SOLAN DECOMMISSIONING

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	XODUS GROUP, 5th FLOOR CAPITAL BUILDING, 429-431 UNION STREEET, ABERDEEN, AB11 6DA

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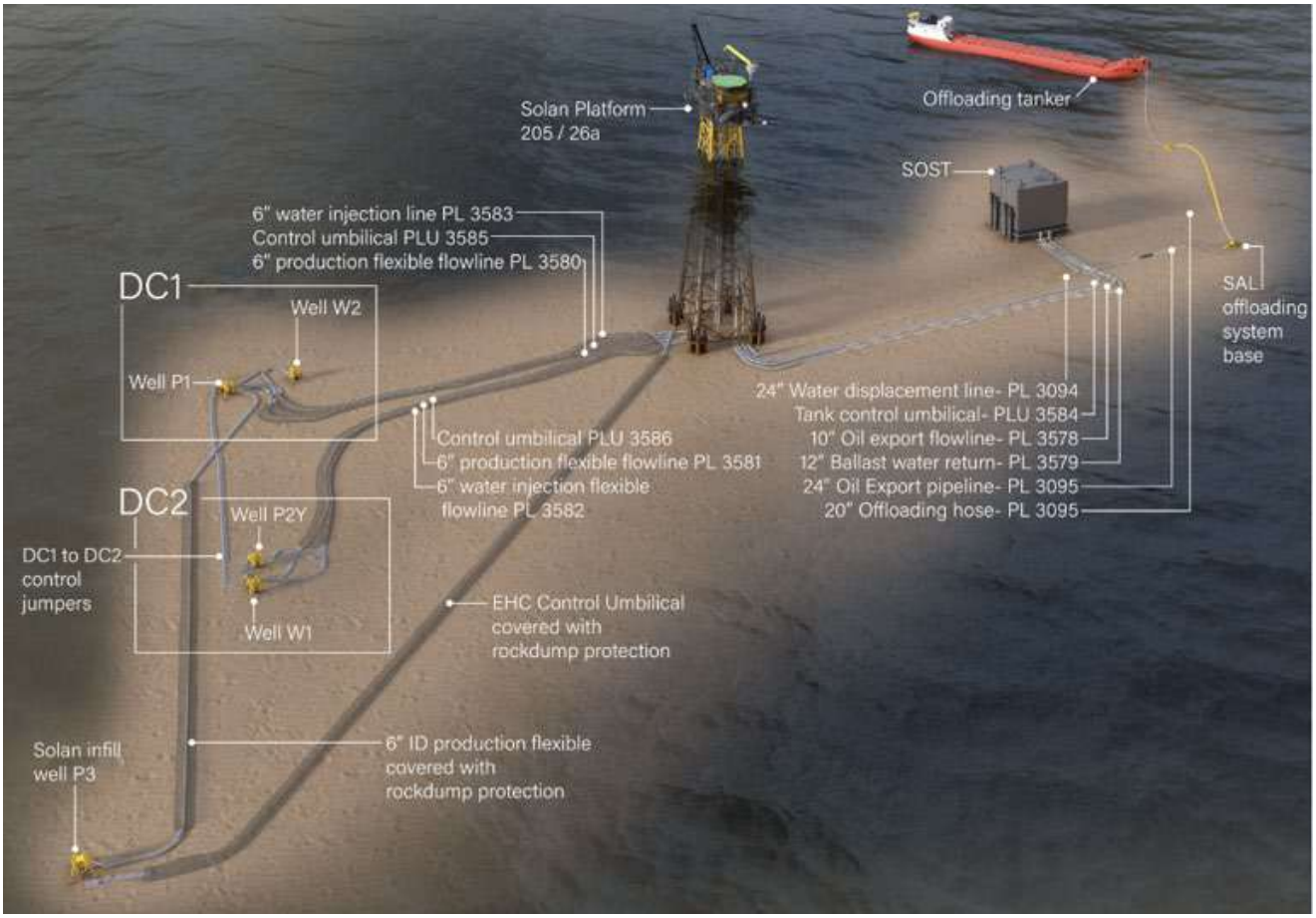
Premier Oil UK Limited



