting points; and
- Installation of an above-water guiding system mounted on the jacket legs.

**Table i Topsides Removal Methods**

| Item | Method |
|---|---|
| 1 | **Single Lift Method:**<br>Removal of topsides as a complete unit and transportation to shore for re-use of selected equipment, recycling, break up, and / or disposal. using a Single Lift Vessel (SLV) or Heavy Lift Vessel (HLV). |
| 2 | **Modular Removal:**<br>The removal of parts/ modules of the topsides and transportation to shore via HLV for use in alternative location(s) and/ or recycling/ disposal. |
| 3 | **Hybrid (Piece Small and Modular Removal):**<br>Combination of removal of topsides:<br>*Piece Small:* Breaking up offshore and transporting to shore using work barge. Items will then be sorted for re-use, recycling or disposal.<br>*Modular Removal:* The removal of parts/ modules of the topsides and transportation to shore via HLV for use in alternative location(s) and/ or recycling/ disposal. |

During removal operations, navigational aid requirements will be fulfilled by the decommissioning contractor. TAQA proposes to pre-install a supporting platform at the top of one of the substructures to support an Aid to Navigation (AtoN) unit. Once removal of the topside has been completed, the HLV will install the AtoN on top of the supporting platform using the vessel crane. TAQA proposes to undertake monitoring and maintenance of the AtoN through a service contract with a specialist contractor, including real time status and analysis.

## Environmental and Socio-Economic Baseline

The key environmental and social sensitivities in the Tern area have been summarised in Table ii.

**Table ii Key Environmental and Social Sensitivities for Tern Field**

| **Sediment type and seabed features** |
|---|
| The Tern installation is located at a water depth of 167 m. The annual mean wave height within the Tern field ranges from 2.71 m – 3.00 m, and current speeds are low (0.1 m/s). The combined energy at the seabed from wave and tide action is also low. Seabed surveys indicate that the seabed sediments present are classified as slightly gravelly muddy sand. This is consistent with information which classifies this region of the North Sea as the EUNIS broadscale habitat 'Offshore Circalittoral Sand' (A5.27).<br><br>A review of the ground-truthing data from the survey area surrounding the Tern installation indicated the presence of several potentially sensitive habitats and species, including the Annex I Habitat 'Submarine structures made by leaking gases.' |
| **Seabed habitats and species** |
| Invertebrate communities living within the sediments was found to have variable dominating species of annelids and polychaete worms. Taxa identified across the Tern survey area are broadly similar to those encountered previously in the NNS. A single specimen of the clam species known as ocean quahog (*Arctica islandica)* was identified during survey work in 2019. Seapens and burrowing megafauna were also identified during this survey. |
| **Fish and shellfish** |
| The Tern field lies within known spawning grounds for haddock (*Melanogrammus aeglefinus)*, Norway pout (*Trisopterus esmarkii)*, whiting (*Merlangius merlangus)* and saithe (*Pollachius virens)*. Norway pout is the only species with a high intensity spawning ground in the Tern area. The area is also a potential low intensity nursery ground for anglerfish (*Lophiiformes)*, blue whiting (*Micromesistius poutassou),* European hake (*Merluccius merluccius*), mackerel (*Scomber scombrus)*, Norway pout, spurdog (*Squalus)*, herring (*Clupea harengus)*, haddock, whiting and ling (*Molva molva)*. Blue whiting is the only species with a high nursery intensity ground in the Tern area. |
| **Seabirds** |
| Offshore in the NNS, the most numerous species present are likely to be northern fulmar, black-legged kittiwake and common guillemot. The Tern decommissioning area is located within or close to hotspots for northern fulmar (*Fulmarus glacialis*), northern gannet (*Morus bassanus*), European storm petrel (*Hydrobates pelagicus*), Arctic skua (*Stercorarius parasiticus*), great skua (*Stercorarius skua*), black-legged kittiwake (*Rissa tridactyla*), herring gull (*Larus argentatus*), Arctic tern (*Sterna paradisaea*), guillemot (*Uria aalge*), razorbill (*Alca torda*) and Atlantic puffin (*Fratercula arctica*) during their breeding season, when adults of these species can be seen foraging far from their coastal breeding colonies. In addition, after the breeding season ends in June, large numbers of moulting auks (common guillemot, razorbill and Atlantic puffin) disperse from their coastal colonies and into the offshore waters from July onwards. At this time these high numbers of birds are particularly vulnerable to oil pollution. Seabird sensitivity to oil pollution in the region of the Tern installation is considered extremely high in December and January and moderate/low throughout the rest of the year. |
| **Marine mammals** |
| Harbour porpoise (*Phocoena phocoena*), white-sided dolphin (*Lagenorhynchus obliquidens*), minke whale (*Balaenoptera acutorostrata*) and killer whale (*Orcinus orca*) are the most abundant species recorded in the survey block covering the Tern Decommissioning area. The harbour porpoise is the most frequently recorded cetacean in the vicinity of Tern, which is reflective of these being the most abundant and widely distributed cetaceans in the North Sea. |

| |
|---|
| Both grey and harbour seal densities are known to be low 104 km offshore. Around Tern densities are predicted to be between 0 and 1 seals per 25 km$^2$ for both species, which is considered low. |
| **Conservation** |
| There are no Nature Conservation Marine Protected Areas (NCMPAs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) or Demonstration and Research Marine Protected Areas (MPAs) within 40 km of the Tern installation. The closest designated site is the Pobie Bank Reef SAC, located approximately 72 km south west of the Tern decommissioning area. |
| **Fisheries and shipping** |
| The Tern field is located in International Council for the Exploration of the Sea (ICES) Rectangle 51F0. This region is primarily targeted for demersal and pelagic species, with some minor shellfish fishing occurring therein. Annual fishery landings by live weight and value in 2018 are considered extremely low for shellfish fisheries (disclosive tonnage and value; i.e. < 5 vessels fished within the area), low for pelagic fisheries (under 300 tonnes and £500K.) and moderate for demersal fisheries (300-1000 tonnes; £500K-£2M) in comparison to other areas of the North Sea. According to the Marine Scotland (2018) fisheries statistics, fishing effort has remained low within this region for the last five fishing years and is dominated by bottom-towed demersal fishing gears.<br><br>Shipping density in the NNS in the vicinity of the proposed decommissioning activities is moderate/high. Between 400 - 550 vessels transit through Block 210/25 annually. |
| **Other sea users** |
| The proposed decommissioning operations are located in a well-developed area for oil and gas extraction. However, there is little activity from other sea users recorded in the area. Apart from pipelines and cables associated with the Tern field, there are no other cables or pipelines, no designated military practice and exercise areas and no offshore renewable or wind farm activity which could interact with the decommissioning activities. There is one protected wreck site 15 km east of the project area. |

## Impact Assessment Process

This EA Report has been prepared in line with the OPRED Decommissioning Guidelines and also with Decom North Sea's EA Guidelines for Offshore Oil and Gas Decommissioning. The OPRED Decommissioning Guidance states that an EA in support of a DP should be focused on the key issues related to the specific activities proposed; and that the impact assessment write-up should be proportionate to the scale of the project and to the environmental sensitivities of the project area.

The environmental impact assessment has been informed by a number of different processes, including identification of potential environmental issues through project engineer and marine environmental specialist review in a screening workshop, and consultation with key stakeholders (OPRED, Marine Scotland, JNCC and SFF).

The impact assessment screening workshop discussed, proposed decommissioning activities and any potential impacts these may pose. This discussion identified eleven potential impact areas based on the three proposed removal methods. All eleven potential impacts were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. The eleven potential impacts are included in Table iii, together with justification statements for the screening decisions.

**Table iii Environmental Impact Screening Summary for Tern Topside Removal**

| Impact | Further assessment | Rationale |
|---|---|---|
| Emissions to air | No | Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of CoP. As such, emissions from operations and vessels associated with operation of the Tern topsides will cease. Reviewing historical European Union (EU) Emissions Trading Scheme data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be small relative to those during production.<br>The majority of emissions for the Tern topsides decommissioning can be attributed to vessel time or are associated with the recycling of material returned to shore (Appendix A). As the decommissioning activities proposed are of such short duration, this aspect is not anticipated to result in significant impact. The estimated $CO_2$ emissions generated by the selected decommissioning options is 21,667 te (Appendix A), this equates to less than 0.2% of the total UKCS emissions in 2018 (13,200,000 te; OGUK, 2019).<br>Considering the above, atmospheric emissions do not warrant further assessment. |
| Disturbance to the seabed | No | Currently it is envisaged that all vessels undertaking the decommissioning and removal works would be dynamically positioned vessels. As a result, there will be no anchoring associated with the decommissioning of the topsides. Should this change following the commercial tendering process and an anchor vessel be required, any potential seabed impact would be assessed and captured in the Consent to Locate application, Marine Licence application and supporting Environmental Impact Assessment (EIA) justification within the Portal Environmental Tracking System (PETS). On this basis, no further assessment need be undertaken. |
| Physical presence of vessels in relation to other sea users | No | The presence of a small number of vessels for topsides decommissioning activities will be short-term in the context of the life of the Tern installation. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities.<br>The decommissioning of the Tern topsides is estimated to require up to seven vessels depending on the selected method of removal; however, these would not all be on location at the same time (maximum of four at any one time).<br>The small number of vessels required will also generally be in use within the existing 500 m safety zone and will not occupy 'new' areas. If applicable, Notices to Mariners will be made in advance of activities occurring meaning those stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations. Considering the above, temporary presence of vessels does not need further assessment. |
| Physical presence of infrastructure decommissioned in situ in relation to other sea users | No | As topsides will be fully removed and a temporary navigational aid will be installed on the substructure up until its subsequent removal.<br>Considering the above, no further assessment related to long term presence of infrastructure is justified. |
| Discharges to sea (short-term and long-term) | No | Discharges from vessels are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. In addition, the topsides will be Drained, Flushed, Purged and Vented (DFPV) using the TAQA DFPV methodology prior to any decommissioning activities commencing. |

| Impact | Further assessment | Rationale |
|---|---|---|
| | | There would be no planned discharges from the topsides. Any residual remaining material will be in trace levels/volumes following the DFPV regime and therefore would not pose any significant risk. Oil spill modelling has not been conducted for a release of diesel from the Tern installation (or for a vessel collision). However, the current OPEP for the North Cormorant topsides (12 km to the south east of the Tern installation) considers a diesel release of approx. 850 $m^3$. For such a spill, no beaching is expected, and under normal weather conditions, the spill will disperse naturally within 9 hours. Any hydrocarbon inventories on site during decommissioning will be a smaller volume than those modelled.<br>As the topsides will be fully removed, there will be no potential for releases in the longer term from the facilities.<br>Considering the above, discharges to sea from the topsides should not be assessed further. |
| Underwater noise emissions | No | Cutting required to remove the topsides will take place above the waterline, and there will be no other noise-generating activities. Vessel presence will be limited in duration. The project is not located within an area protected for marine mammals.<br>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. On this basis, underwater noise assessment does not need assessed further. |
| Resource use | No | Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Such use of resources is not typically an issue of concern in offshore oil and gas. The estimated total energy usage for the project is 247,195 GJ (Appendix A).<br>Material will be returned to shore as a result of project activities, and expectation is to recycle at least 97% of this returned material. There may be instances where infrastructure returned to shore is contaminated and cannot be recycled, but the weight/volume of such material is not expected to result in substantial landfill use.<br>Considering the above, resource use does not warrant further assessment. |
| Onshore activities | No | The onshore waste management process is likely to have negligible consequences for the human population in terms of an increase in dust, noise, odour and reduced aesthetics.<br>It should be noted that, through TAQA's Waste Management Strategy, only licenced contractors will be considered who can demonstrate they are capable of handling and processing the material to be brought ashore (e.g. permitted capacity to accept the relevant waste streams). This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact. TAQA understands that dismantling sites will also require consents and approvals from onshore regulators such as the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work. |
| Waste | No | It is waste management, not generation, that is the issue across DPs, with capacity to handle waste within the UK often cited as a |

| Impact | Further assessment | Rationale |
|---|---|---|
| | | stakeholder concern. The limited waste to be brought to shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy as part of the project Active Waste Management Plan, using approved waste contractors. On this basis, no further assessment of waste is necessary. |
| Employment | No | TAQA will communicate regularly with all crew members throughout. TAQA will also be working closely with its contractor companies to retain and redeploy crew where possible.<br>Following the above measures and continued communications further assessment is not warranted for this aspect. |
| Unplanned events | No | The topsides process system will have been through the DFPV process prior to the decommissioning activities described herein being carried out. Release of live hydrocarbon and chemical inventory is therefore not a relevant impact mechanism.<br>The lift vessel to be used for removing the topsides will have the largest fuel inventory of the few vessels involved in the decommissioning activities. The vessel's fuel is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory. The potential impact from fuel inventory release will be at worst equivalent to that already assessed and mitigated for the operational phase of Tern.<br>Oil spill modelling has not been conducted for a release of diesel from the Tern installation (or for a vessel collision). The current OPEP for the North Cormorant topsides (12 km to the south east of the Tern installation) considers a diesel release of approx. 850 $m^3$. For such a spill, no beaching is expected, and under normal weather conditions, the spill will disperse naturally within 9 hours. Any hydrocarbon inventories on site during decommissioning will be a smaller volume than those modelled.<br>As the methodology for the removal to shore of the topsides has not been defined in detail, there exists the possibility that during transport of the topsides materials, elements may dislodge and drop from the transport vessel. Dropped object procedures are industry-standard and there is only a very remote probability of any interaction with any live infrastructure.<br>Considering the above, the potential impacts from accidental chemical/ hydrocarbon releases during decommissioning activities do not warrant further assessment.<br>Although the risk of oil spill is remote, an OPEP will be in place for the Tern decommissioning activities. Any spills from vessels in transit and outside the 500 m zone are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Up to seven vessels will be deployed during decommissioning activities, including a heavy lift vessel, tug vessels (4 off), a barge vessel, a standby vessel and supply vessels (2 off).<br>Any dropped objects of significant size (for example, those reported to OPRED on PON2 notifications) will be removed. Any small non-significant objects will be marked and will be within the safety zone of the substructure. These dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the substructure decommissioning activities. |

Based on this initial screening, there are no aspects which warrant further assessment within the EA as any potential impact will be short in duration and of low impact severity, and therefore poses no significant risk to environmental or societal receptors.

## Environmental Management

The project has limited activity associated with it beyond the main period of preparation for decommissioning and removal of the Tern topsides. 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 Environmental Management System and Health, Safety, Security and Environment 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 Active Waste Management Plan (AWMP) for the project in order to identify and describe the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the Decommissioning Programme for the Tern topsides. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during the decommissioning.

In terms of activities in the northern North Sea, the National Marine Plan has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been 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. As part of the conclusions to this assessment (Section 6.0), TAQA has given due consideration to the Scottish National Marine Plan during Project decision making and the interactions between the Project and Plan.

## Conclusions

Given the remote offshore location of the Tern field, there is no potential for Tern topsides decommissioning to impact any European or nationally designated protected sites.

This EA has considered the Scottish National Marine Plan, adopted by the Scottish Government to help ensure sustainable development of the marine area. TAQA considers that the proposed decommissioning activities are in alignment with its 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 Health, Safety, Security and Environment Policy and EMS, it is considered that the proposed Tern topside decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the UKCS.

# 1.0 INTRODUCTION

In accordance with the Petroleum Act 1998, TAQA Bratani Limited (TAQA), an established operator on the United Kingdom Continental Shelf (UKCS), and 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 Tern topsides. The installation is currently in production. Once the Tern Field reaches the end of its economic life and ceases to produce hydrocarbons, it is intended to shut down and isolate the installation and clean the topsides to a standard that allows them to be deemed 'Hydrocarbon Free', such that removal activities can safely proceed (TAQA, 2018a).

This Environmental Appraisal (EA) has been conducted to assess potential environmental impacts resulting from topsides removal activities as part of a staged decommissioning of the Tern facilities. This EA supports the Decommissioning Programme (DP) being submitted to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), the offshore decommissioning regulator under the Department for Business, Energy and Industrial Strategy (BEIS), which covers decommissioning the Tern topsides only (TAQA, 2018b).

Separate decommissioning programmes and Environmental Appraisals covering the remainder of the Tern field, including substructure, associated pipelines, power cables and umbilicals, will be provided at a later date yet to be determined.

## 1.1 Project Overview

The Tern installation is a drilling/production unit located in Block 210/25 of the northern North Sea (NNS), 104 km north east of Shetland and 47 km west of the UK/Norway median line (Figure 1-1). The installation stands in 167 m of water.

The Tern platform is a fixed installation which consists of a 4-legged steel jacket sub-structure, anchored by piles to the seabed, supporting an 8-legged module support frame (MSF) and two levels of modules including accommodation and drilling facilities. The topsides were installed in 1988 and production started in 1989. The installed total weight of the topsides is currently estimated to be 22,173 te. A CoP (Cessation of Production) application for Tern was submitted to the Oil & Gas Authority (OGA) in Q4 2019 and the date of CoP is set to Q4 2023.

The Tern installation is designed to fulfil four main functions:

- To provide a production facility for Tern, Hudson, Kestrel, Falcon and Cladhan fields.
- To provide a well engineering facility for the Tern Field.
- To provide gas lift facilities for the Tern, Hudson, Kestrel, Falcon and Cladhan fields.
- To provide water injection facilities for Tern, Hudson, Kestrel, Cladhan and Otter fields, (TAQA, 2018a).

Oil from the Tern, Hudson, Kestrel, Falcon and Cladhan fields is produced and exported from the Tern installation to North Cormorant through a 16-inch subsea pipeline, and then via the Brent Oil Pipeline System to Sullom Voe in the Shetland Islands. Separated gas is distributed between the Tern, Hudson, Cladhan, Falcon and Kestrel facilities as fuel gas and lift gas, with any excess being exported to North Cormorant via an 8-inch subsea pipeline. Injection water also is distributed from Tern via subsea pipelines to Hudson, Cladhan, Falcon, Kestrel and Otter facilities. A schematic figure illustrating Tern in the context of other installations in the vicinity, together with connecting infrastructure including pipelines, umbilicals and power cables, is shown in Figure 1-2.

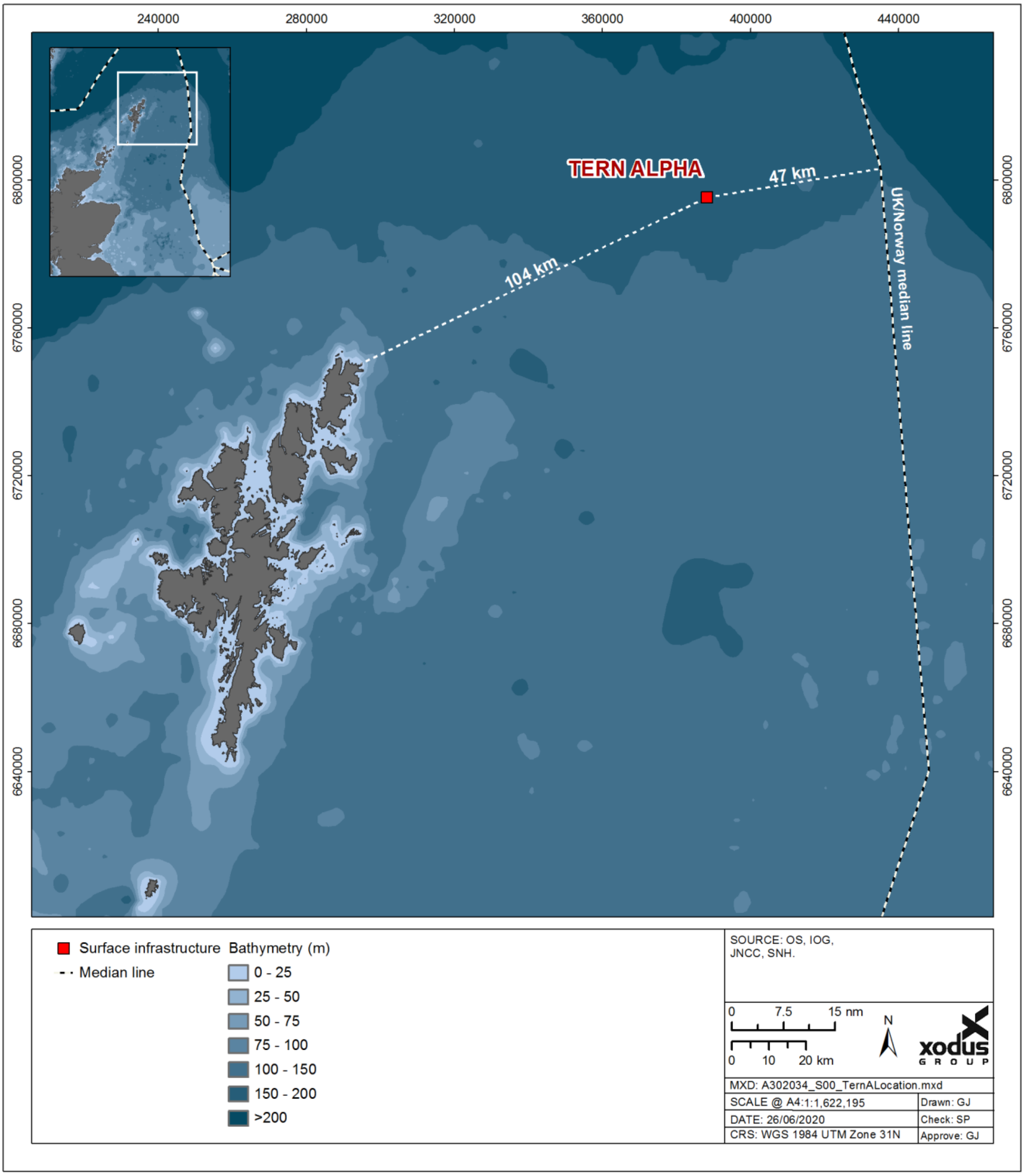


**Figure 1-1 Location of the Tern Installation**

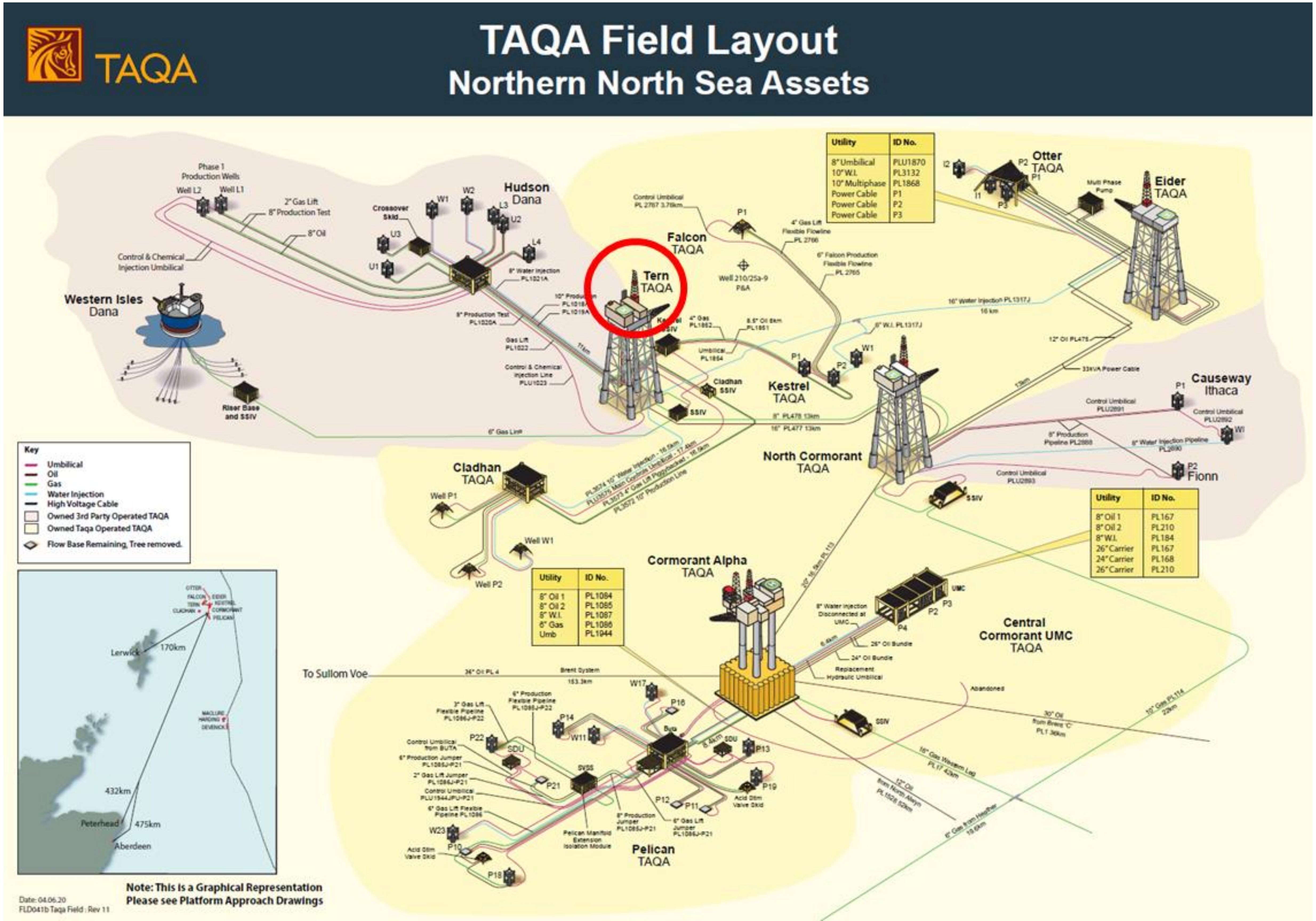


Figure 1-2 Location of the Tern Installation in Relation to Other Installations

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As outlined above in Section 1.0, decommissioning of the Tern field will be split into three programmes:

- Topsides decommissioning, covered by this EA and the associated DP; and
- Jacket to be carried out at a time yet to be confirmed and to be covered by a separate DP and supporting EA.
- Subsea infrastructure decommissioning to be carried out at a time yet to be confirmed and to be covered by a separate DP and supporting EA.

With uncertainties in the timing of Tern field decommissioning in relation to other TAQA decommissioning scopes, splitting the decommissioning programme into three provides TAQA with greater flexibility as to the timing of specific decommissioning activities. Allowing topsides decommissioning in the short term could also potentially result in cost savings, since the requirement for a long period of topsides maintenance can be avoided in the eventuality that full facilities decommissioning is significantly delayed. The removal of the Tern topsides will not prejudice any decommissioning options for the remaining substructure. This will minimise the period between CoP and the removal of the topsides. This also has safety and environmental benefits, as it reduces the length of time that people and equipment are mobilised to the installation to perform maintenance of the topsides to ensure they are in a safe condition for dismantling.

Prior to works, well plugging and abandonment will have been assessed, permitted and completed as updates/variations to existing operational permits prior to any of the installation and subsea decommissioning activities progressing.  This means that each well will be systematically and permanently closed in accordance with well abandonment best practice. Similarly, flushing and cleaning operations for pipeline systems subsea and on the Term substructure and topsides will also have been completed under existing operational permits prior to commencement of decommissioning activities.

## 1.2 Purpose of the Environmental Appraisal

This EA assesses the potential environmental impacts associated with the proposed Tern topsides decommissioning activities. The impact identification and assessment process also considers stakeholder engagement, comparison of similar decommissioning projects undertaken in the UKCS, expert judgement, and the results of supporting studies which aim to refine the scope of the DP.  This EA Report documents this process and details, in proportionate terms, the extent of any potential impacts and any necessary mitigation/control measures proposed.

## 1.3 Regulatory Context

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 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 (as amended) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the UKCS.  The Act 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, part of BEIS, before initiating decommissioning work.  The DP must outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place.

The primary guidance for offshore decommissioning from the regulator (OPRED, 2018), details the need for an EA to be submitted in support of the DP. The guidance sets out a framework for the required environmental inputs and deliverables throughout the approval process. It now describes a proportionate EA process that culminates in a streamlined EA report rather than a lengthy Environmental Statement. The OPRED guidance is supported by Decom North Sea's (Decom North Sea, 2017) 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 has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been 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. As part of the conclusions to this assessment (Section 6.0), TAQA has given due consideration to the National Marine Plan during Project decision making and the interactions between the Project and Plan.

## 1.4 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 Tern topsides 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 by which TAQA has arrived at the selected decommissioning strategy (Section 2.0);
- A description of the proposed decommissioning activities (Section 2.0);
- A review of the potential impacts from the proposed decommissioning activities and justification for the assessments that support this EA (Section 5.0);
- A summary of the baseline sensitivities and receptors relevant to the assessment area that support this EA (Section 3.0);
- Assessment of key issues (Section 5.1); and
- Conclusions (Section 6.0).

This EA report has been prepared in line with TAQA's environmental assessment requirements and has given due consideration to the regulatory guidelines (OPRED, 2018) and to Decom North Sea's Environmental Appraisal Guidelines for Offshore Oil and Gas Decommissioning (Decom North Sea, 2017).

# 2.0 PROJECT SCOPE

## 2.1 Description of the Infrastructure being Decommissioned

The Tern installation comprises a 4-legged steel jacket weighing 24,585 te, which is designed to supporting a topsides operating weight of 22,173 tonnes (Figure 2-1). The topsides infrastructure is of modular construction with an 8-legged MSF and two levels of modules including accommodation and drilling facilities including wellheads (M1), oil/gas separation (M2), gas compression and water injection (M3), utilities (M4), derrick module (M6), drilling module (M7), living quarters and helideck (M8), as shown in Figure 2-2. The deck clearance above sea-level is 24.45 m LAT.


**Figure 2-1 Tern Topsides**

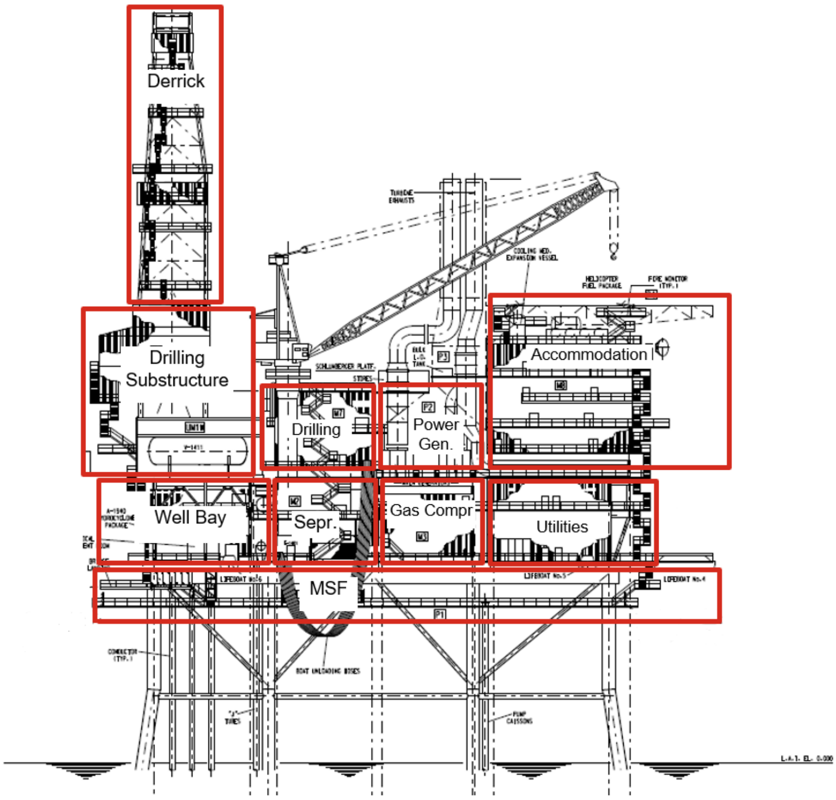


Figure 2-2 Tern Installation

A study assessing the options for reuse of the Tern installation was conducted (TAQA, 2018c). The alternatives for reuse included:

- an offshore renewable energy generation station (wind, wave or tidal);
- a marine research station;
- a training centre;
- a fish farming site;
- a carbon capture and storage site; and
- reuse of the facilities at an alternative location.

The report concluded that there are no credible reuse options for the topsides principally due to the limited remaining life of the jacket structure due to fatigue issues, obsolescence issues associated with the installed topsides/equipment, and economic factors associated with converting the installations for any intended reuse purpose. Components from the installation may be reused if a suitable use can be found.

## 2.2 Description of Proposed Decommissioning Activities

The topsides removal methodology detail has not been finalised yet, as this will be subject to a commercial tendering process. TAQA has conducted a Topsides Removal Study (TAQA, 2018a), which reviewed the technically feasible options and provides detailed method statements for each approach. As outlined in Section 1.1, all engineering down and cleaning (EDC) associated with the topsides will be managed through updates/variations to existing operational permits prior to commencement of topsides removal activities.

The methods for removal of the topsides have been reviewed by TAQA (TAQA, 2018a). The resulting feasible options were single lift, modular removal and hybrid removal (including piece small and modular removal). Details of these are summarised in Section 2.4.

Upon completion of topside decommissioning activities, the substructure will be placed in a cold stack prior to its removal. During this period, the substructure will have a temporary 'Aid to Navigation' (AtoN) unit installed ensuring the installation meets all operational and regulatory requirements. It is envisaged that the system will be developed in consultation with the Northern Lighthouse Board (NLB) and monitoring and maintenance of the system will be via a service contract with a specialist contractor. The existing 500 m safety exclusion zone will remain in operation during the cold stack phase.

In addition to the maintenance of navigational aids, TAQA will continue to maintain an Oil Pollution Emergency Plan (OPEP) for the installation and a Dismantling Safety Case will be in place to cover all activities required to complete the substructure removal operations.

## 2.3 General Assumptions

TAQA (2018a) have made the following assumptions in the preparation of method statements for each of the topsides removal options considered:

- The Tern installation is hydrocarbon free (and has been flushed/cleaned to the required standard; hydrocarbon flushing target of < 100mg/l oil in water);
- Substructure removal is out of the scope of these method statements;
- All essential systems (lighting, power) and escape/egress facilities (escape routes, lifeboats etc.) and navigation aids (as required but the Consent to Locate) will be in place for all removal methodologies preparation and appropriately managed in conjunction with normal operations.
- Additional essential services (lighting, power) and escape/egress facilities (escape routes, lifeboats etc.) are required to be in place for Single Lift methodology and appropriately managed in conjunction with full 175 personnel on board (POB);
- Suitable cranage will be available on the installation/ vessels as required;
- Installation of required temporary services (e.g. welding, burning, compressed air, water, power generation etc.) by contractor;
- The estimated durations do not take account of weather delays;
- During piece small removal (Hybrid Methodology) spare capacity of existing supply vessels, supporting COA, Tern and CON and Tern existing accommodation will be utilised during this period;
- Assumes one Supply Vessel visit per week for food, diesel, water whilst installation supports exiting accommodation.
- Minor lifts - assume 10 tonne lifts (skips) offshore, 2 tonne lifts (components) onshore and offshore and normal food/material transfers from supply vessel;
- Heavy Lift Vessel POB 320;
- Single Lift Vessel POB 200;
- Tug POB assumed to be 12;

- Barge POB assumed to be 20; and
- Onshore demolition estimate is based on industry feedback, including information from the Murchison and Brent Delta decommissioning projects.

During topside decommissioning activities, the existing 500 m safety exclusion zone will be maintained and will remain in operation until wider field decommissioning is complete. Vessels other than standby and supply boats will be required to remain outside of this exclusion zone.

## 2.4 Method Statements

The methods reviewed by TAQA (2018a) were single lift, modular removal and hybrid removal (including piece small and modular removal). The processes involved in each case are detailed in the following sections. All three options were considered viable and as such any decision on the selection will be open to the contractor in the commercial tendering process.

This EA considers all three options, and selects the worst-case impact posed for each aspect or receptor rather than assessing all three options simultaneously against each aspect or receptor.

### 2.4.1 Single Lift Method Statement

This method would entail the removal of the topsides infrastructure in one piece via a single lift vessel (SLV) or Heavy Lift Vessel (HLV) or device for transport to shore for size reduction, reuse, recycling or disposal. A maximum of seven vessels will be used during decommissioning operations, but not all concurrently (SLV or HLV, guard/support vessel, cargo barge and tugs x4).

#### 2.4.1.1 Preparation

The required preparation works, to avoid clashes between the topsides and the topsides lift system equipment and to ensure structural integrity and stability of the topsides structures during the lift and transport operations, consist of:

1. Under deck and IDS preparations:

   Removal of under deck objects and cutting of Risers, J-tubes and Caissons – (41 te);

   Leg cutting for topsides – jacket separation (diamond wire);

   MSF strengthening (9 te)

2. Lift point preparations (installation of support points (80 te)):

   Access for under deck preparations.

3. Module deck preparations:

   Equipment and loose items sea fastening/removal.

4. Transfer of personnel between the SLV (when in field) and installation – likely to be by basket transfer or walk to work. Otherwise helicopter to installation will be used;

5. Installation of clamps and/or beams to provide lifting points. This activity may also involve the removal of some braces connected to the legs;

6. Installation of an above-water guiding system mounted on the jacket legs due to clearance requirements between the vessel hull and jacket legs;

7. Rigging installation; and

8. Flare boom and drill derrick can be transported without applying structural strengthening.

#### 2.4.1.2 Removal

Topsides are raised and then lifted using hydraulic clamps mounted to horizontal lifting beams on the SLV. This will be subject to stringent sea state limits (although a motion compensation system will be used).

#### 2.4.1.3 Transport to shore

1. Topsides legs are tensioned via the clamps in order to secure to the SLV for transport;

2. Topsides transferred to a cargo barge; and

3. Final loading on to the quayside.

#### 2.4.1.4 Onshore handling

1. Rigging installation;

2. Size reduction of entire topsides including module separation, module internals and the external structure of each module. This will involve significant cutting and grinding etc;

3. Lifting (small and large lifts will be required, this will be dependent on how the topsides are dismantled);

4. Waste segregation; and

5. Reuse, recycle or disposal (not included as part of this study).

### 2.4.2 Modular Removal Method Statement

The topsides would be removed in modular sections, in a manner similar to their original installation by using a HLV. The modules would then be transported to shore for re-use, recycling or disposal. A total of four vessels would be on site at any one time (HLV, tug, supply vessel and guard/support vessel).

#### 2.4.2.1 Preparation

1. Installation of between 1% and 5% of the topsides weight in steel reinforcements/bracings. To be installed prior to the arrival of the HLV. Tern was designed, built and installed utilising pad-ears/eyes and therefore it is envisaged that there is no requirement for installation of lifting points;

2. Transfer of personnel between the HLV (when in field) and installation – likely to be by basket transfer. Otherwise helicopter to installation will be used while helideck in place;

3. Installation of required temporary services (e.g. welding, compressed air, water, power generation etc.) to be supplied via HLV (when in field);

4. Installation of module lift off bumpers and guides (requires welding and non-destructive examination activities);

5. Remove and recover any temporary securing;
6. Install access/rigging laydown platforms (these will require modifications as the modules are removed);
7. Perform diamond wire cutting between modules to ensure adequate clearance between modules – typically two cuts and removal of material between modules; and
8. Install rigging to modules and infills and laydown/access areas.

#### 2.4.2.2 Removal

1. Modules to be lifted clear of the installation using HLV crane(s) and placed on HLV deck.

#### 2.4.2.3 Transport to shore

1. Each module will be adequately sea-fastened to the HLV deck for transport to shore; and
2. Each module will be lifted to quayside using HLV crane.

#### 2.4.2.4 Onshore handling

1. Rigging installation;
2. Size reduction of entire topsides including module separation, module internals and the external structure of each module. This will involve significant cutting and grinding etc.;
3. Lifting (small and large lifts will be required, this being dependent on how the topsides are dismantled);
4. Waste segregation; and
5. Reuse, recycle or disposal (not included as part of this study).