SOLAN

Decommissioning Environmental Appraisal

Consultation Draft

Fifth Issue

Approval page

Name	Position	Purpose	Signature	Date
Xodus Group	Lead Environmental Consultant	Author	K.Smith	23/05/2024
Xodus Group	Principal Environmental Consultant	Reviewer	A.Corse	23/05/2024

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Abbreviation	**Description**
~	Approximately
3LPP	3-Layer Polypropylene, coating used for carbon steel pipelines and pipework
AET	Apparent Effects Thresholds
ALARP	As Low as Reasonably Practicable
Ba	Barium
BC	Background Concentration
BEIS	The Department for Business, Energy, and Industrial Strategy
BGS	British Geological Society
CA	Comparative Assessment
Cd	Cadmium
CO_2e	Carbon Dioxide Equivalent
CoP	Cessation of Production
Cr	Chromium
Cu	Copper
CWC	Concrete Weight Coated
DC	Drill Centre
DECC	Department of Energy and Climate Change
Defra	Department for Environment, Food and Rural Affairs
DESNZ	The Department for Energy Security and Net Zero
DP	Decommissioning Programme
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMS	Environmental Management System
ENVID	Environmental Impact Identification
EPS	European Protected Species
ERL	Effects Range-Low
ESDV	Emergency Shut Down Valve
ESP	Electrical Submersible Pump
EU	European Union

Table of Abbreviations	
Abbreviation	**Description**
EUNIS	European Nature Information System
FishSAFE	The FishSAFE database contains a host of oil & gas structures, pipelines, and potential fishing hazards. This includes information and changes as the data are reported for pipelines and cables, suspended wellheads pipeline spans, surface & subsurface structures, safety zones and pipeline gates (www.fishsafe.eu). FishSAFE is a PC-based safety device that provides the skipper of a fishing vessel with detailed information about subsea obstruction and provides a timely warning of any nearby oil and gas related infrastructure that may pose a snagging hazard and potentially result in the damage or loss of the fishing gear or even the vessel.
$gC/m^2/yr$	Carbon Content of Dry Matter Weight per Year
GHG	Greenhouse Gas
GJ	Gigajoule
Hg	Mercury
HLV	Heavy Lift Vessel
HSE	The Health and Safety Executive
HSES	Health, Safety, Environment and Security
ICES	International Council for the Exploration of the Seas
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometre
km^2	Square Kilometre
km/hr	Kilometre per Hour
KP	Kilometre Point, usually measured from point of origin, the start of the pipeline at the pipeline flange. A negative KP means that the features (e.g. tie-in spools) lie between the riser flange and the start of the pipeline.
KPI	Key Performance Indicator
LAT	Lowest Astronomical Tide
m	metre, 1000mm
m^2	Square Metre
m^3	Cubic Metre
MCV	Monohulled Crane Vessel
MCZ	Marine Conservation Zone
MFE	Mass Flow Excavator
mg	Milligram

Table of Abbreviations	
Abbreviation	**Description**
mg/l	Milligram per Litre
mm	millimetre
MNAW	Modified North Atlantic Water
MoD	Ministry of Defence
MU	Management Unit
NAW	North Atlantic Water
NCMPA	Nature Conservation Marine Protected Area
Ni	Nickel
No.	Number (of)
NMP	National Marine Plan
NMPi	National Marine Plan interactive
NNS	Northern North Sea
NORM	Naturally Occurring Radioactive Material
NSTA	North Sea Transition Authority
OD	Outside diameter (used for pipelines, flowlines, umbilicals and piles)
OGA	Oil and Gas Authority
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PAH	Polycyclic Aromatic Hydrocarbon
Pb	Lead
PCO	Precipitated Carbonates
PETS	Portal Environmental Tracking System
PL, PLU	Pipeline or Umbilical Identification number as given by OGA using the PWA application process
PMF	Priority Marine Feature
POC	Particulate Organic Carbon
Premier	Premier Oil UK Limited
PWA	Pipeline Works Authorisation
ROV	Remotely Operated Vehicle
SAC	Special area of Conservation