### 2.4.3 Hybrid: Piece Small and Modular Removal Method Statement

This method is a combination of piece small and modular removal techniques. The piece small element involves removing certain elements of the topsides infrastructure in manageable sections for transport via conventional supply vessels to shore for re-use, recycling or disposal. It is envisaged that the piece small methodology would only be utilised when supported from existing facilities e.g. cranes, accommodation and helideck. The remaining modules would then be removed via the modular removal methodology, using an HLV for multiple lifts rather than SLV as this would present worst case in terms of duration and number of vessels. A total of four vessels would be on site at any one time (supply vessel, guard/support vessel and HLV and tug).

#### 2.4.3.1 Preparation

1. No specific preparation required for piece small removal of drilling derrick, substructure and flare Boom;
2. Preparation for HLV, installation of between 1% and 5% of the topsides weight in steel reinforcements/bracings. To be installed prior to the arrival of the HLV. Tern was designed, built and installed utilising pad-ears and therefore it is envisaged that there is no requirement for installation of lifting points;

3. Transfer of personnel between the HLV (when in field) and installation – likely to be by basket transfer. Otherwise helicopter to installation will be used while helideck in place;
4. Installation of required temporary services (e.g. welding, compressed air, water, power generation etc.) to be supplied via HLV (when in field);
5. Installation of module lift off bumpers and guides (requires welding and NDE activities).
6. Remove and recover any temporary securing installed in step 4;
7. Install access/rigging laydown installations (these will require modifications as the modules are removed);
8. Perform diamond wire cutting between modules to ensure adequate clearance between modules – typically two cuts and removal of material between modules; and
9. Install rigging to modules and infills and laydown/access areas.

#### 2.4.3.2 Topsides removal

**Piece small**

1. Removal of Drilling derrick and Drilling Substructure (M6) via Piece Small methodology, creating laydown area on the roof of the Wellheads module (M1);
2. Remove Flare Boom (P5) via Piece Small methodology utilising the roof of module M1; and
3. Existing waste management and utilisation of spare capacity on existing vessels, helicopters and accommodation envisaged during phase 1 & 2.

**Modular Removal**

4. Modules to be lifted clear of the installation using HLV crane(s) and placed on HLV deck.

#### 2.4.3.3 Transport to shore

1. Each module will be adequately sea-fastened to the HLV deck for transport to shore; and
2. Each module will be lifted to quayside using HLV crane.

#### 2.4.3.4 Onshore handling

1. Rigging installation;
2. Size reduction of entire topsides including module separation, module internals and the external structure of each module. This will involve significant cutting and grinding etc.;
3. Lifting (small and large lifts will be required, this will be dependent on how the topsides are dismantled);
4. Waste segregation; and
5. Reuse, recycle or disposal.

All three options were considered potentially suitable and as such any decision on the selection will be open to the contractor in the commercial tendering process.

The EA will consider the worst-case option for each impact receptor or aspect and not consider every option against each receptor or aspect.

## 2.5 Navigational aids

During removal operations, navigational aid requirements will be fulfilled by the decommissioning contractor. TAQA proposes to pre-install a supporting platform at the top of one of the substructure to support an AtoN unit. Once removal of the topside has been completed, the HLV will install the AtoN on top of the supporting platform using the vessel crane. Replacement of the module following any failure will be undertaken via helicopter deployment (Figure 2-3).

TAQA will consult with the NLB to ensure that the design of the AtoN unit meets all regulatory requirements. It is anticipated that the unit will be of a self-contained offshore lighthouse (SCOL) design and will be helicopter portable to facilitate maintenance and replacement as required (Figure 2-3). TAQA proposes to undertake monitoring and maintenance of the AtoN through a service contract with a specialist contractor, including real time status and analysis.

Further information on the long-term monitoring and management of AtoN requirements will be provided within the Tern Topsides Decommissioning Programme.

Figure 2-3 AtoN deployment via helicopter

## 2.6 Proposed Schedule

The precise timing of the topsides decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements and following permanent down-manning of the installation in a window between 2020 and 2028 (Figure 2-4). The base case for the removal of the Tern topsides is 2025.

The Tern topsides will not be decommissioned until the cessation of production in 2023. Since topsides integrity degrades rapidly following the installation being down-manned, the most effective management option is to remove the topside infrastructure as soon as possible.

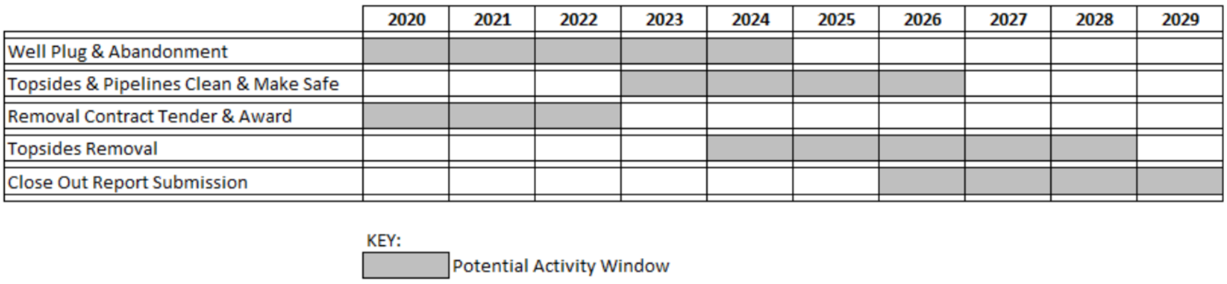


Figure 2-4 Tern Topsides Decommissioning Schedule

## 2.7 Summary of Materials Inventory

During the decommissioning of the Tern topsides infrastructure, there will be a wide range of materials that will need to be processed and, where possible either reused or recycled.

Table 2-1 and Table 2-2 present the estimated total tonnage of infrastructure to be decommissioned and recovered to shore for processing and its high-level constituent material. Figure 2-5 and Figure 2-6 present the bulk (total) and hazardous waste material breakdowns, respectively, for the Tern topsides infrastructure.

**Table 2-1 Summary of Proposed Fate of the Non-Hazardous Materials from the Tern Topsides**

| Material | Estimated total weight to be recovered to shore (te) | Proposed fate % | | |
|---|---|---|---|---|
| | | Reuse/ | Recycling | Disposal |
| Iron and Steel | 17,883.15 | 0 | 100 | 0 |
| Copper, Bronze, Brass | 5.25 | 0 | 100 | 0 |
| Concrete | 3.86 | | | |
| Aluminium | 10.32 | 0 | 100 | 0 |
| Other | 3,316 | <5 | >85 | <10 |
| **Total** | **21,219** | | | |

**Table 2-2 Summary of Hazardous Materials from the Tern Topsides**

| Material | Estimated total weight to be recovered to shore (te) |
|---|---|
| Miscellaneous equipment | 625.43 |
| Waste paint and varnish | 150.00 |
| End-of-life vehicles | 15.47 |
| Metal waste | 4.02 |
| Batteries (Pb) | 25.67 |
| Batteries (NiCd) | 16.32 |
| Asbestos | 0.30 |
| Fluorescent lighting | 1.88 |
| **Total Hazardous** | **839.09** |
| Naturally occurring radioactive material (NORM) | 115.23 |
| **Total Hazardous (including NORM)** | **954** |
| **Total Materials (Figures 2.5 and 2.6)** | **22,173** |

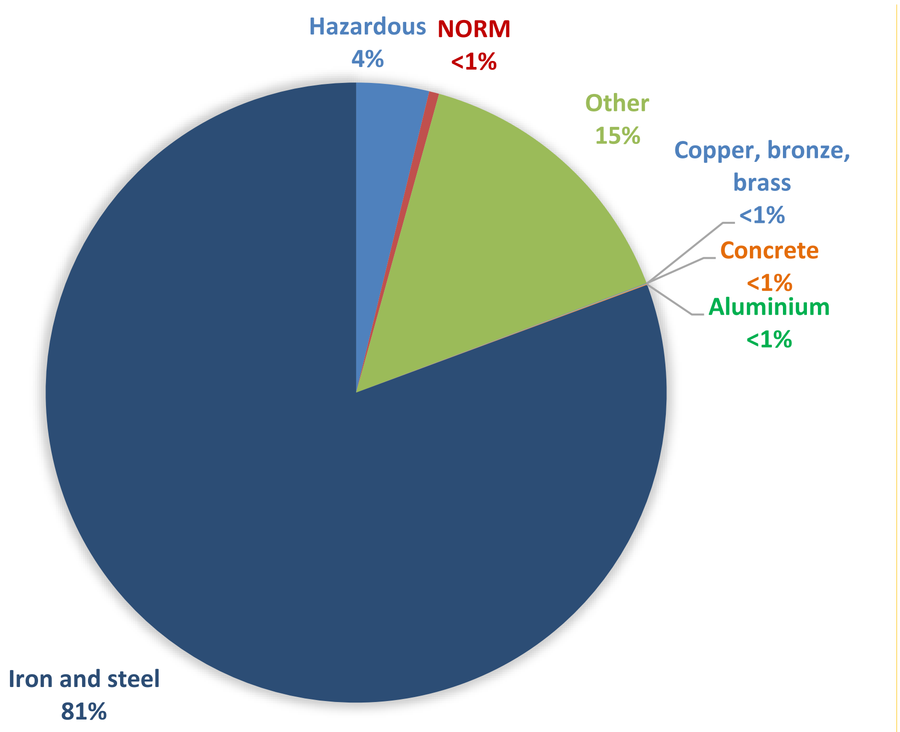


Figure 2-5 Bulk Materials from the Tern Topsides Infrastructure (Source: D3, 2019)

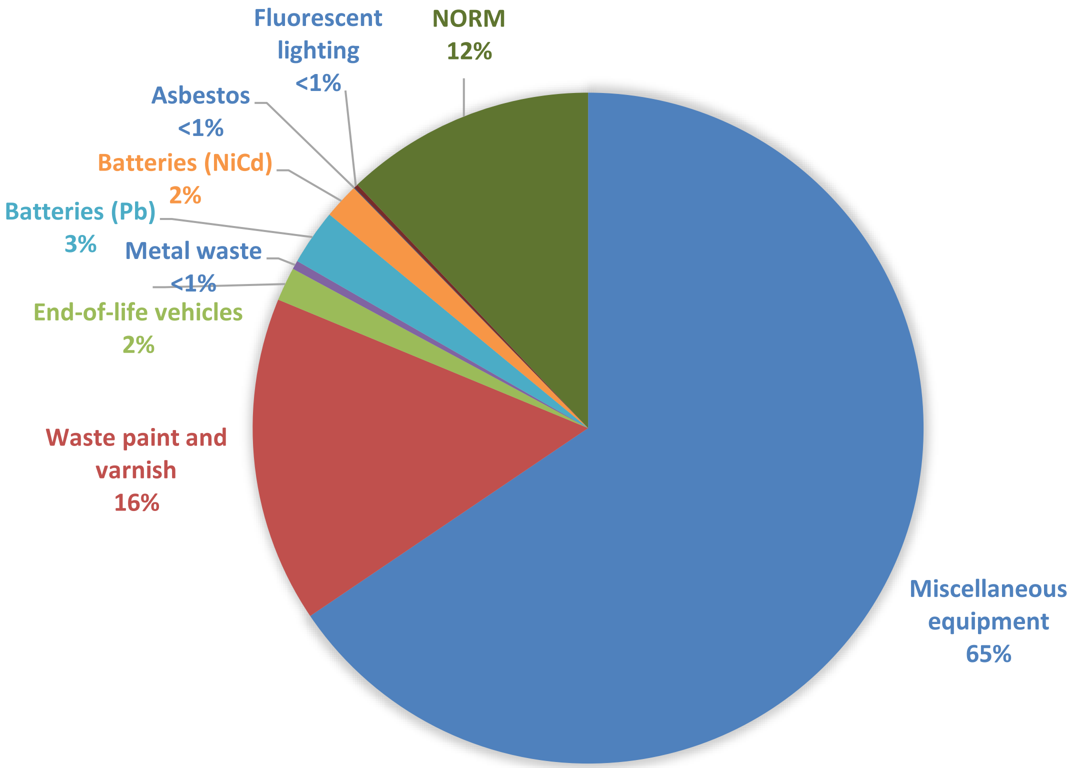


Figure 2-6 Hazardous Material from the Tern Topsides Infrastructure (Source: D3, 2019)

## 2.8 Waste Management

TAQA comply with the Duty of Care requirements under the UK Waste Regulations and The Environmental Protection (Duty of Care) (Scotland) Regulations 2014. The hierarchy of waste management will also be followed at all stages of disposal (Figure 2-7) and industry best practice will be applied (Decom North Sea, 2018 Managing Offshore Decommissioning Waste, November 2018). Driving waste management up the waste hierarchy is central to the development of sustainable waste management and the ambition of a zero-waste society in Scotland.

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 Tern topsides decommissioning activities will be non-hazardous, including steel, non-ferrous metals and concrete as outlined in Section 2.7.

Preventing waste is ultimately the best option, achieved through reducing consumption and using resources more efficiently. However, this is followed by re-use of goods. TAQA intends to review Tern's critical equipment and stores with the objective of identifying the re-use opportunities that potentially exist and ensuring application of the principles of the circular economy. By re-using items, it may be possible to address prospective equipment obsolescence issues or as a way to fulfil the first principal of the waste hierarchy (Figure 2-7): reducing consumption of resources. If all re-use opportunities have been taken by TAQA we will look to canvass other Operators for their interest in items. An auditable trail of items removed for re-use will be available via asset register updates, manifests/consignment notes and Maximo records. These materials are not defined as waste as they are to be used for the same purpose.


Figure 2-7 Waste Hierarchy Model

The next preferable option is for recycling of materials and specifically, closed loop recycling of materials. Evidence shows that there are greater environmental benefits to closed loop recycling, where a product is used, discarded, captured, and then the component materials recycled into a new product of similar functionality. Which can then again travel through this cycle, continuously moving the material through the supply chain.

The Material Inventory has also classified each material according to the European Waste Catalogue Codes (EWC) as required for disposal of wastes within the European Union (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 legal 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 and concrete will be recycled. Approximately 97% of material recovered is anticipated to be recycled, with a target of less than 3% to go to 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 naturally occurring radioactive material (NORM) be encountered TAQA will hold a permit for the onshore disposal of radioactive waste arising from the decommissioning of the topsides infrastructure under the Environmental Authorisations (Scotland) Regulations 2018.

An Active Waste Management Plan (AWMP) including an inventory of hazardous waste will be compiled to aid the segregation and recycling of waste.

## 2.9 Environmental Management Strategy

TAQA Bratani has an established and independently verified Environmental Management System (EMS) which operates 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 to the planning of decommissioning activities in defined license areas of the UK sector of the North Sea. This scope encompasses the Tern installation plus associated infrastructure, all under the control of the TAQA Aberdeen headquarters. The EMS meets the requirements of OSPAR Recommendation 2003/5 which promotes the use and implementation of the EMS by the offshore industry.

Relevant to the EA, and to all of TAQA's activities, is the company's commitment 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 include both industry-standard and project-specific measures. A signed copy of TAQA's Health, Safety, Security and Environment Policy is presented in Section 8.0.

# 3.0 ENVIRONMENTAL AND SOCIETAL BASELINE

The Tern installation is located in UK Continental Shelf (UKCS) Block 210/25, in the NNS, approximately 104 km north east of the Shetland coastline and 47 km from the UK/Norway median line (see Figure 1-1). The water depth at the installation is 167 m LAT.

As part of the EA process it is important that the main physical, biological and societal sensitivities of the receiving environment are well understood. This environmental baseline describes the main characteristics of the offshore environment in and around the Tern installation and highlights the key sensitivities. This section draws on several information sources including published papers, relevant strategic environmental assessments (SEAs) and site-specific investigations.

A survey gap analysis study commissioned by TAQA, mapped and assessed all available survey reports covering TAQA assets across the wider NNS area including Tern (Xodus, 2018). The full coverage of this study, including sampling station locations and listings of the survey reports consulted, are shown in Figure 3-1. These surveys have all indicated similar species and sediment compositions which provide evidence of a relatively uniform nature of the seabed habitats and communities within the vicinity and the wider region.

Three environmental survey reports in particular have been used to inform the seabed and benthos sections of this environment description for the immediate area adjacent to the Tern installation:

- *Tern Environmental Monitoring Survey UKCS Block 210/25a (Fugro, 2014):*

  This report presents the data obtained from the environmental baseline survey at the Tern installation by Fugro in May 2013. The main objective of this survey programme was to gather sufficient data to assess the current status of the seabed at each location and thus establish new and robust baseline conditions for future environmental monitoring studies. Analyses included sediment characterisation, organic containment (including hydrocarbons), heavy metal content and macrofaunal descriptions from survey stations within 10 km of the installation.

- *Tern – Combined Environmental Baseline and Habitat Assessment Survey Report (Benthic Solutions, 2019):*

  The report provided the results of a pre-decommissioning environmental baseline and habitat assessment survey conducted around the Tern installation by Benthic Solutions in 2018. Seabed ground-truthing was undertaken at 10 stations within 500 m of the installation. Following on from the 2013 Fugro survey (Fugro, 2014), the main objectives of this survey were to establish the current gradients of physical, chemical and biological indices around the installation and to identify and quantify any species/features of conservation importance near to the structure.

- *Tern Cuttings Pile UKCS Block 210/25 (Fugro, 2019):*

  The survey associated with this report included remotely operated vehicle (ROV) core sampling for physico-chemical analyses and ROV grab sampling for biological analysis of the sediments within the Tern cuttings pile. Twelve cores and five ROV grab samples were collected from corresponding locations so that biological data could be related to physico-chemical sample results.

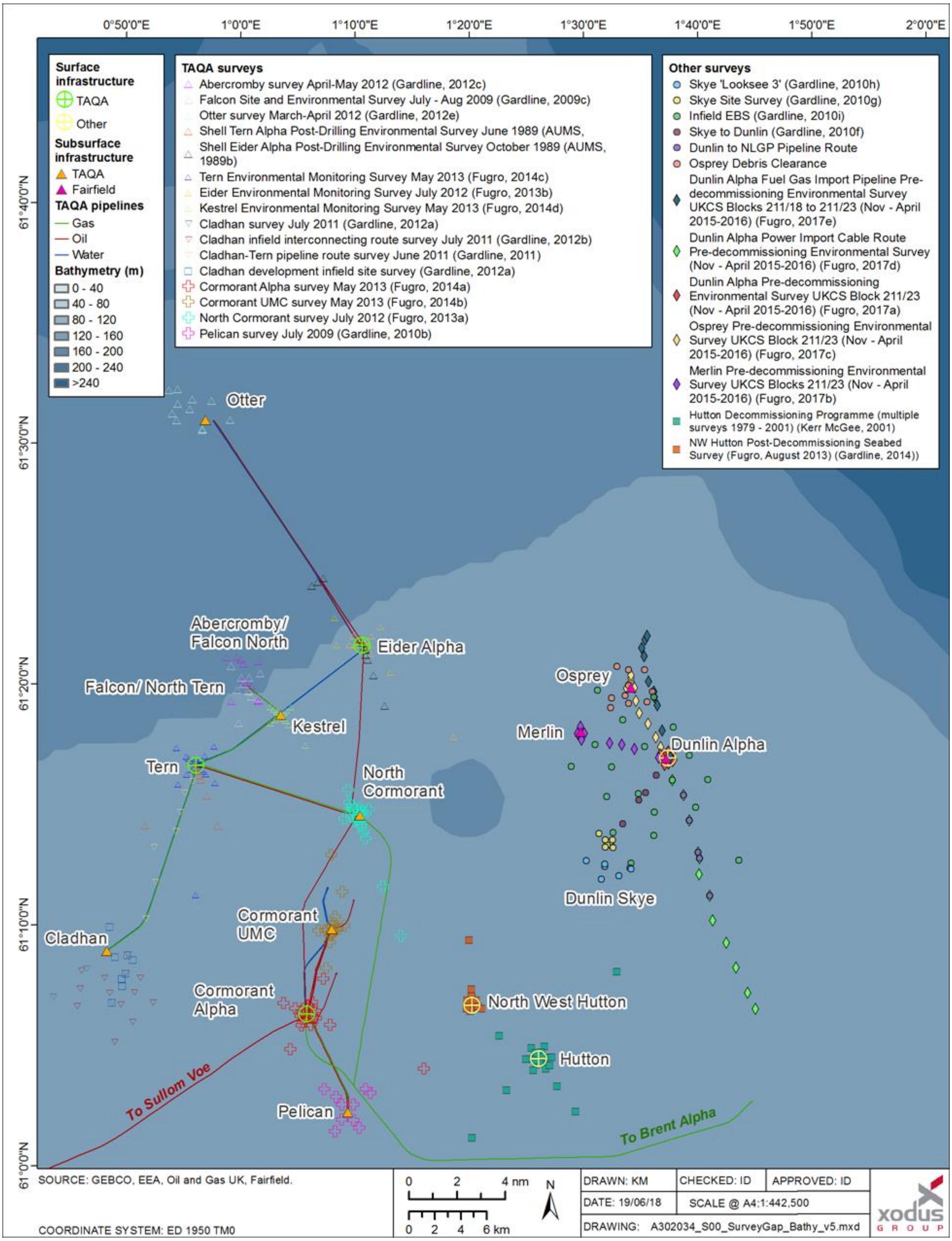


**Figure 3-1** Location of previous surveys around the TAQA infrastructure

## 3.1 Physical Environment

### 3.1.1 Bathymetry

The Tern installation is located at a water depth of 167 m. The Tern installation is not located on any large-scale features of functional significance such as shelf deeps, shelf banks and mounds, seamounts, or continental slopes (NMPI, 2019).

### 3.1.2 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 2.71 - 2.30 m whilst in the north it ranges from 2.41 - 3.00 m (NMPI, 2018). McBreen *et al*. (2011) shows wave energy at the seabed is 'low' within the Tern field. The annual mean wave height within the Tern field ranges from 2.71 m – 3.00 m and the annual mean wave power is 41.5 kW/m (NMPI, 2019).

The anti-clockwise movement of water through the North Sea and around the NNS region originate from the influx of Atlantic water, via the Fair Isle Channel and around the north of Shetland and the main outflow northwards along the Norwegian coast (DECC, 2016). Against this background tidal flow, the direction of residual water movement in the NNS is generally to the south or east (DTI, 2001; DECC, 2016). The peak flow for mean spring tide ranges between low velocities of 0.1 m/s in open sea (DECC, 2016). The mean residual current through the Tern field is approximately 0.05 to 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 (DECC, 2016). Distinct density stratification occurs in the NNS region in summer at a depth of around 50 m and the thermocline becomes increasingly distinct towards deeper water in the north of the region (DECC, 2016). This stratification breaks down in September as the frequency and severity of storms increases causing mixing in the water column (DECC, 2009).

### 3.1.3 Meteorology

The prevailing winds in the NNS are from the south west and north north-east. 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 (DECC, 2016).

### 3.1.4 Seabed sediments

In the NNS, and indeed across the North Sea, seabed sediments generally comprise a veneer of unconsolidated terrigenous and biogenic deposits, generally much less than 1 m thick, although areas of outcropping rock occur in coastal waters around and between Shetland, Orkney and the Scottish mainland. Sediments in the area are predominantly sand and muddy sand, although the deeper areas within the Fladen Ground consist of mud or sandy mud off the edge of the continental shelf to the north of the region, the slope is characterised by areas of mixed and coarse sediments, while the floor of the Faroe-Shetland Channel is classified as mud (JNCC, 2017; DECC, 2016).

Under the European Nature Information System (EUNIS) habitat classification, the predicted broad-scale seabed type at the Tern installation is 'A5.27 deep circalittoral sand', as shown in Figure 3-2 (JNCC, 2017). The Tern installation is also located approximately 10 km south east of an area of 'deep circalittoral mud' (EUNIS habitat code A5.37) and 5 km northeast of an area of 'deep circalittoral mixed sediments' (EUNIS habitat code A5.45). The seabed in Block 210/25 is composed mainly of sand, with small areas of muddy sand and gravel (NMPI, 2019) and 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, 2016) (NMPI, 2019).

Table 3-1 provides the percentage of gravel and fines found in sediments at Tern during the surveys around the Tern installation, along with the type of sediments they have been classified into. The physical seabed characteristics recorded during the 2014 survey of the area between 10 km and 230 m of the Tern installation (Fugro 2014) show a high degree of uniformity. Sediments in this survey appeared to be consistently dominated by poorly sorted very fine and fine sands. The samples collected in the Benthic Solutions (2019) survey (between 90 and 500 m away from the Tern installation) exhibited wider variability and represented five Folk (1954) classifications ranging from muddy sand to slightly gravelly sand, with most stations conforming to slightly gravelly muddy sand (50% of stations). The sediment type throughout the Tern cuttings pile (directly below the Tern installation) showed moderate variability and ranged from fine silt to medium sand. Coarser material was typically noted in the top core sections in comparison to their respective middle and bottom core sections. The cuttings pile sediment was highly modified, containing high levels of both gravel and fines (silt/clay; Fugro, 2019).

Table 3-1 Seabed Characteristics for the Tern installation

| Survey | Gravel (mean %) | Fines (mean %) | Sediment classification (Folk, 1954) |
|---|---|---|---|
| Fugro, 2014 | <1 | 15.1 | Very fine to fine sand |
| Benthic Solutions, 2019 | 6.8 | 18.3 | Muddy to slightly gravelly sand |
| Fugro, 2019 (Cuttings pile) | 5.4 | 50.6 | Fine silt to medium sand |

Total hydrocarbon (THC) concentrations measured in the cuttings pile by Fugro (2019) ranged from 2.6 µg/kg (top of the pile) to 82.7 µg/kg (bottom of the pile), with a mean of 28.2 µg/kg. Throughout the wider survey area (Fugro 2014; Benthic Solutions 2019), stations beyond approximately 300 m of the Tern installation exhibited THC concentrations below the background level of 10.82 µg/g for this part of the NNS (UKOOA, 2001), but THC levels were generally elevated (within the range of the cuttings pile levels) within 300 m of the Tern installation. A gradient of THC levels decreasing with distance from Tern was evident, suggesting a point source of hydrocarbons most likely related to drilling discharges.

Of particular relevance to the offshore oil and gas industry are metals associated with drilling-related discharges. These can contain substantial amounts of barium sulphate (barites) as a weighting agent (NRC, 1983). Barium is therefore frequently used to detect the deposition of drilling fluids around offshore installations (Chow and Snyder, 1980; Gettleson and Laird, 1980; Muniz *et al.*, 2004). Solid barites are often discharged during the drilling process and also contain measurable concentrations of heavy metals as impurities, including cadmium, chromium, copper, lead, mercury, and zinc (NRC, 1983; McLeese *et al.*, 1987). Metal levels analysed in sediments around Tern also showed a similar pattern of higher levels at central stations, decreasing with distance from the installation. Within the cuttings pile (Fugro, 2019) some measured metals, including cadmium, chromium, copper, mercury, lead, and zinc showed elevation above their respective OSPAR Effects Range Low (ERL) thresholds, above which a significant environmental impact might be expected.

Overall, the environmental data obtained from the pre-decommissioning survey at the Tern cuttings pile indicate that the cuttings pile sediments were heavily modified compared to the wider field but could generally be ascribed as typical for cuttings piles at North Sea installations (Fugro, 2019).

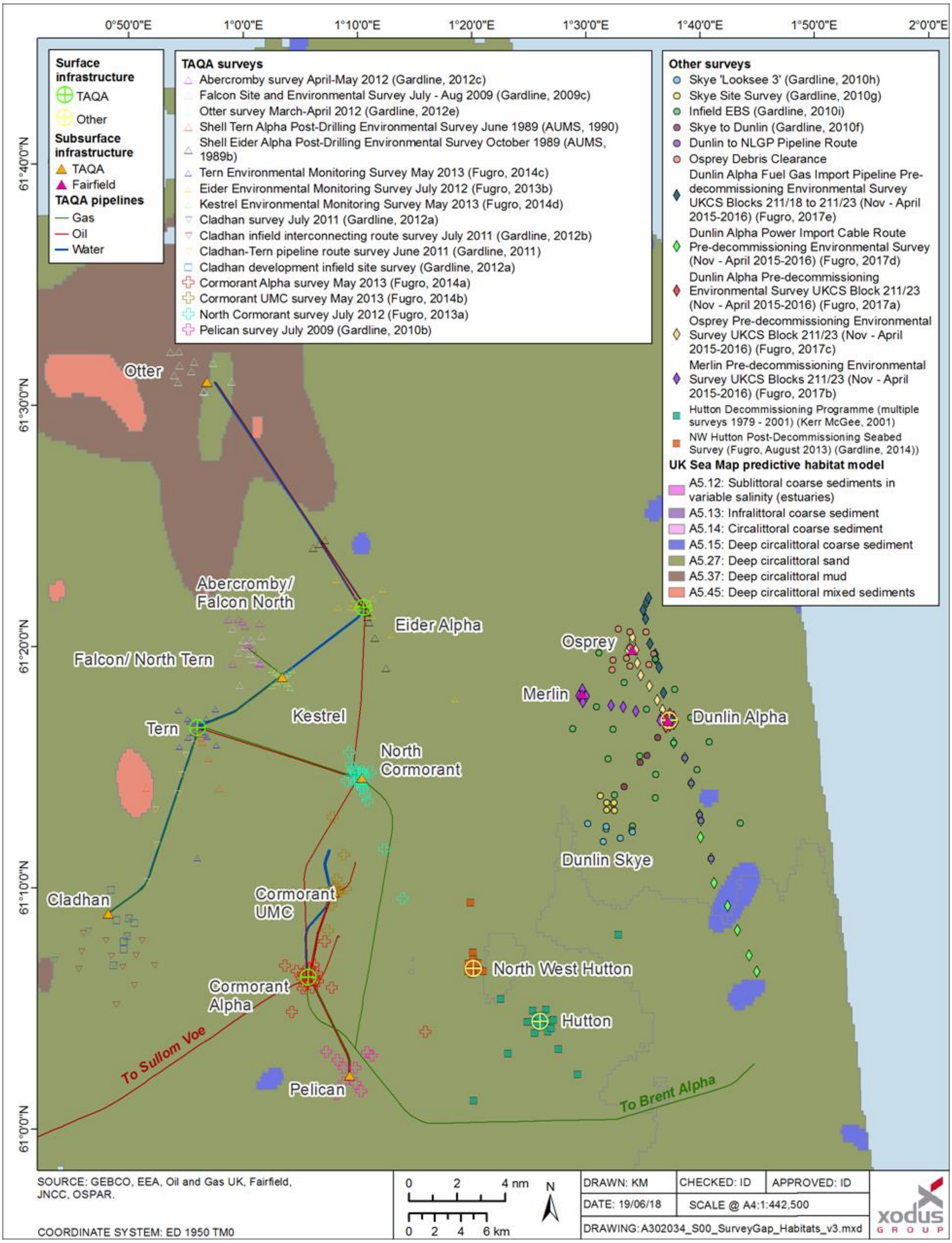


**Figure 3-2** **Broad-Scale Predicted Habitat around the Tern installation (JNCC, 2017)**

## 3.2 Biological Environment

### 3.2.1 Plankton

Planktonic assemblages exist in large water bodies and are transported simultaneously with 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. There is a water column of approximately 167 m at the Tern installation.

In both the northern and central areas of the North Sea, the phytoplankton community is dominated by dinoflagellates of the genus *Ceratium* and diatoms such as *Thalassiosira spp*. and *Chaetoceros spp*. In recent years the dinoflagellate *Alexandrium tamarense* and the diatom *Pseudo-nitzschia* (known to cause amnesic shellfish poisoning) has been observed in the area (DECC, 2016). Densities of phytoplankton fluctuate during the year, with sunlight intensity and nutrient availability driving its abundance and productivity together with water column stratification (Johns & Reid, 2001; DECC, 2016). In the 10-year period between 1997 and 2007, two main blooms are seen to occur in the NNS: one in May, and a second in August before levels decrease through the winter months when light and temperature are less abundant (SAHFOS, 2015).

Zooplankton species richness is greater in the northern and central areas of the North Sea, than in the south and displays greater seasonality. Zooplankton in this area is dominated by calanoid copepods, in particular *Calanus* and *Acartia spp*. and *Euphausiids* and decapod larvae are also important to the zooplankton community in this region (DECC, 2016).

*Calanus finmarchicus* has historically dominated the zooplankton of the North Sea and is used as an indicator of zooplankton abundance. Analysis of data provided by the Continuous Plankton Reader (CPR) surveys in the 10-year period between 1997 and 2007 shows a sharper spring increase in *C. finmarchicus* biomass in May in the NNS compared to more southerly areas. This peak in numbers is 70% greater than seen in the central North Sea 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. Overall abundance of *C. finmarchicus* has declined dramatically over the last 60 years, which has been attributed to changes in seawater temperature and salinity (Beare *et al*., 2002; FRS, 2004). *C. finmarchicus* has largely been replaced by boreal and temperate Atlantic and neritic (coastal water) species in particular, and a relative increase in the populations of *C. helgolandicus* has occurred (DECC, 2009; Edwards *et al*., 2010; Baxter *et al*., 2011).

### 3.2.2 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 (i.e. sediment or rock), water depth, salinity, the local hydrodynamics and degree of organic enrichment (DECC, 2016). 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.

During the environmental survey around the Tern installation, conducted by Benthic Solutions (2019), the macrofauna was analysed from 20 grab samples at ten stations. A total of 9,845 individuals and 331 taxa were identified including juvenile and indeterminate specimens. The arthropods were represented by 85 species (5.6% of total individuals) and the molluscs by 75 species (6.4% of total individuals). Only 16 species of echinoderms were recorded, accounting for just 2.4% of the total individuals. Solitary epifauna was represented by four cnidarians (Edwardsiidae, *Actiniaria, Cerianthus lloydii, Caryophyllia* (*Caryophyllia*) *smithii*), where only one individual of *Cerianthus lloydii* in total was noted. All other groups (*Nemertea, Nematoda, Sipuncula, Turbellaria, Phoronida, Chaetognatha,* etc.) were represented by just 12 species, but accounted for 22.5% of the total individuals (Benthic Solutions, 2019).

One of the survey stations (230 m from the Tern installation) recorded the peak mollusc abundance with a total of 322 individuals due to the mixed sediment consisting of a high proportion of sedimentary fines and gravel. Such material provides a hard substrate for colonisation by sessile and epifaunal species. Combined, solitary and colonial epifauna belonging to 20 species were recorded across the 10 sampled stations. These were predominantly consisting of the phyla Cnidaria and Bryozoa, of which Bryozoa were the most well represented, with 10 taxa observed.

The macrofauna within the Tern survey area was variable with different species dominating at the sediment close to the installation compared to the sediment sampled further afield. For example, the annelid species, *Glycera lapidum, Prionospio cirrifera, Spiophanes kroyeri* and *Spiophanes wigleyi* (polychaete worms) were found uniformly distributed throughout the survey area corresponding to the generally muddy sand/slightly gravelly muddy sand habitat. Polychaetes have frequently been found to account for ca. 50% of the species encountered in offshore sediments in the North Sea and the taxa identified across the Tern survey area are broadly similar to those encountered previously in the NNS (Eleftheriou & Basford, 1989; Kunitzer *et al*., 1992;). In contrast, a high abundance of the taxa Nematoda, *Capitella*, *Nereimyra punctata*, *Cirratulus cirratus* and *Raricirrus beryli* was found in the areas closer to the Tern installation where barium-rich drill cuttings have had an influence. This indicates that peak barium concentrations are suppressing the dominance of opportunistic species. Both species richness and abundance were affected by the influence of drilling related activity with stations close to the installation showing a reduced species diversity and increase in the abundance of opportunistic species (Benthic Solutions, 2019).

### 3.2.3 Potential sensitive habitats and species

A review of the ground-truthing data from the survey area surrounding the Tern installation indicated the presence of several potentially sensitive habitats and species, including:

- ‘Submarine structures made by leaking gases’ - Annex I Habitat
- ‘Sea-pen and Burrowing megafauna communities – UK BAP habitat
- Ocean quahog (*Arctica islandica*) - OSPAR list of threatened and/or declining species and habitats (Region II - Greater North Sea)

These habitats are listed by one or more International Conventions, European Directives or UK Legislation (including devolved UK administrations).

‘Submarine structures made by leaking gases’ encompass hard substrates which support a unique community of organisms that are able to survive on the methane and hydrogen sulphide gasses associated with these ecosystems. There are two main types of submarine structures known to occur in the UK: bubbling reefs and submarine structures associated with pockmarks (JNCC, 2014). Pockmarks are generally connected to the release of methane, which reacts with the surrounding seawater forming carbonate blocks. The closest Special Areas of Conservation (SACs) relating to ‘Submarine structures made by leaking gases’ is situated approximately 250 km south of the Tern survey area, the ‘Braemar Pockmarks’. Depressions resembling unit pockmarks have were recorded throughout the survey area on side scan sonar and bathymetry data (Benthic Solutions, 2019). The observed depressions were ground-truthed, revealing a high density of relic mussel shells and vessel related anthropogenic debris. Potential scour marks and anchor scars were also observed and would indicate that the sediment has been disturbed and could have contributed to the release of methane gas and the formation of unit pockmarks. However, no MDAC was noted in the underwater footage acquired within the survey area (Benthic Solutions, 2019).

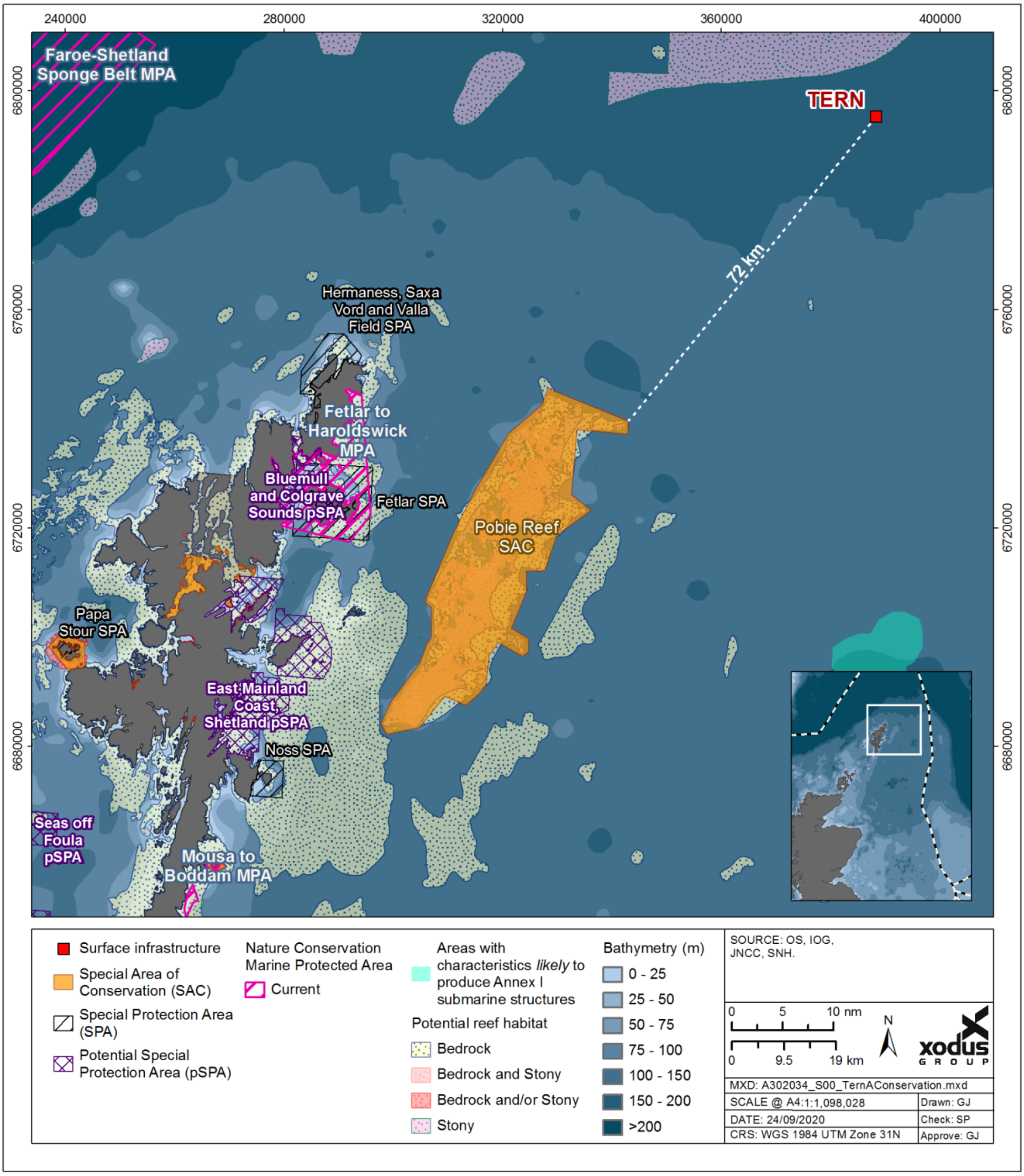


Figure 3-3 Location of the Tern Installation in Relation to Protected Areas

'Sea-pen and burrowing megafauna communities' are classified as a UK Habitat Feature of Conservation Importance (FOCI) and are also an OSPAR-listed habitat. OSPAR defines of 'Sea-pen and burrowing megafauna communities' as follows:

"Plains of fine mud, at water depths ranging from 15–200 m or more, which are heavily bioturbated by burrowing megafauna; burrows and mounds may form a prominent feature of the sediment surface with conspicuous populations of sea-pens, typically *Virgularia mirabilis* and *Pennatula phosphorea.* The burrowing crustaceans present may include *Nephrops norvegicus*, *Calocaris macandreae* or *Callianassa subterranea*. In the deeper fjordic lochs which are protected by an entrance sill, the tall sea-pen (*Funiculina quadrangularis)* may also be present. The burrowing activity of megafauna creates a complex habitat, providing deep oxygen penetration. This habitat occurs extensively in sheltered basins of fjords, sea lochs, voes and in deeper offshore waters such as the North Sea and Irish Sea basins and the Bay of Biscay" (OSPAR, 2010).