Table of Abbreviations	
Abbreviation	**Description**
SAL	Single Anchor Loading
SCANS	Small Cetacean Abundance in the North Sea
SEA	Strategic Environmental Assessment
SEEMP	Shipboard Energy Efficiency Management Plan
SLV	Single Lift Vessel
SOPEP	Shipboard Oil Pollution Emergency Plan
SOSI	Seabird Oil Sensitivity Index
SOST	Subsea Oil Storage Tank
SPA	Special Protection Area
SSCV	Semi-Submersible Crane Vessel
SSS	Side-Scan Sonar
SSSI	Site of Special Scientific Interest
SUTU	Subsea Umbilical Termination Unit
Te	Tonne
TFSW	Transfrontier Shipment of Waste
THC	Total Hydrocarbon Content
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UKBAP	UK Biodiversity Action Plan
UKOOA	United Kingdom Offshore Operators Association
WHPS	Well Head Protection Structure
WONS	Well Operations Notification System
WoS	West of Shetland
Zn	Zinc
µg	Microgram

1 Executive Summary

1.1 Introduction and background

In accordance with the Petroleum Act 1998, Premier Oil UK Limited ('Premier'), is applying to the Department for Energy Security and Net Zero ('DESNZ') (formerly known as the Department for Business, Energy and Industrial Strategy ('BEIS')) to obtain approval for decommissioning the subsea infrastructure associated with the Solan field.

The Solan field is located in seas West of Shetland ('WoS'), approximately 129 km west of the main island Shetland and 165 km north of mainland Scotland. The Solan field is situated in Block 205/26a of the United Kingdom Continental Shelf ('UKCS') (Figure 1.2.1). The Solan field is 100% owned and operated by Premier Oil UK Limited.

1.2 Regulatory context

The Petroleum Act 1998 (as amended by the Energy Act 2008) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the United Kingdom Continental Shelf ('UKCS'). The responsibility for ensuring compliance with the Petroleum Act 1998 rests with DESNZ, managed through Offshore Petroleum Regulator for Environment and Decommissioning ('OPRED'). The Petroleum Act requires the operator of an offshore installation or pipeline to submit a draft Decommissioning Programme ('DP') for statutory and public consultation, and to obtain approval of the DP from the Secretary of State. The DP should outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place. Well decommissioning is determined under a different process to the Decommissioning Programme, called the Well Operations Notification System ('WONS').

This Environmental Appraisal ('EA') has been conducted to assess the potential environmental impacts that may result from undertaking the subsea decommissioning activities as part of the decommissioning of the Solan installation, subsea infrastructure, associated pipelines, umbilicals, flowlines and protective materials. This EA supports the combined DPs submitted to OPRED [26], the offshore decommissioning regulator under DESNZ. The DPs address the following assets:

Solan associated installations and structures:

- Solan platform.
- Solan Subsea Oil Storage Tank ('SOST').
- Single Anchor Loading ('SAL').
- Wellheads and associated Wellhead Protection Structures ('WHPS'): Well P1, W2, P2, W1 and P3.
- Two wet-stored trash caps.

Solan associated pipelines, flowlines and umbilicals including:

- Solan export and ballast pipelines: PL3094, PL3095, PL3578, PL3579 and PLU3584.
- Drill Centre 1 ('DC1') and Drill Centre 2 ('DC2') flowlines and umbilicals: PL3580, PL3581, PL3582, PL3583, PLU3585, PLU3586, PLU3585JW2, PLU3586JW1, PLU4204, PLU4205, PLU4206, PLU4207, PLU4208, and PLU4209.
- Well P3 flowlines and umbilicals: PL4971, PLU4972, PL4973, PL4974, PL4975, PLU4976 and PL4977.

The EA has been written considering the BEIS 2018 [3] guidance and the 2018 Decom North Sea EA guidance [11] and focuses on screening out of non-significant impacts and presents a detailed assessment of potentially significant impacts.

In terms of activities West of Shetland ('WoS'), the Scottish National Marine Plan ('NMP') has been adopted by the Scottish Government to help ensure sustainable development of the marine area. The NMP has been developed in line with United Kingdom ('UK'), European Union ('EU') and The Convention for the Protection of the Marine Environment of the North-East Atlantic ('OSPAR') legislation, directives and guidance. The NMP states that '*where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets from the seabed will be fully supported where practicable and adhering to relevant regulatory process*' [64]. As part of the conclusions to this assessment (Section 6), Premier demonstrates due consideration to the NMP during project decision making and the interactions between the project and NMP.

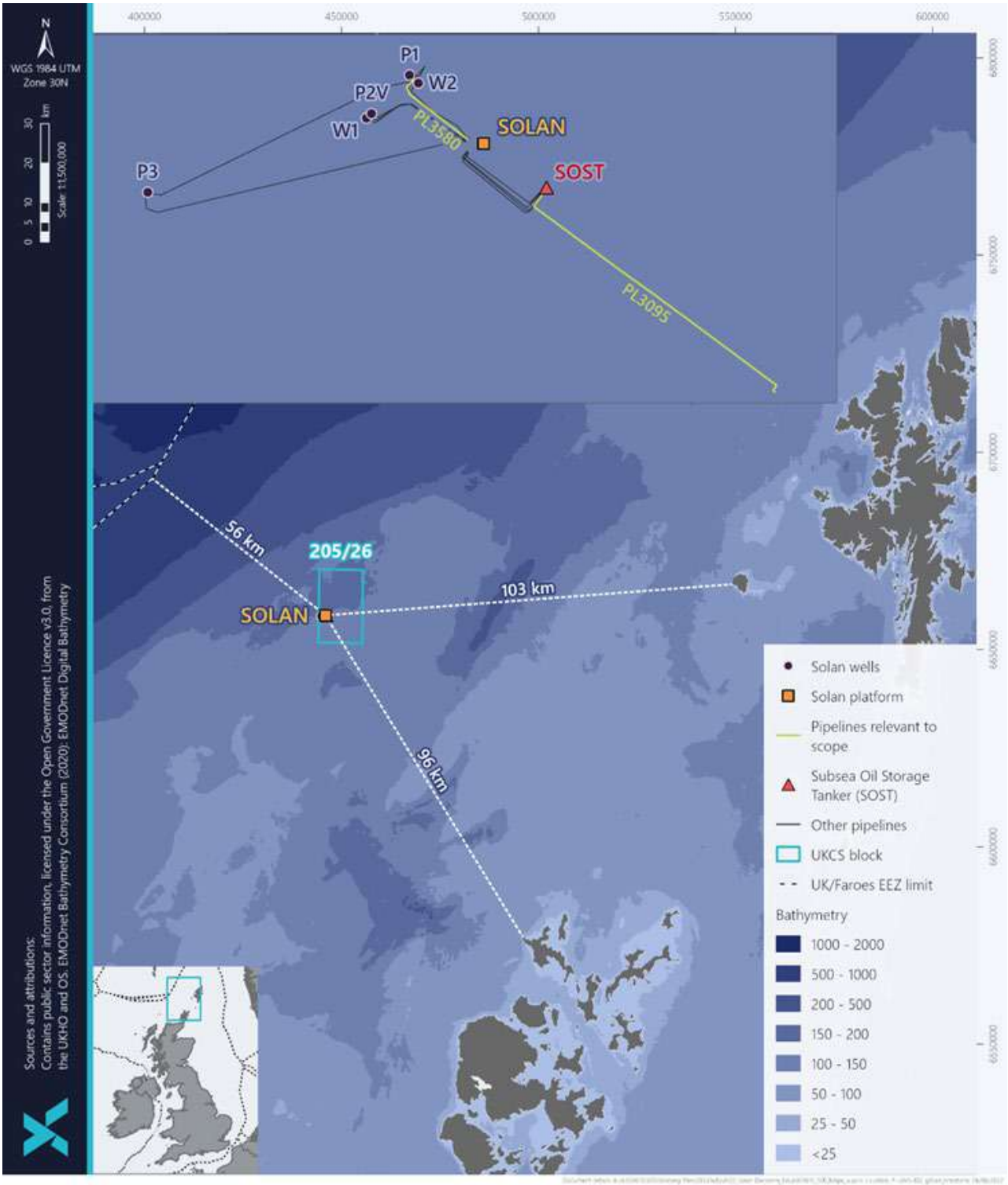

Figure 1.2.1 Location of Infrastructure

1.3 Schedule

Decommissioning activity in the Solan field is anticipated to commence in 2026 and will continue up to 2031. Ongoing monitoring surveys will extend beyond these timescales. The activity windows are subject to the acceptance of the DPs supported by this document and any unavoidable constraints (e.g., vessel availability) that may be encountered while executing the decommissioning activities.