According to JNCC (2015) guidance, the key determinant for classification of 'Sea-pen and burrowing megafauna communities' is the presence of burrowing species or burrows at a SACFOR density of at least 'frequent'. Benthic Solutions (2019) estimated the density of burrow openings at the seabed using representative video transects from each sampling station and found that the density of small and large burrows across the two transects were recorded as 'occasional' on the SACFOR scale and therefore not considered to be a high enough density to be classified as a FOCI or as an OSPAR Habitat.

There was one record of the ocean quahog *Arctica islandica* (a type of clam) at a station approximately 280 m from the installation (Benthic Solutions, 2019). This species is listed as PMF in Scottish waters (Tyler-Walters, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). However, there was no evidence of distinct *A. islandica* siphons at the seabed on any of the video footage or still photographs. The Tern field is located on the edge of a number of UKCS Blocks where this species has been recorded (Figure 3-4) and the distribution of *A. islandica* is relatively wide in the North Sea (OSPAR, 2009).

No other benthic habitat or species features of conservation interest have been noted within the scope of the most recent (Benthic Solutions, 2019) surveys within 500 m of the Tern installation, including those listed on the Annex I of the EC Habitats Directive, the IUCN Red List of Threatened Species, the OSPAR list of threatened and/or declining species, or the Scottish PMF list (NMPI, 2019).

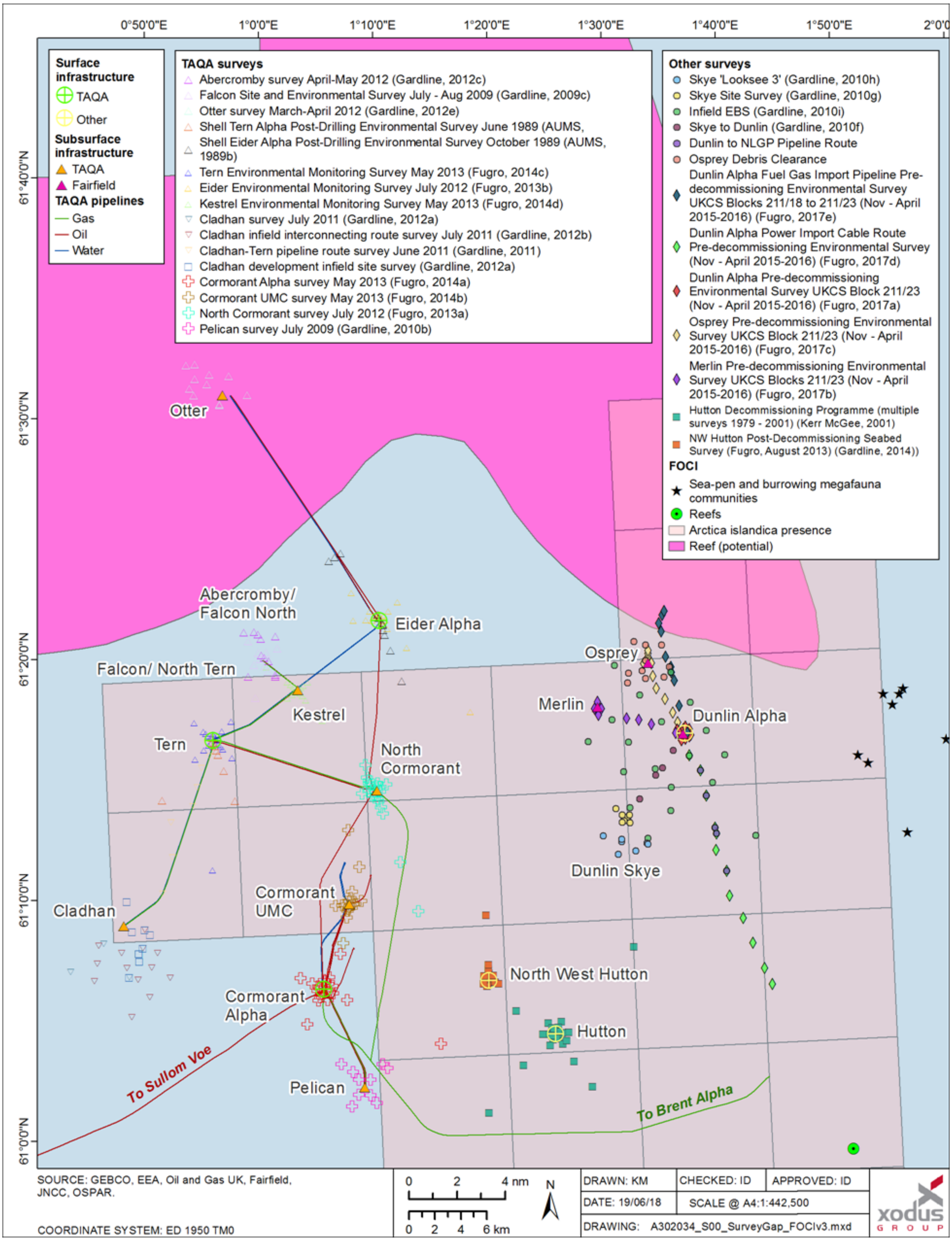


**Figure 3-4** Features of Conservation Importance in the Region of Interest

### 3.2.4 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 proposed decommissioning project for the Tern installation is located in International Council for the Exploration of the Sea (ICES) rectangle 51F0 (Block 210/25), 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 3-2.

**Table 3-2 Fisheries Sensitivities within ICES Rectangle 51F0 (Coull *et al*., 1998 and 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 |
| 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; *Clupea harengus*) have very specific habitat requirements, and therefore their spawning grounds are relatively limited and potentially vulnerable to seabed disturbance and change.

The Tern installation is within an area of spawning ground for haddock (*Melanogrammus aeglefinus*; February to May [peak spawning February – April]), Norway pout (*Trisopterus esmarkii;* January to April [peak spawning February – March]), saithe (*Pollachius virens;* January to April [peak spawning January – February]) and whiting (*Merlangius merlangus*; February to June) (Coull *et al*., 1998; Ellis *et al*., 2012) (Figure 3-5). Norway Pout is the only species with a high intensity spawning ground in the Tern area (Coull *et al*., 1998).

The Tern Decommissioning area is also a potential nursery ground for anglerfish (*Lophius piscatorius)*, blue whiting (*Micromesistius poutassou*), European hake (*Merluccius merluccius)*, haddock, herring, ling (*Molva molva)*, mackerel (*Scomber scombrus)*, Norway pout, spurdog (*Squalus acanthias)*, and whiting (Coull *et al*., 1998; Ellis *et al*., 2012). Blue whiting is the only species with a high nursery intensity ground in the Tern area while other species have a lower nursery intensity (Ellis *et al*., 2012).

Fisheries sensitivity maps produced by Aires *et al*., (2014) for Marine Scotland Science detail the likelihood of aggregations of fish species in the first year of their life (i.e. group 0 or juvenile fish) occurring around the UKCS, as shown on Figure 3-6 and Figure 3-7.

Aires *et al.,* (2014) provided modelled spatial representations of the predicted distribution of 0 age group fish (fish in the first year of their life) aggregations. 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. With this caveat in mind, the modelling indicates the presence, in medium densities, of juvenile fish (less than one years old) for six species within the project Blocks. This includes haddock, whiting, Norway pout, anglerfish, blue whiting and European Hake. All other species were low.

Most fish identified in the project blocks are known to produce pelagic eggs with the exception of herring, which is a benthic spawner. This species is reported to spawn within Block 210/25 where the Tern installation is located (Coull *et al*, 1998; Ellis *et al*., 2012).

The following species listed above are also listed as Scottish PMF and are considered as of natural heritage importance: mackerel, Norway pout, spurdog and herring (SNH, 2016).

Herring, mackerel and hake are also on the IUCN Red List, listed as species of global status 'least concern', as well as spurdog (listed with a global status of “vulnerable” and European status of “least concern”). Norway pout and whiting are listed as species of 'least concern', with both global and European status, and saithe and blue whiting are listed as species of 'least concern', (European status; IUCN, 2020). Cod and haddock are listed as a global status of 'vulnerable' global status (IUCN, 2020).

Cod, mackerel, ling, Norway pout, spurdog, herring, sole, whiting, blue whiting and hake are also on the Scottish Biodiversity List which identifies species of most importance for biodiversity conservation in Scotland (SNH, 2013a).

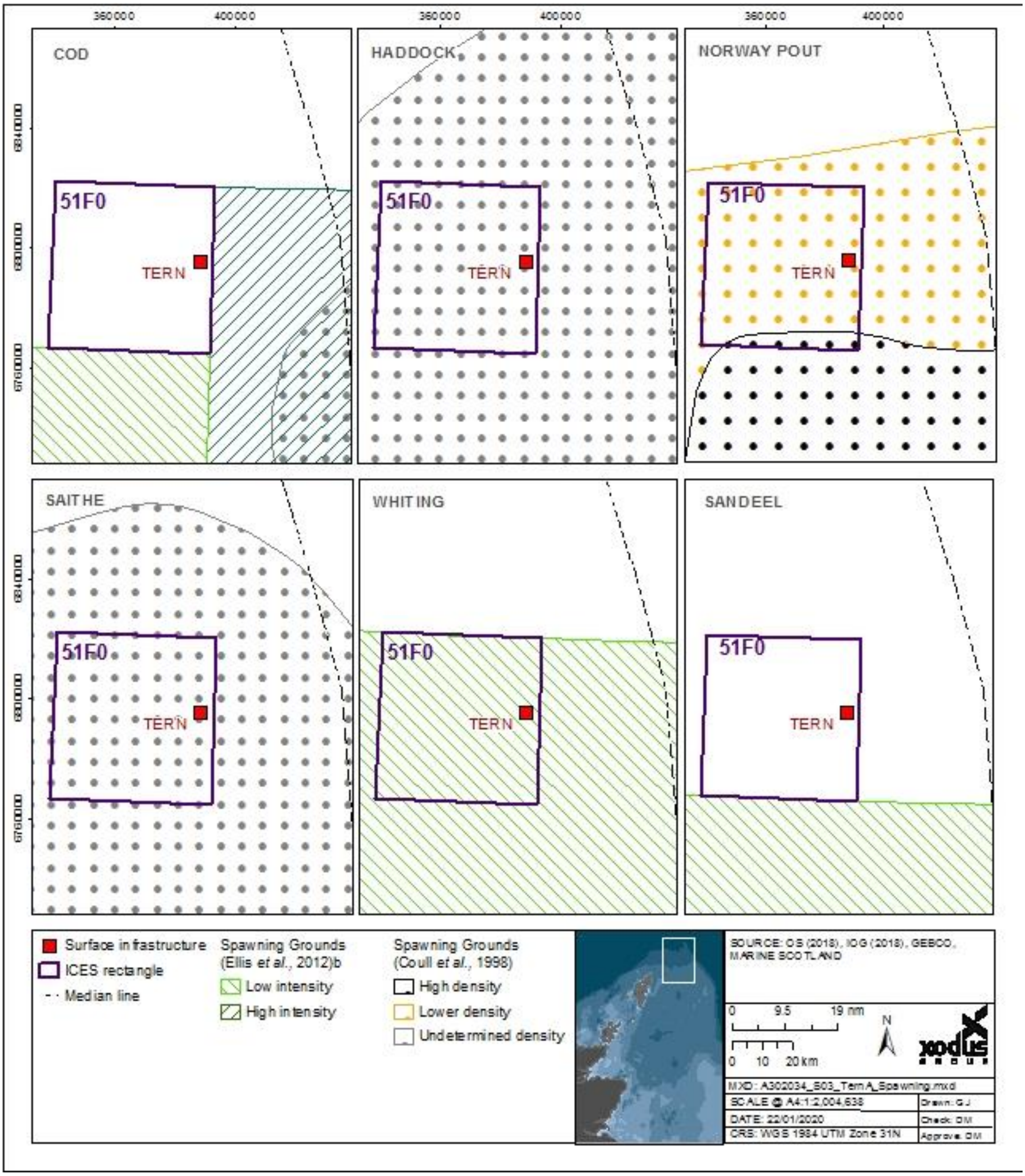


**Figure 3-5 Potential Fish Spawning Grounds**

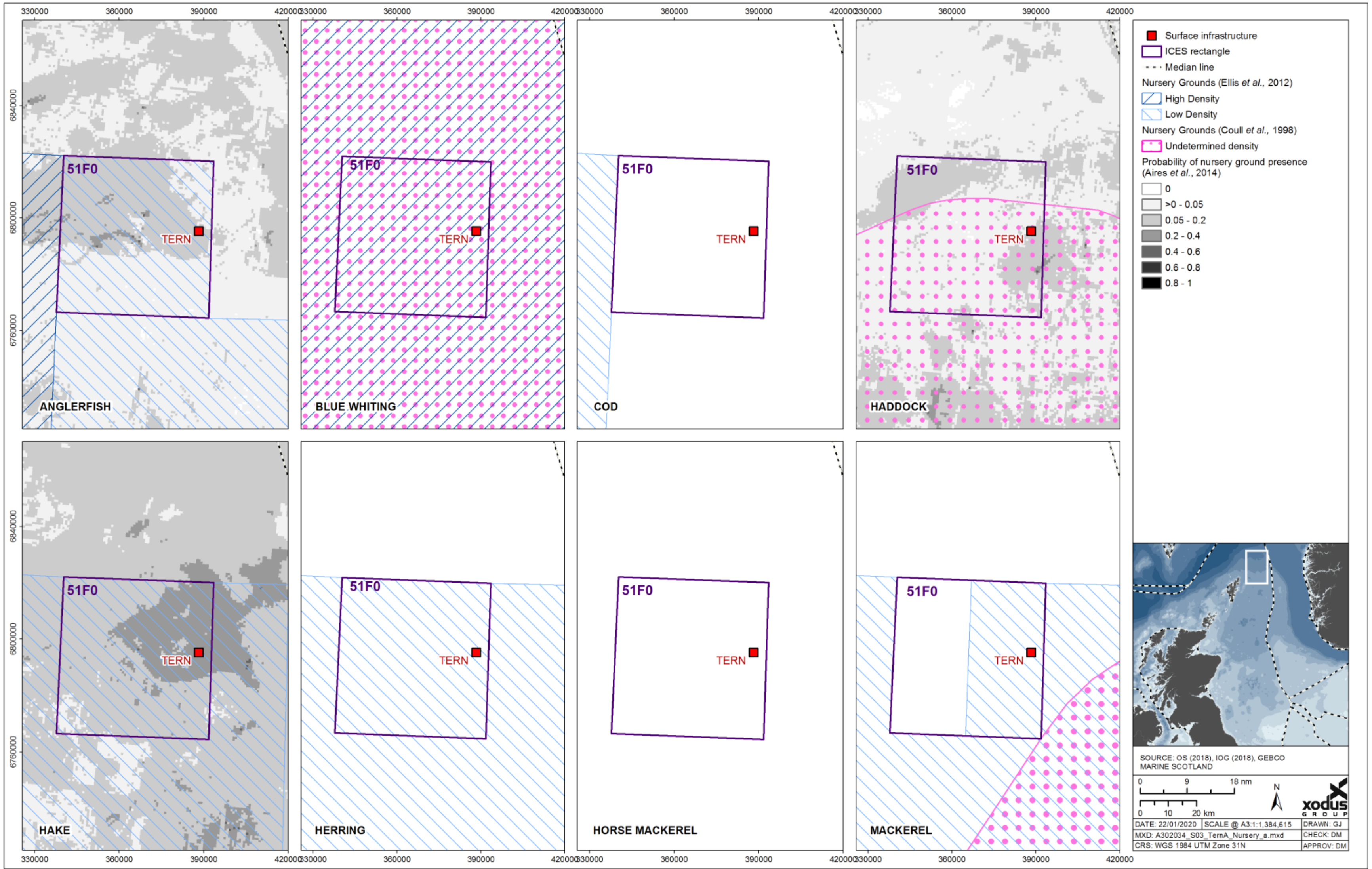


Figure 3-6 Potential Fish Nursery Habitats adapted from Aires *et al.* (2014) (1 of 2)

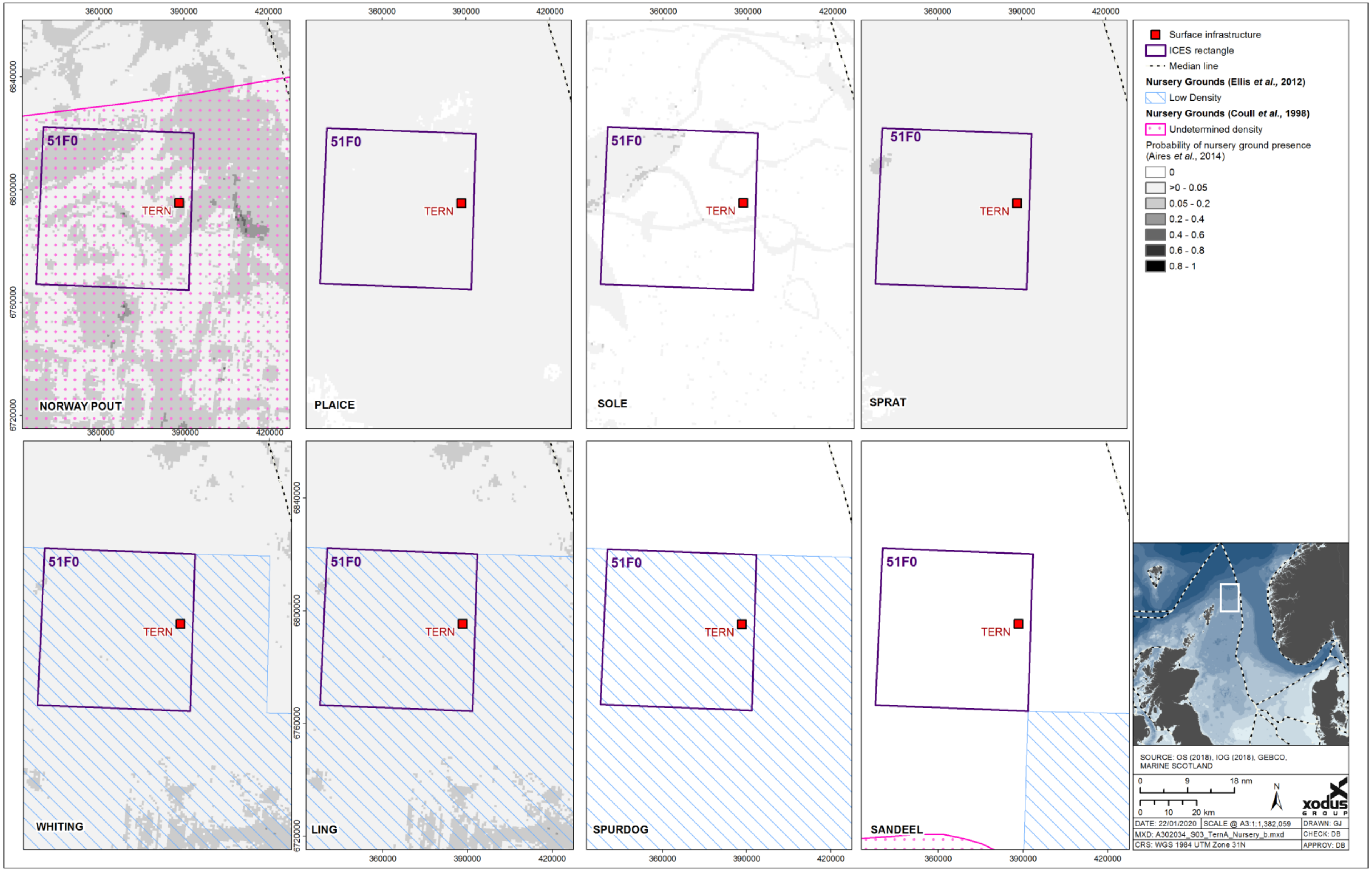


Figure 3-7 Potential Fish Nursery Habitats adapted from Aires *et al.* (2014) (2 of 2)

### 3.2.5 Seabirds

Much of the North Sea and its surrounding coastline is an internationally important breeding and feeding habitat for seabirds. In the CNS and NNS, the most numerous species present are likely to be northern fulmar (*Fulmarus glacialis)*, black-legged kittiwake (*Rissa tridactyla)* and common guillemot (*Uria aalge)* (DECC, 2009; DECC, 2016). Seabirds are not normally affected by routine offshore oil and gas operations. In the unlikely event of an oil release, however, birds are vulnerable to oiling from surface pollution, which could cause direct toxicity through ingestion, and hypothermia as a result 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 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. At this time these high numbers of 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.