1.4 Selected decommissioning options

Options to re-use the Solan associated installations and structures *in situ* for future hydrocarbon or alternative developments have been considered, but to date none have yielded a viable commercial opportunity. There is an implicit assumption that options for re-use of the pipelines have been exhausted before facilities and infrastructure move into the decommissioning phase and Comparative Assessment ('CA'). Therefore, the re-use option has been excluded from this assessment.

Given the uncertainty over the feasibility of re-use of the Solan associated installations and structures, there is no reason to delay decommissioning of the infrastructure in a way that is safe and environmentally and socio-economically acceptable (and the 'do nothing' approach to the infrastructure is thus rejected).

All surface and subsea structures (including concrete protection structures and grout bags) and surface laid pipelines, umbilicals and flowlines will be fully removed and any local excavations will be left to backfill naturally, with the exception of the pile excavations, which will be remediated via rock placement.

The following pipelines are buried under rock: PL3095 (204 m), PL3580, PL3583, PLU3585 (300 m, shared), PL3581, PL3582, PLU3586 (360 m, shared), PL4971 (916 m), and PLU4972 (1,196 m). The decommissioning methods for the associated buried flushed and cleaned pipeline infrastructure were assessed against each other in CA which looked at a number of full removal, partial removal and decommission *in situ* options. The emerging recommendation from the CA was that the overlying deposited rock will need to be dispersed to expose the underlying infrastructure, once exposed all infrastructure is to be completely removed and returned to shore.

1.5 Environmental and societal sensitivities

The key environmental and societal sensitivities in the project area are summarised in Table 1.5.1.

Table 1.5.1 Environmental and Societal Sensitivities

Conservation Interests and Sites
The closest protected site within a 40 km radius of the Solan field is the Faroe-Shetland Sponge Belt Nature Conservation Marine Protected Area ('NCMPA'), which is located approximately 22 km away. This has been designated for aggregations of the Oslo and Paris Convention OSPAR (2008) threatened and/or declining habitat of deep-sea sponges. It is also designated for offshore subtidal sands and gravels, presence of ocean quahog (*Arctica islandica)*, large-scale continental slope features, and features representative of the West Shetland Margin Paleo-depositional system Key Geodiversity area, including continental slope channels, iceberg plough marks, prograding wedges, slide deposits, sand wave fields, and sediment wave fields [35]. The West of Shetland Shelf NCMPA is located approximately 23 km away from the Solan field. The NC MPA has been designated for the wide variety of offshore subtidal sand and gravel habitats, which are classed as a United Kingdom Biodiversity Action Plan ('UKBAP') habitat of priority importance. The Seas off Foula Special Area of Conservation ('SPA') is located approximately 38 km from the Solan field. This site is designated as a protected area due to the high concentrations of seabirds which use the site for breeding and foraging. In particular, the