Kober *et al*. (2010) have identified hotspots for a number of breeding seabirds in UK waters. The Tern installation is located within or in the vicinity of a wider area of aggregation (or hotspots) for northern fulmar, northern gannet, European storm petrel *Hydrobates pelagicus*, Arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua*, black-legged kittiwake, herring gull *Larus argentatus*, Arctic tern *Sterna paradisaea*, guillemot, razorbill and Atlantic puffin during their breeding season. The offshore presence of these species during the breeding season is confirmed by the maximum foraging distances from colonies reported by Thaxter *et al*. (2012). The northern fulmar has been recorded up to 580 km from colonies, the northern gannet up to 590 km, and the Atlantic puffin up to 200 km (Thaxter *et al*., 2012).

The Seabird Oil Sensitivity Index (SOSI) (Webb *et al*., 2016) identifies sea areas where seabirds are likely to be most sensitive to oil pollution. It is an updated version of the Oil Vulnerability Index (JNCC, 1999) as it uses survey data collected between 1995 and 2015 and includes an improved method to calculate a single measure of seabird sensitivity to oil pollution. The seabird sensitivity to oil pollution in the region of the Tern installation throughout the year ranges from low/medium from February to November and extremely high in December to January. No data was available for the months of May, October and November for several Blocks (Table 3-3).

**Table 3-3 Seabird Oil Sensitivity in Block 210/25 and Surrounding Vicinity (Webb *et al*., 2016)**

| Block | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| 211/16 | 4* | 5 | 5 | 5* | N | 5* | 5 | 5 | 5* | N | 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 |
| 210/29 | 2 | 5 | 5 | 5* | 3* | 3 | 5 | 5 | 5 | 5* | 5* | 5 |
| 210/30 | 5 | 5 | 5 | 5* | 5* | 5 | 5 | 5 | 5 | 5* | 5* | 5 |
| 211/26 | 5* | 5 | 5 | 5* | 5* | 5 | 5 | 5 | 5 | 5* | 5* | 5 |

| Key | Extremely high | Very high | High | Medium | Low | No data |
|---|---|---|---|---|---|---|

* in light of coverage gaps, an indirect assessment of SOSI has been made

### 3.2.6 Marine Mammals

#### 3.2.6.1 Cetaceans

The central and 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 regularly recorded as frequent seasonal visitors. Coastal waters of the Moray Firth and 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 area. Atlantic white-sided dolphin *Lagenorhynchus acutus*, Risso's dolphin *Grampus griseus* and long-finned pilot whale *Globicephala melas* can be considered occasional visitors, particularly in the north of the area (DECC, 2016).

White-sided dolphin, harbour porpoise, killer whale and minke whale have been recorded in the vicinity of the Tern field (Reid *et al*, 2003). The harbour porpoise has been recorded at high densities (approximately 10-100 individuals cited per hour) in February and August (Reid *et al*., 2003).

In 2016, the third series of Small Cetaceans in European Atlantic waters and the North Sea (SCANS-III) was conducted in European Atlantic waters. This involved a large-scale ship and aerial survey to study the distribution and abundance of cetaceans. Harbour porpoise, white-sided dolphin, minke whale and beaked whale (all species) were the most abundant species recorded in the survey block covering the Tern Decommissioning area, with specific densities listed in Table 3-4 (Hammond *et al*., 2017). Other species recorded within this survey block were killer whale and fin whale however there was not sufficient data for these species to provide abundance estimates (Hammond *et al*., 2017).

**Table 3-4 Densities of Cetaceans in the Tern Decommissioning Area (Hammond *et al*., 2017)**

| Species | Density of cetaceans in the survey block (animals per km$^2$) |
|---|---|
| Harbour porpoise | 0.321 |
| White-sided dolphin | 0.003 |
| Minke whale | 0.015 |
| Beaked whale | 0.001 |

#### 3.2.6.2 Seals

Two species of seal live and breed in the UK, namely the grey and harbour seal, both of which are protected under Annex II of the EU Habitats Directive and are listed as Scottish PMFs (SNH, 2016; Jones *et al*., 2015; DECC, 2016).

Approximately 38% of the world's grey seals breed in the UK with 88% of these breeding at colonies in Scotland with the main concentrations in the Outer Hebrides and in Orkney. Birth rates have grown since the 1960s, although according to data from the Special Committee on Seals (SCOS) population growth is levelling off (SCOS, 2014). In the case of harbour seals, approximately 30% of the world's population are found in the UK. Following significant population declines due to disease in 1988 and 2002, harbour seal numbers on the English east coast have been rising since 2009 (SCOS, 2014). Harbour seals are widespread around the west coast of Scotland and throughout the Hebrides and Northern Isles (SCOS, 2017).

Grey and harbour seals will feed both in inshore and offshore waters depending on the distribution of their prey, which changes both seasonally and yearly. Both species tend to be concentrated close to shore, particularly during the pupping and moulting season. Seal tracking studies from the Moray Firth have indicated that the foraging movements of harbour seals are generally restricted to within a 40–50 km range of their haul-out sites (Special Committee on Seals, 2017). The movements of grey seals can involve larger distances than those of the harbour seal, and trips of several hundred kilometres from one haul-out to another have been recorded (SMRU, 2011).

Since the Tern installation is located approximately 104 km offshore, grey and harbour seals are unlikely to be encountered. This is supported by the grey and harbour seal density maps published by the Sea Mammal Research Unit (SMRU), which are provided in the NMPI (2018). The maps report the presence of grey and harbour seals in UKCS block 210/25 as between 0 - 1 per 25 km$^2$ (Figure 3-8).

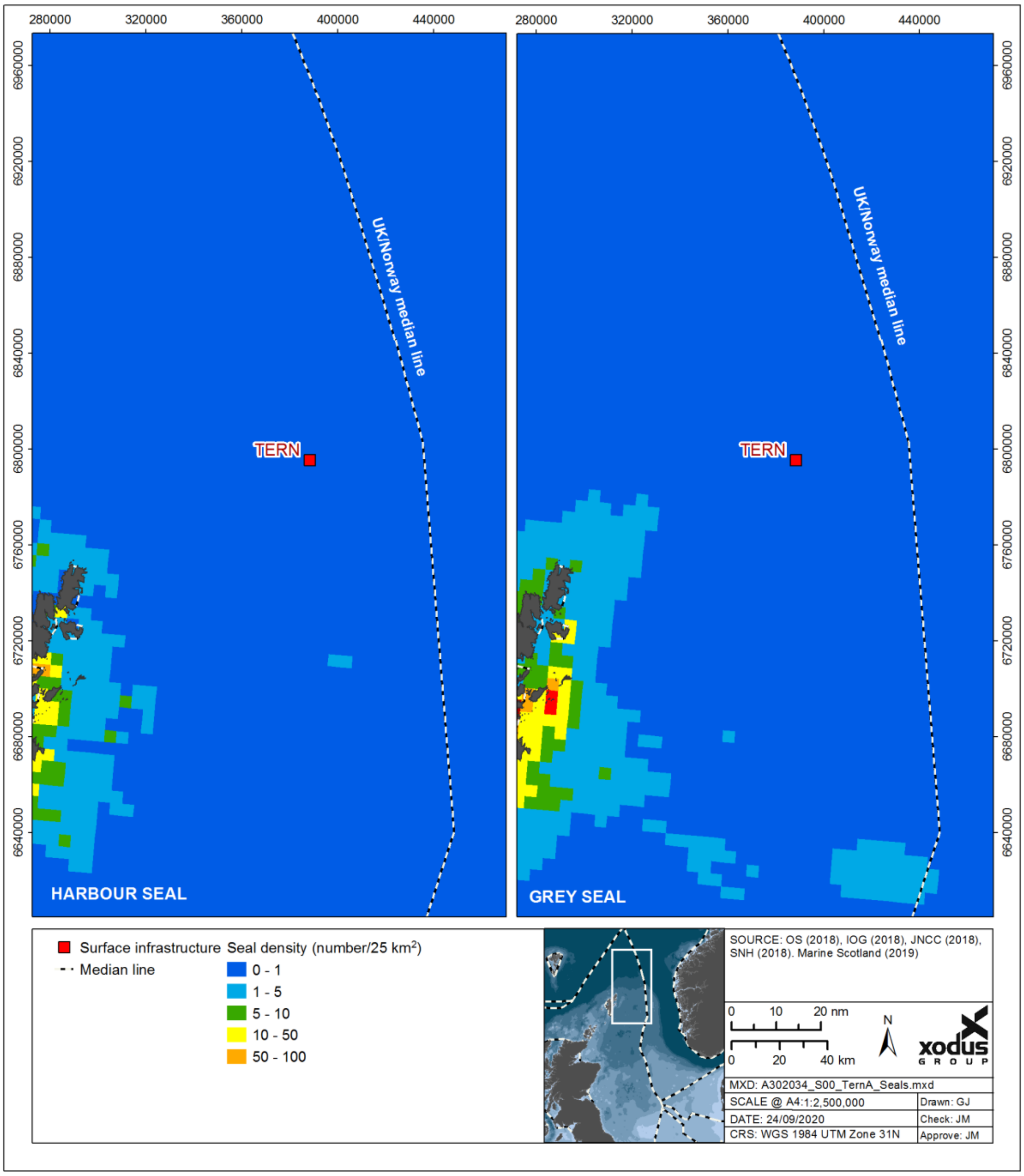


**Figure 3-8 Seal Densities around the Tern installation (per 25 km$^2$)**

## 3.3 Conservation

### 3.3.1 Offshore Conservation

There are no Nature Conservation Marine Protected areas (NC MPAs), Special Protection areas (SPAs) Special Areas of Conservation (SAC), or Demonstration and Research Marine Protected Areas (DR MPA) within 40 km of the Tern installation (NMPI, 2019). The closest designated site is the Fetlar to Haroldswick NC MPA, located approximately 110 km to the south west of the Tern installation (Figure 3-3). The closest SAC is the Pobie Bank Reef, located approximately 72 km south west of the Tern Decommissioning area. The closest SPA is the Hermaness, Saxa Vord and Valla Field, located in Unst, Shetland approximately 104 km to the south west (NMPI, 2019).

The seabed in UKCS Block 210/25 is within a wider area of 'subtidal sand and gravels' (NMPI, 2019), a seabed type designated as a PMF in Scottish waters (Tyler-Walters, 2016). '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, 2016). However, the distribution of this feature is relatively wide in the North Sea (NMPI, 2019).

### 3.3.2 Protected Species

Four species listed under Annex II of the EU Habitats Directive are found in UK waters; harbour porpoise, minke whale, grey seal and harbour seal. Grey and harbour seals are unlikely to be observed near the Tern project with any regularity as both species have very low densities as was previously described. The harbour porpoise and minke whale are the two Annex II species which could be present near the Tern decommissioning project; the species are however likely, due to their mobile nature, to move away and not be adversely affected by the proposed Tern installation decommissioning activities.

All species of cetacean recorded within the proposed operations area are listed as European Protected Species (EPSs). 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.

*A. islandica* is listed as PMF in Scottish waters (Tyler-Walters, 2016) and is on the OSPAR List of Threatened and/or Declining Species (OSPAR, 2008). The presence of an individual in close proximity to the Tern installation is discussed in Section 3.2.3.

The OSPAR (2008) listed habitat 'seapens and burrowing megafauna communities' is listed under the PMF 'burrowed mud' (Tyler-Walters, 2016) (NMPI, 2018). The presence of 'seapens and burrowing megafauna communities' is discussed in Section 3.2.3.

### 3.3.3 Onshore Conservation

The Tern installation is located approximately 104 km from the northeast coast of Shetland. Due to this distance, no impacts to onshore conservation sites are expected from routine decommissioning operations in UKCS block 210/25.

### 3.3.4 National Marine Plan

The National Marine Plan (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 Marine Plan areas. The proposed operations as described in this permit have been assessed against the Marine Plan Objectives and policies, specifically GEN 1, 4, 5, 9, 12, 14 and 21 (Section 3.3.4.1 to Section 3.3.4.7) and OIL AND GAS 2, 3 and 6 (Section 3.3.4.8 to Section 3.3.4.10).

Assessment of compliance against relevant policies has already been achieved through the impact assessment in Section 5.0, in support of this EA Justification. The proposed operations do not contradict any of the marine plan objectives and policies. TAQA will ensure they comply with all the new policies that have been introduced; with particular attention being made to the following policies:

#### 3.3.4.1 GEN 1 – General planning and 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. TAQA will ensure that any potential impacts associated with the Tern installation decommissioning operations will be kept to a minimum as discussed in Section 5.0.

#### 3.3.4.2 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. TAQA will ensure that any potential impacts on other sea users associated with the proposed Tern topsides decommissioning operations will be kept to a minimum.

#### 3.3.4.3 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 will ensure that any potential impacts associated with Tern topsides decommissioning operations will be kept to a minimum as discussed in Section 5.0

#### 3.3.4.4 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.

TAQA will ensure that any potential impacts to protected species and sites associated with Tern topsides decommissioning operations will be kept to a minimum, as discussed in Section 5.0

#### 3.3.4.5 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 that apply. TAQA will ensure that any potential impacts to water quality associated with Tern topsides decommissioning operations will be kept to a minimum, as discussed in Section 5.0

#### 3.3.4.6 GEN 14 – 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 any potential impacts to air quality with Tern topsides decommissioning operations will be kept to a minimum, as discussed in Section 5.0

#### 3.3.4.7 GEN 21 – Cumulative impacts

Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation. TAQA will ensure that any potential impacts to air and water quality and biological communities associated with Tern topsides decommissioning operations will be kept to a minimum, as discussed in Section 5.0.

#### 3.3.4.8 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 will ensure that any material returned to shore as a result of Tern topsides decommissioning activities adheres to the waste hierarchy (Figure 2-7) as discussed in Section 5.0.

#### 3.3.4.9 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 take into account environmental and socio-economic constraints. TAQA will ensure that the onshore resources required for Tern topsides decommissioning activities will be minimised, as discussed in Section 5.0.

#### 3.3.4.10 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 have the relevant risk reduction measures in place for the decommissioning of the Tern topsides, as discussed in Section 5.0.

## 3.4 Socio-Economic Environment

### 3.4.1 Commercial Fisheries

To provide the fullest picture of fisheries within the area, and the associated landings and effort trends, data from 2014 to 2018 are considered (see Table 3-5). The Tern field is located in ICES rectangle 51F0 (see Figure 3-9), which in general is targeted primarily for demersal species in terms of both landed weights and value.

In 2018, 2017 and 2016, landings of demersal fish accounted for more than 99% of the total value. Landings of demersal fish accounted for more than 99% of the total landed weight in 2018 and 2016 and accounted for 79% of the total landed weight in 2017. In these same years shellfish and pelagic species accounted for less than 1% of the value and in 2018 and 2016, 1% of landed weight. By contrast, in 2014 and 2015 there were significant pelagic species landings accounting for 69-90% of the live weight and 49-79% of the value.

In 2018, the three most valuable species were hake, saithe and megrim. Saithe, ling and hake had the largest contribution to the live weight landed in 2018 (Scottish Government, 2019).

In 2018, the live weight of demersal fish in ICES 51F0 was moderate compared to surrounding ICES blocks such as block 51E9 and 51F1, where demersal live weight reached 1,788 and 846 te respectively (NMPI, 2019).

To put the landings of 2018 into context, catches amounting to 552,564 te with a value of £751,777,445 were landed across the UK in 2018. Therefore, ICES rectangle 51F0 presents a relatively low contribution to the UK total, comprising 0.18% of tonnes landed and providing a 0.22% contribution to the total value of the UK commercial fisheries in 2018.

Table 3-6 presents the fishing effort in ICES rectangle 51F0 between 2014-2018.

Figure 3-10 shows fishing intensity (hours) in the NNS around Tern based on vessel monitoring system (VMS) data (NMPi, 2019). Fishing intensity is considered low to moderate for both demersal and pelagic fisheries in comparison with other areas of the North Sea when averaged across 2014-2016.

Table 3-6 presents to fishing effort in ICES rectangle 51F0 between 2014-2018 and Figure 3-11 presents fishing effort (days) (by UK vessels >10m length) (NMPi, 2019). Fishing effort in ICES Rectangle 51F0 is dominated by demersal (trawl) activities and is relatively low in comparison to areas to the south and east. Fishing effort amounted to 159 days in ICES rectangle 51F0 in 2018 as detailed in Table 3-6. This represents an increase in effort compared to the three preceding years, particularly compared to the 59 days spent fishing in 2015. Effort for the 51F0 rectangle has been recorded as disclosive for all except the spring/summer months each year between 2014 and 2015, indicating very low levels of fishing effort. Fishing effort is generally highest between May and August. Trawls and hooks and lines were the gear type used in the ICES rectangle 51F0 over all the years, with trawls making up more than 75% of the gear type used in 2018, 2016, 2015 and 2014 with hooks and lines making up 57% of the gear type in 2017 (Scottish Government, 2019).

**Table 3-5 Live Weight and Value of Fish and Shellfish from ICES Rectangle 51F0 from 2014-2018 (Scottish Government, 2019)**

| Species type | 2018 | | 2017 | | 2016 | | 2015 | | 2014 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Live weight (te) | Value (£) | Live weight (te) | Value (£) | Live weight (te) | Value (£) | Live weight (te) | Value (£) | Live weight (te) | Value (£) |
| Demersal | 1,003 | 1,625,492 | 560 | 1,148,609 | 709 | 1,447,307 | 333 | 499,741 | 688 | 1,046,701 |
| Pelagic | 1 | 2,966 | 147 | 7 | <1 | <1 | 2,944 | 1,912,829 | 1,526 | 1,023,288 |
| Shellfish | <1 | <1 | 1 | 1,846 | <1 | 1,559 | <1 | 539 | <1 | 628 |
| **Total** | **1,004** | **1,628,458** | **707** | **1,150,462** | **709** | **1,448,867** | **3,277** | **2,413,109** | **2,214** | **2,070,617** |

**Table 3-6 Number of Fishing Days per Month (all gear) in ICES Rectangle 51F0 from 2014-2018 (Scottish Government, 2019)**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2014 | D | D | 21 | 18 | 32 | 39 | 12 | 23 | D | D | D | D | 145 |
| 2015 | D | D | D | D | 21 | 9 | 8 | 14 | D | 7 | D | D | 59 |
| 2016 | D | D | 6 | D | 5 | 7 | 26 | D | 9 | D | 16 | 13 | 82 |
| 2017 | D | D | D | D | 13 | 27 | D | 58 | D | D | 3 | 7 | 108 |
| 2018 | D | D | D | 20 | 29 | 33 | 23 | 12 | D | 10 | 10 | 22 | 159 |

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 3-9 Average Landings (Tonnes) and Values (£) of Demersal, Pelagic and Shellfish Fisheries by ICES rectangle (2014-2018)

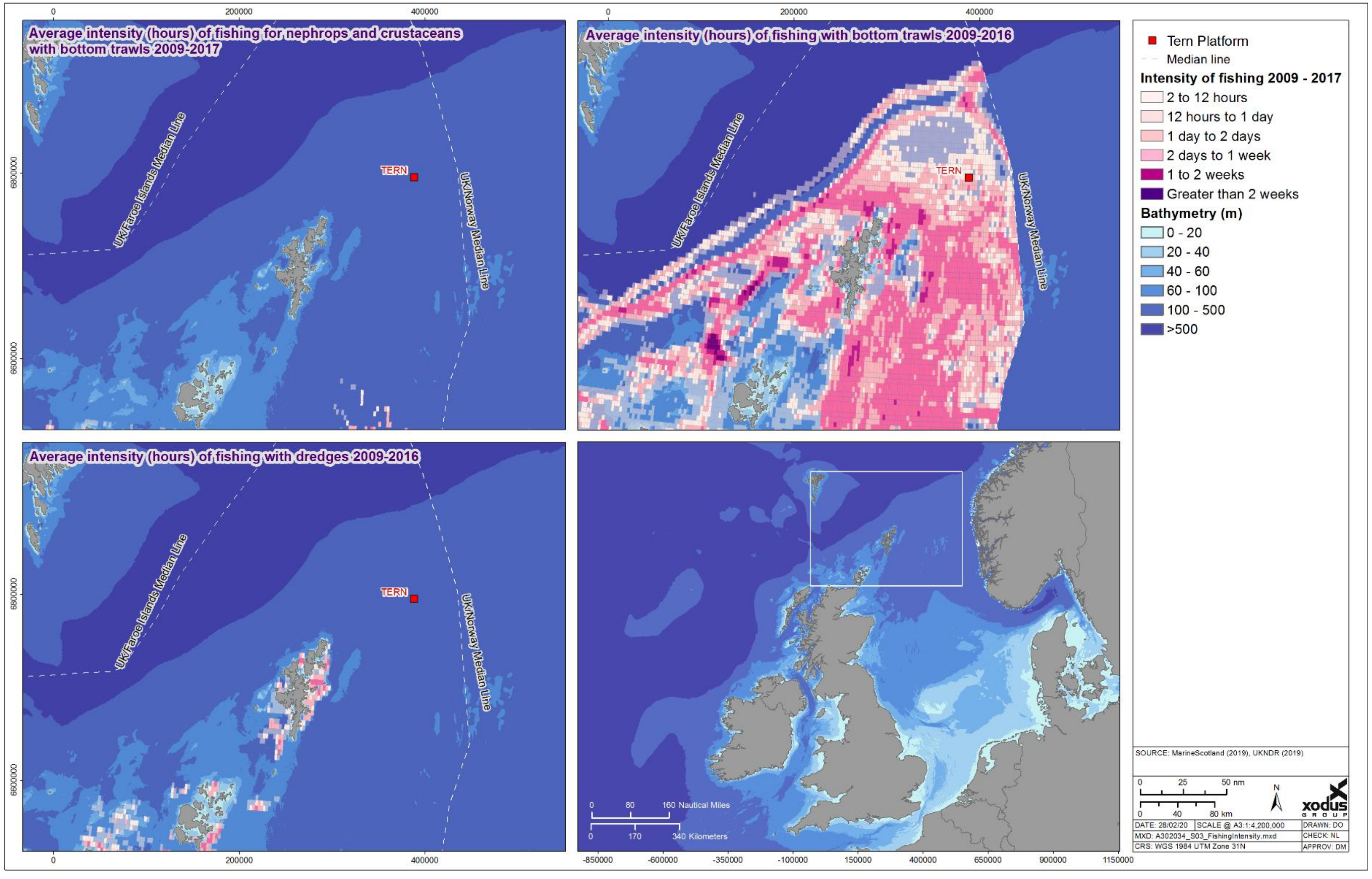


Figure 3-10 Fishing intensity (hours) in the region of the Tern Development between 2009 – 2017 grouped by fishing methods.

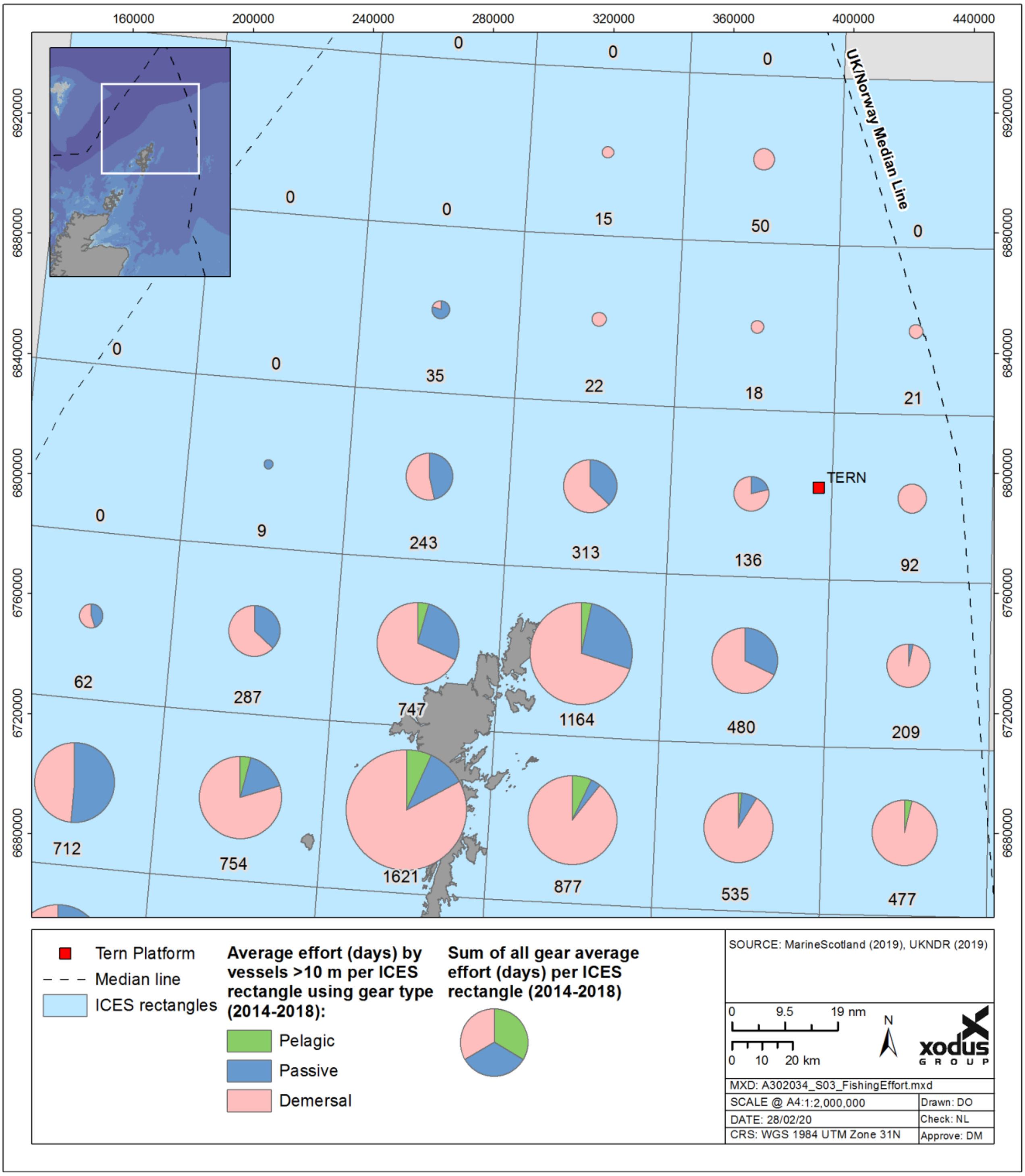


**Figure 3-11 Fishing effort (days) (by UK vessels >10m length) per ICES rectangle for demersal, passive and pelagic gears (2014 – 2018)**

### 3.4.2 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 (DECC, 2016).

The level of shipping activity is considered moderate/high in Block 210/25 (Oil and Gas Authority, 2016). The average weekly density of vessels (all combined) using automatic identification systems (AIS) data in 2015 is 20-50 transits in the UKCS block 210/25, which is moderate compared to other areas in the North Sea (NMPI, 2018). Satellite data based on the Automatic Identification System dataset from 2015, plotted in Figure 3-12, show that between 400 – 550 vessels transit through Block 210/25 annually (MMO, 2017). The relatively high vessel density in this area (Figure 3-12) can be attributed to the high shipping activity relating to oil and gas activity around the Tern installation.

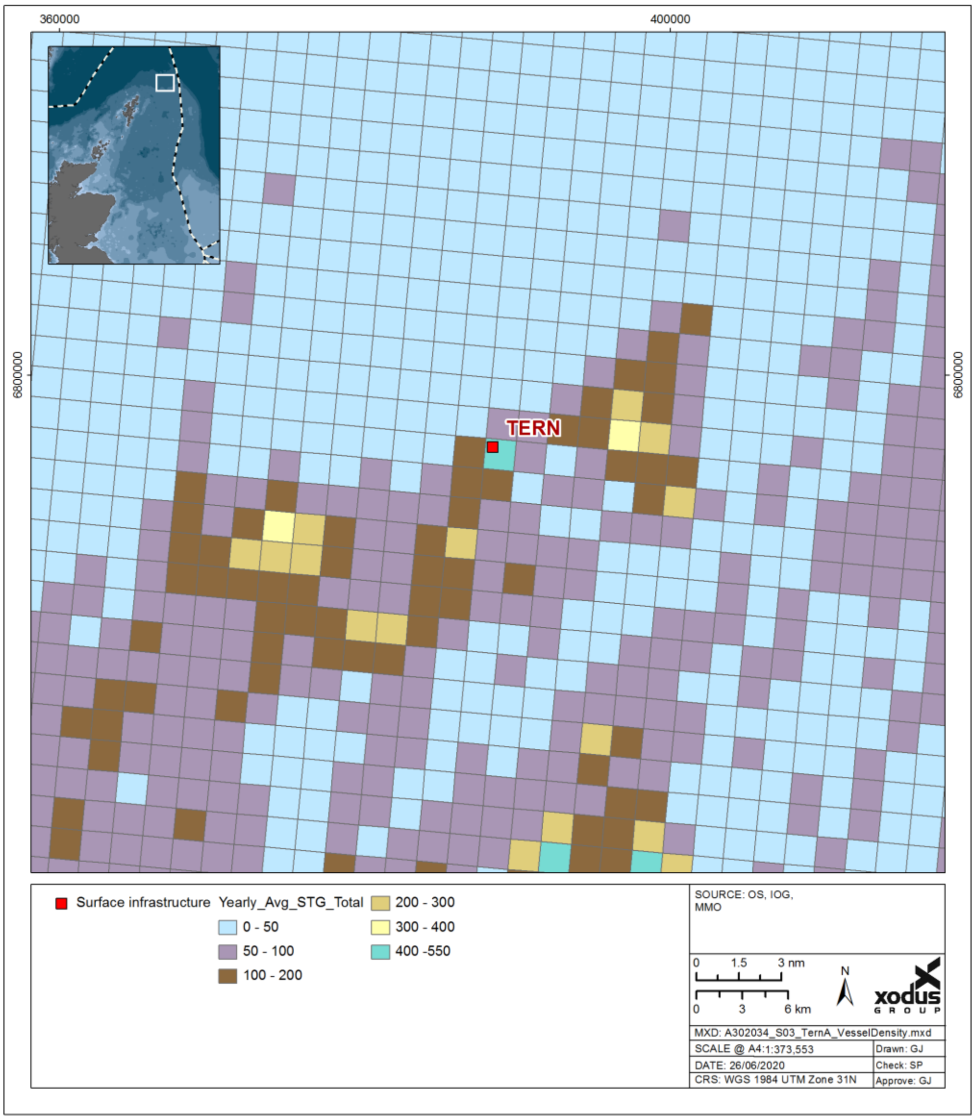


Figure 3-12 Annual Density of Vessel Transits (number of transits per 2 km$^2$) around Tern installation in 2015 (MMO, 2017)

### 3.4.3 Oil and Gas Activity

There are a number of installations located within the vicinity of the Tern installation, as shown in Figure 3-13. Table 3-7 provides the distances in the vicinity (<40 km) of the Tern installation.

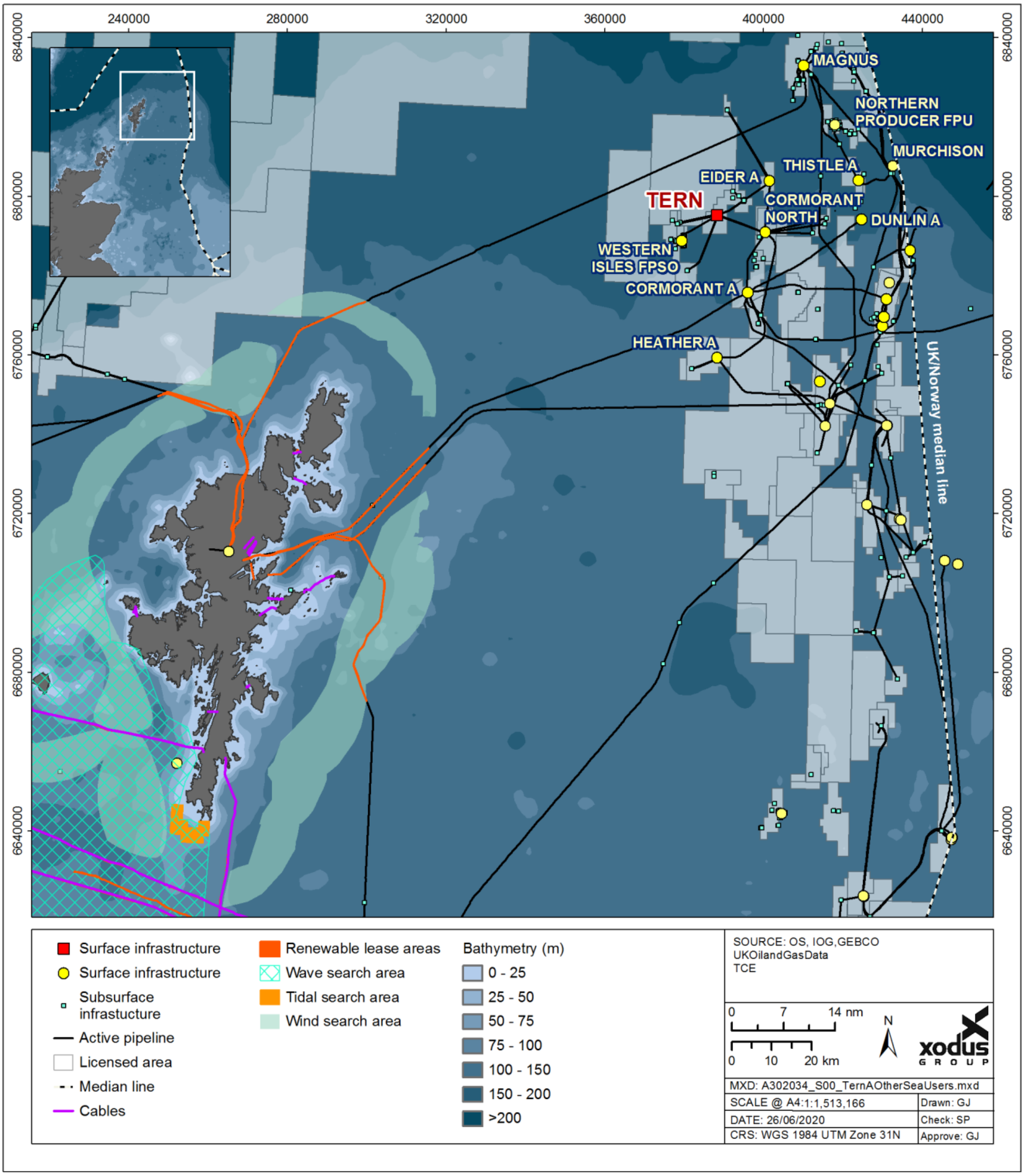


**Figure 3-13 Other Users in the Vicinity of the Tern installation**

Table 3-7 Installations located within 40 km of the Tern installation

| Installation | Distance from Tern (km) | Direction from Tern | Status |
|---|---|---|---|
| Cormorant North | 12.0 | southeast | Active |
| Eider Alpha | 16.0 | northeast | Active |
| Cormorant Alpha | 21.0 | southeast | Active |
| Heather Alpha | 36.0 | south | Active |
| Dunlin Alpha | 36.5 | southeast | Under preparation for decommissioning |
| Thistle Alpha | 36.5 | northeast | Active |
| Northern Producer FPU | 37.5 | northeast | Active |

### 3.4.4 Military Activities

There are no charted Military Practice and Exercise Areas (PEXAs) the vicinity of the Project area (DECC, 2016).

### 3.4.5 Renewable Energy

There are no planned or operating renewable energy sites in close vicinity (<40 km) of the Tern installation.

### 3.4.6 Telecommunication Cables

There are no telecommunication cables within or in the vicinity of Block 210/25 (NMPI, 2019).

### 3.4.7 Wrecks

There is one wreck site in the vicinity of the project area, located 15 km to the east of Block 210/25 (NMPI, 2019). The closest protected wreck is 107 km from the project area.

# 4.0 EA METHODOLOGY

The Impact assessment 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 best practice; and address concerns or issues raised by stakeholders through consolation.

The impact assessment was undertaken using the following approach:

- The potential environmental issues arising from topsides decommissioning activities were identified through a combination of the expert judgement of project engineers and marine environmental specialists in a screening workshop, and consultation with key stakeholders (Section 4.1). The potential environmental issues were grouped under the following key receptor risk groups:
  - Emissions to air;
  - Disturbance to the seabed;
  - Physical presence;
  - Discharges to sea;
  - Underwater noise;
  - Resource use;
  - Onshore activities;
  - Waste;
  - Employment; and
  - Unplanned events.
- Undertake initial screening based on a high-level consideration of these aspects against the evaluation criteria. Screening aspects in or out of further detailed assessment. Justification statements will be compiled detailing the rationale for screening out any aspects from further assessment (Section 5.1).
- For aspects which are considered potentially significant, evaluate significance of potential impacts against impact criteria definitions (Sections 4.2.3 to 4.2.5).
- For any potentially significant impact capture any potential mitigation and/or control measures to be used to further reduce any impact to 'as low as reasonably practicable' (ALARP).

## 4.1 Stakeholder Engagement

The consultation for the Tern topside decommissioning has been largely based on sharing project expectations, approach and specific considerations with key stakeholders including OPRED, Scottish Fishermen's Federation (SFF), Global Marine Systems Ltd (GMS), the National Federation of Fishermen's Organisation (NFFO) and the Northern Irish Fish Producer's Organisation (NIFPO). Current stakeholder responses are listed in Table 4-1.

**Table 4-1 Stakeholder Issues and Concerns Raised Through Consultation**

| Issues/concerns | Outline response and EA section where addressed |
|---|---|
| **Scottish Fishermen's Federation** | |
| 28th January 2020: Email to provide high level summary of the scope and intent of the project | SFF thanked TAQA for the information provided. As the DP is focusing on topside removal work, they may provide comment at consultation. |
| **Global Marine Systems Ltd** | |
| 28th January 2020: Email to provide high level summary of the scope and intent of the project | No comment received. |
| **National Federation of Fishermen's Organisation** | |
| 28th January 2020: Email to provide high level summary of the scope and intent of the project | NFFO thanked TAQA for the information provided. However, as the infrastructure in question lays in Scottish Waters NFFO believe the Scottish Fisherman's Federation, who they work very closely with, are best placed to take the lead role in commenting. |
| **Northern Irish Fish Producers Organisation** | |
| 28th January 2020: Email to provide high level summary of the scope and intent of the project | A specific location map was requested to gauge what, if any, impact there might be for NIFPO. NIFPO confirmed that the location of the proposed decommissioning programme is out with their geographical area of interest. |

## 4.2 EA Methodology

### 4.2.1 Overview

The decision process related to defining whether or not a project is likely to significantly impact on the environment is the core principle of the environmental impact assessment process; the methods used for identifying and assessing potential impacts should be transparent and verifiable.

The method presented here has been 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 SNH in their handbook on environmental impact assessment (SNH, 2013a) and by The Institute of Environmental Management and Assessment (IEMA) in their guidelines for environmental impact assessment (IEMA, 2015, 2016).

Environmental impact assessment 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 environmental impact assessment 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, were a 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 level of impact. 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.

### 4.2.2 Baseline Characterisation and Receptor

In order to make an assessment of 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 1.0 and is based on desk studies combined with additional site-specific studies such as surveys and modelling where required. Information obtained through consultation with key stakeholders was also used to help characterise specific aspects of the environment in more detail.

The EA process requires identification of the potential receptors that could be affected by the Tern Topsides Decommissioning Project (e.g. other users of the sea, water quality). High level receptors are identified within the impact assessments (Section 5.1).

### 4.2.3 Impact Definition

#### 4.2.3.1 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, i.e. the geographical area;
- Duration over which the impact is likely to occur e.g. days, weeks;
- Seasonality of impact i.e. is the impact expected to occur all year or during specific times; and
- Frequency of impact, i.e. how often the impact is expected to occur.

Each of these variables are expanded upon in Table 4-2 – Table 4-6 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 enlarged upon as necessary in any supporting text. With respect to the nature of the impact (Table 4-2), it should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

Table 4-2 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 4-3 Type of Impact

| Type of impact | Definition |
|---|---|
| Direct | Impacts that result from a direct interaction between the Tern Topsides Decommissioning Project and the receptor. Impacts that are actually caused by the activities. |
| Indirect | Reasonably foreseeable impacts that are caused by the interactions of the Tern Topsides Decommissioning Project 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 Tern Topsides Decommissioning Project. Definition encompasses “in-combination” impacts. |

Table 4-4 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 4-5 Geographical Extent of Impact

| Geographical extent | Description |
|---|---|
| Local | Impacts that are limited to the area surrounding the Tern Topsides Decommissioning Project 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 4-6 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 Tern Topsides Decommissioning Project. This definition also covers such impacts that occur on a planned or unplanned basis and those that may be described as ‘periodic’ impacts. |

#### 4.2.3.2 Impact magnitude criteria

Overall impact magnitude requires consideration of all impact parameters described above. Based on these parameters, magnitude can be assigned following the criteria outlined in Table 4-7. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement.

Table 4-7 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.<br>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.<br>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.<br>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. | |

#### 4.2.3.3 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 also the probability that the receptor will be present and is based on knowledge of the receptor and experienced professional judgement. Consideration of likelihood is described in the impact characterisation text and used to provide context to the specific impact being assessed in topic specific chapters as required.

### 4.2.4 Receptor Definition

As part of the assessment of impact significance it is necessary to differentiate between receptor 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 an 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.

#### 4.2.4.1 Receptor sensitivity

These range from negligible to very high and definitions for assessing the sensitivity of a receptor are provided in Table 4-8.

Table 4-8 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. |

### 4.2.4.2 Receptor vulnerability

Information on both receptor sensitivity and impact magnitude is required to be able to determine receptor vulnerability. These criteria, described in Table 4-7 and Table 4-8 are used to define receptor vulnerability as per Table 4-9.

Table 4-9 Vulnerability of Receptor

| Receptor Sensitivity | 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 of functioning of a system will be imperceptible. |

It is important to note that the above approach to assessing sensitivity/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 with regard to a particular receptor. Where this is the case, this is detailed in the relevant impact assessment in Section 5.0.

#### 4.2.4.3 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 may be 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 4-10.

Table 4-10 Value of Receptor

| Receptor Sensitivity | Definition |
|---|---|
| Very high | Receptor of international importance (e.g. United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site).<br>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. International Union for Conservation of Nature (IUCN) red list).<br>Receptor has little flexibility or capability to utilise alternative area.<br>Best known or only example and/or significant potential to contribute to knowledge and understanding and/or outreach. |
| High | Receptor of national importance (e.g. Nature Conservation Marine Protected Area (NCMPA), Marine Conservation Zone (MCZ)).<br>Receptor of high importance or rarity, such as those which are designated under national legislation, and/or ecological receptors such as United Kingdom Biodiversity Action Plan (UKBAP) priority species with nationally important populations in the study area, and species that are near-threatened or vulnerable on the IUCN red list.<br>Receptor provides the majority of income from the Tern installation area.<br>Above average example and/or high potential to contribute to knowledge and understanding and/or outreach. |
| Medium | Receptor of regional importance.<br>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.<br>Any receptor which is active in the Tern installation area and utilises it for up to half of its annual income/activities.<br>Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach. |
| Low | Receptor of local importance.<br>Receptor of low local importance and/or ecological receptors such as species which contribute to a national site, are present in regionally.<br>Any receptor which is active in the Tern installation area and reliant upon it for some income/activities.<br>Below average example and/or low potential to contribute to knowledge and understanding and/or outreach. |
| Negligible | Receptor of very low importance, no specific value or concern.<br>Receptor of very low importance, such as those which are generally abundant around the UK with no specific value or conservation concern.<br>Receptor of very low importance and activity generally abundant in other areas/ not typically present in the Tern installation area.<br>Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach. |

### 4.2.5 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 consequence;
- Mitigation; and
- Residual impacts.

#### 4.2.5.1 Assessment of consequences and impact significance

The sensitivity, vulnerability and value of receptor 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 4-11. 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 4-11 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 |

### 4.2.6 Cumulative Impact Assessment

While the scope of this impact assessment is restricted to the decommissioning of the Tern topsides as outlined in Section 2.0, 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 as a result of overlapping activities.

### 4.2.7 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.

### 4.2.8 Mitigation

Where potentially significant impacts (i.e. those ranked as being of moderate impact level or higher in Section 5.1) are identified, mitigation measures must be 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.

# 5.0 IMPACT ASSESSMENT AND JUSTIFICATION

An impact assessment screening workshop was undertaken to discuss the proposed decommissioning activities and any potential impacts these may pose. This discussion identified eleven potential impact areas based on the proposed removal methods identified in Section 2.4. All eleven potential impacts were screened out of further assessment based on the low level of severity, or likelihood of significant impact occurring. The eleven potential impacts are tabulated in Section 5.1, together with justification statements for the screening decisions.

## 5.1 Assessment of Potential Impacts

| Impact | Further assessment | Rationale |
|---|---|---|
| Emissions to air | No | Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of CoP. As such, emissions from operations and vessels associated with operation of the Tern topsides will cease. Reviewing historical European Union (EU) Emissions Trading Scheme data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be small relative to those during production.<br>The majority of emissions for the Tern topsides decommissioning can be attributed to vessel time or are associated with the recycling of material returned to shore (Appendix A). As the decommissioning activities proposed are of such short duration, this aspect is not anticipated to result in significant impact. The estimated $CO_2$ emissions generated by the selected decommissioning options is 21,667 te (Appendix A) this equates to less than 0.2% of the total UKCS emissions in 2018 (13,200,000 te; OGUK, 2019).<br>Considering the above, atmospheric emissions do not warrant further assessment. |
| Disturbance to the seabed | No | Currently it is envisaged that all vessels undertaking the decommissioning and removal works would be dynamically positioned vessels. As a result, there will be no anchoring associated with the decommissioning of the topsides. Should this change following the commercial tendering process and an anchor vessel be required, any potential seabed impact would be assessed and captured in the Consent to Locate application, Marine Licence application and supporting Environmental Impact Assessment (EIA) justification within the Portal Environmental Tracking System (PETS).<br>On this basis, no further assessment need be undertaken. |
| Physical presence of vessels in relation to other sea users | No | The presence of a small number of vessels for topsides decommissioning activities will be short-term in the context of the life of the Tern installation. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities.<br><br>The small number of vessels required will also generally be in use within the existing 500 m safety zone and will not occupy 'new' areas. If applicable, Notices to Mariners will be made in advance of activities occurring meaning those stakeholders will have time to make any necessary alternative arrangements for the very limited period of operations. |

| | | |
|---|---|---|
| | | The small number of vessels required will also generally be within the existing 500 m safety zone. 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.<br>The decommissioning of the Tern topsides is estimated to require up to seven vessels depending on the selected method of removal; however, these would not all be on location at the same time (maximum of four at any one time).<br>Considering the above, temporary presence of vessels does not need further assessment. |
| Physical presence of infrastructure decommissioned in situ in relation to other sea users | No | As topsides will be fully removed and a temporary navigational aid will be installed on the substructure up until its subsequent removal.<br>Considering the above, no further assessment related to long term presence of infrastructure is justified. |
| Discharges to sea (short-term and long-term) | No | Discharges from vessels are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. In addition, the topsides will be Drained, Flushed, Purged and Vented (DFPV) using the TAQA DFPV methodology prior to any decommissioning activities commencing. There would be no planned discharges from the topsides. Any residual remaining material will be in trace levels/volumes following the DFPV regime and therefore would not pose any significant risk. Oil spill modelling has not been conducted for a release of diesel from the Tern installation (or for a vessel collision). However, the current OPEP for the North Cormorant topsides (12 km to the south east of the Tern installation) considers a diesel release of approx. 850 m3. For such a spill, no beaching is expected, and under normal weather conditions, the spill will disperse naturally within 9 hours. Any hydrocarbon inventories on site during decommissioning will be a smaller volume than those modelled.<br>As the topsides will be fully removed, there will be no potential for releases in the longer term from the facilities.<br>Considering the above, discharges to sea from the topsides should not be assessed further. |
| Underwater noise emissions | No | Cutting required to remove the topsides will take place above the waterline, and there will be no other noise-generating activities. Vessel presence will be limited in duration. The project is not located within an area protected for marine mammals.<br>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.<br>On this basis, underwater noise assessment does not need assessed further. |
| Resource use | No | Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Such use of resources is not typically an issue of concern in offshore oil and gas. The estimated total energy usage for the project is 247,195 GJ (Appendix A). Material will be returned to shore as a result of project activities, and expectation is to recycle at least 97% of this returned material. There may be instances where infrastructure returned to shore is contaminated and cannot be recycled, but the weight/volume of such material is not expected to result in substantial landfill use.<br>Considering the above, resource use does not warrant further assessment. |

| | | |
|---|---|---|
| Onshore activities | No | The onshore waste management process is likely to have negligible consequences for the human population in terms of an increase in dust, noise, odour and reduced aesthetics.<br>It should be noted that, through TAQA's Waste Management Strategy, only licenced contractors will be considered who can demonstrate they are capable of handling and processing the material to be brought ashore (e.g. permitted capacity to accept the relevant waste streams). This will form part of the commercial tendering process, including duty of care audits and due diligence on the successful contractor. Approval is determined through due-diligence assessment comprising site visits, review of permits and consideration of the facilities design and construction has been developed to minimise environmental impact.<br>TAQA understands that dismantling sites will also require consents and approvals from onshore regulators such as the Environment Agency, who apply conditions relating to mitigation, management and who are responsible for the provision of permits for such work. |
| Waste | No | It is waste management, not generation, that is the issue across DPs, with capacity to handle waste within the UK often cited as a stakeholder concern. The limited waste to be brought to shore, which will be routine in nature, will be managed in line with TAQA's Waste Management Strategy as part of the project Active Waste Management Plan, using approved waste contractors.<br>On this basis, no further assessment of waste is necessary. |
| Employment | No | TAQA has communicated regularly with all crew members throughout. TAQA will also be working closely with its contractor companies to retain and redeploy crew where possible.<br>Following the above measures and continued communications further assessment is not warranted for this aspect. |
| Unplanned events | No | The topsides process system will have been through the DFPV process prior to the decommissioning activities described herein being carried out. Release of live hydrocarbon and chemical inventory is therefore not a relevant impact mechanism.<br>The lift vessel to be used for removing the topsides will have the largest fuel inventory of the few vessels involved in the decommissioning activities. The vessel's fuel is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of a full inventory. The potential impact from fuel inventory release will be at worst equivalent to that already assessed and mitigated for the operational phase of Tern.<br>Oil spill modelling has not been conducted for a release of diesel from the Tern installation (or for a vessel collision). The current OPEP for the North Cormorant topsides (12 km to the south east of the Tern installation) considers a diesel release of approx. 850 m3. For such a spill, no beaching is expected, and under normal weather conditions, the spill will disperse naturally within 9 hours. Any hydrocarbon inventories on site during decommissioning will be a smaller volume than those modelled.<br>As the methodology for the removal to shore of the topsides has not been defined in detail, there exists the possibility that during transport of the topsides materials, elements may dislodge and drop from the transport vessel. Dropped object procedures are industry-standard and there is only a very remote probability of any interaction with any live infrastructure. |

| | | |
|---|---|---|
| | | Considering the above, the potential impacts from accidental chemical/ hydrocarbon releases during decommissioning activities do not warrant further assessment.<br>Although the risk of oil spill is remote, an OPEP will be in place for the Tern decommissioning activities. Any spills from vessels in transit and outside the 500 m zone are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Up to seven vessels will be deployed during decommissioning activities, including a heavy lift vessel, tug vessels (4 off), a barge vessel, a standby vessel and supply vessels (2 off).<br>Any dropped objects of significant size (for example, those reported to OPRED on PON2 notifications) will be removed. Any small non-significant objects will be marked and will be within the safety zone of the substructure. These dropped objects will be addressed during the debris clearance survey post decommissioning activities associated with the substructure decommissioning activities. |

## 5.2 Aspects Taken Forward for Further Assessment

Based on the initial screening (Section 5.1), there are no aspects which warrant further assessment within the EA as any potential impact will be short in duration and of low impact severity, therefore pose no significant risk to the environmental or societal receptors assessed.

## 5.3 Proposed Mitigation and Control Measures

To ensure that impacts remain as described above, TAQA will follow routine environmental management activities, for example appropriate Project planning, contractor management, vessel audits, activity permitting and legal requirements to report discharges and emissions, such that the environmental and societal impact of the decommissioning activities will be minimised.

The activities associated with the decommissioning of the Tern topsides are not likely to result in significant impacts to the environment or other sea users either offshore or onshore, for example shipping traffic, fishing or seabed communities, if appropriate mitigation and control measures are effectively applied. A summary of the proposed control and mitigation measures is shown in Table 5-1.

**Table 5-1 Proposed Mitigation and Control Measures**

| General and Existing |
|---|
| • Lessons learnt from previous decommissioning scopes will be reviewed and implemented as appropriate;<br>• Vessels will be managed in accordance with TAQA's existing marine procedures;<br>• The vessels' work programme will be optimised to minimise vessel use;<br>• The 500 m safety exclusion zone will remain in operation during the decommissioning activities reducing risk of non-project related vessels entering into the area where topsides decommissioning activities are taking place;<br>• All topsides will be subject to a drain, flush, purge and vent strategy that will be assessed and permitted under existing operational permits prior to decommissioning, to ensure minimal residual contaminants are present in the infrastructure before removal operations commence;<br>• The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of large hydrocarbon releases and to mitigate their impacts should they occur;<br>• All vessels undertaking decommissioning activities will have an approved Shipboard Oil Pollution Emergency Plan (SOPEP);<br>• Existing processes will be used for contractor management to assure and manage environmental and social impacts and risks;<br>• TAQA's management of change process will be followed should changes of scope be required;<br>• Careful planning, selection of equipment, subsequent management and implementation of activities;<br>• A debris survey will be undertaken once decommissioning activities for the field as a whole are fully completed. Any debris identified as resulting from oil and gas activities will be recovered from the seabed where possible; and<br>• Similarly, overtrawl assessments conducted as assurance of a safe seabed for other sea users will be undertaken once decommissioning activities for the Tern field as a whole have been completed. |
| **Large-scale Releases to Sea** |
| • Risk of a full inventory loss from a vessel is very low given that the majority of vessels have compartmentalised or distributed fuel tanks, making full containment loss highly unlikely and the distance from shore would prevent any significant volume of diesel reaching any shoreline; and<br>• Any release will be managed under an approved OPEP, in which the risks associated with Tern topside removal have been appropriately assessed and planned for. |
| **Waste Management** |
| • All contractors will be audited as part of a stringent commercial tendering process to ensure they can demonstrate that they are capable of handling the materials expected to be present on the Tern topside;<br>• TAQA is targeting at least 97% of the material brought back onshore will be recycled and will actively engage with the supply chain and other operators/ industries to explore opportunities to maximise this recovery of the other 3%;<br>• All waste will be managed in compliance with relevant waste legislation by a licenced waste management contractor; and<br>• TAQA will develop and maintain an AWMP to help identify and track all wastes generated. |

# 6.0 CONCLUSIONS

Although the three options for topsides removal differ in their durations, type of vessels and detail of activities undertaken, the worst-case aspects from each method were considered and assessed in line with a tried and tested EA Methodology and the results detailed in Section 5.0.

Following detailed review of the Project activities, the environmental sensitivities of the Project area, industry experience with decommissioning activities and taking stakeholder concerns into account, it was determined that none of the issues commonly associated with offshore oil and gas activities required detailed assessment. The proposed Tern topsides removal will involve surface activities only with a limited number of vessels mostly within the Tern installation 500 m safety zone. It will not involve any interaction with the seabed, significant discharges to sea or underwater noise generation.

The Tern installation is located 104 km offshore from Shetland, remote from coastal sensitivities and from any designated sites. Therefore, no significant impact to any protected sites is expected.

Finally, this EA has considered the objectives and marine planning policies of the National Marine Plan 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 such 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 Health, Safety, Security and Environment Policy and EMS, it is considered that the proposed Tern topside decommissioning activities do not pose any significant threat of impact to environmental or societal receptors within the UKCS.

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# 8.0 APPENDIX A: ENERGY AND EMISSIONS

Table 8-1 Energy and emissions by project activity for Single Lift removal of topsides

| Planned activity | Operations energy (GJ) | Operations $CO_2$ (Te) |
|---|---|---|
| Onshore transportation of materials | 23 | 2 |
| Onshore deconstruction | 25,499 | ND |
| Onshore recycling of materials | 161,234 | 17,180 |
| Offshore transport (See table 8.2) | 60,439 | 4,485 |
| **Total** | **247,195** | **21,667** |

Table 8-2 Offshore transport energy and emissions for Single Lift removal of topsides

| Vessel type | Total Duration (days) | | | | Operations energy (GJ) | Operations $CO_2$ (Te) |
|---|---|---|---|---|---|---|
| | Mob/ Demob | Transit | Working | Wait on Weather | | |
| Single Lift Vessel | 2 | 4 | 4 | 2 | 60,008 | 4,455 |
| Cargo Barge | 2 | 8 | 20 | 6 | | |
| Standby vessel | 2 | 8 | 40 | 5 | | |
| Tugs (4) | 8 | 16 | 16 | 8 | | |
| Helicopters | <1 | | | | 431 | 30 |
| **Total offshore transport** | | | | | **60,439** | **4,485** |

# 9.0 APPENDIX B: TAQA HSSE POLICY

## TAQA Europe 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 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)
- Everyone within TAQA demonstrates commitment and accountability to implement this policy and to work in accordance with the TAQA Management System Elements and Expectations

### 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

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# TAQA Europe 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.

Donald Taylor, Managing Director

John Hogg, HSSEQ Director

René Zwanepol,
NL Country Manager

Sandy Hutchison,
Legal, Commercial
and Business Services Director

Calum Riddell,
Operations Director

Iain Lewis,
Europe CFO / Europe
Decommissioning Director

Gary Hunt,
Human Resources Manager

Gary Tootill, Technical Director –
Subsurface / Wells

David Wilson,
Technical Director – Projects,
Engineering and Assurance

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