Table 1.5.1 Environmental and Societal Sensitivities
site is a breeding and foraging ground for a large population of great skuas. There are no Special Areas of Conservation ('SACs') within a 40 km radius of the Solan field. The nearest Annex I designated offshore conservation site is the Wyville Thomson Ridge SAC, located approximately 110 km to the southwest.
Conservation Species
Harbour porpoise, Atlantic white-sided dolphin, killer whale, minke whale and white-beaked dolphin have all been observed within the vicinity of the project. For all species but harbour porpoise, they are found in relatively low densities within the project area or have low abundance estimates. Harbour porpoises are common throughout the year within the vicinity of Solan in low densities [63]. The density of harbour porpoise in the project area is estimated to be 0.152 animals/km^2, which is relatively low compared to other areas of the UKCS. All of the cetacean species are both European Protected Species ('EPS') and are covered by the UK Biodiversity Action Plan ('UK BAP'). Neither grey nor harbour seals are expected to be present in significant numbers within the project area. Harbour seals are unlikely to occur in the area and grey seals may be present at low densities ranging between 0 and 5 individuals per 25 km^2. Norway pout, cod, saithe, sandeel and whiting are Priority Marine Feature ('PMF') species in offshore waters. Cod are also listed as vulnerable on the International Union for Conservation of Nature ('IUCN') Global Red List [65]. They use the project area as a nursery ground.
Benthic Environment
The sediments within Block 205/26 vary with the majority of sediment characteristic of sand and muddy sand (associated with the identified European Nature Information System ('EUNIS') biotope A5.27 'Offshore circalittoral sand'. The area also features coarse sediment in some parts (associated with EUNIS biotope A5.15 'Offshore circalittoral coarse sediment') [53]. Seabed sediments within the area are expected to comprise fine to coarse gravelly sand with cobbles and boulders, with the presence of Holocene sandy sediment to depths of around 0.8 m below the seabed and over-consolidated firm to hard glacial till at deeper depths [20]. Sparse benthic communities in relatively low abundances which were not uniform across the area were recorded. In total, 1,295 faunal individuals were collected during the survey, representing 163 taxa. Of the 163 taxa, 87 were polychaete annelids (bristle worms) accounting for 64% of the recorded individuals and 53% of the taxa. There were 29 crustacean taxa (crabs, shrimps etc.) and 24 mollusc taxa (bivalves and snails) identified [20].
Fish
Only Norway pout (*Trisopterus esmarkii*) and sandeel (*Ammodytidae spp*.) are likely to use the Solan area as spawning grounds. Additionally, the following species use the area as a nursery ground: anglerfish (*Lophius piscatorius*), blue whiting (*Micromesistius poutassou*), cod (*Gadus morhua*), European hake (*Merluccinus merluccinus*), herring (*Clupea harengus*) ling (*Molva molva*), mackerel (*Scomber scombrus*) Norway pout, sandeel, spurdog (*Squalus acanthias*) and whiting (*Merlangius merlangus*). The probability of juvenile fish aggregations occurring is the area is low for haddock (*elanogrammus aeglefinus*), whiting, Norway pout, herring, mackerel, blue whiting, anglerfish. Hake have a medium probability [1].

Table 1.5.1 Environmental and Societal Sensitivities
Seabirds
According to the density maps provided in Kober *et al.* (2010) [45], the following species have been recorded within the Solan field: northern fulmar, European storm-petrel (*Hydrobates pelagicus*), northern gannet (*Morus bassanus*), Arctic skua (*Stercorarius parasiticus*), great skua (*Stercorarius skua*), black-legged kittiwake, great black-backed gull (*Larus marinus*), lesser black-backed gull (*Larus fuscus*), herring gull (*Larus argentatus*), Iceland gull (*Larus glaucoides*), glaucous gull (*Larus hyperboreus*), common guillemot, razorbill (*Alca torda*) and Atlantic puffin (*Fratercula arctica*). The sensitivity of seabirds to oil pollution is shown below by the Seabird Oil Sensitivity Index [69]. SOSI identifies areas at sea where seabirds are likely to be most sensitive to surface pollution. SOSI is shown by UKCS Block. Solan sits within Block 205/26. Seabird sensitivity to oil within the area of the Solan infrastructure varies considerably throughout the year. For a large part for the year the sensitivity remains 'Low' to 'Medium', however within the months of October, November, December and January it jumps to 'high'. The risk of an oil spill from the proposed operations at the project area is considered remote and therefore the overall risk to birds is considered negligible.
Commercial Fishing
The Solan field infrastructure is located in International Council for the Exploration of the Seas ('ICES') Rectangle 49E6. This ICES Rectangle is predominantly targeted for demersal and pelagic species. However, proportionately the value of pelagic catch exceeds that of demersal species, with pelagic fisheries landing 82% of the total weight and 72% of the total value of fish landed in 2022. Comparatively, demersal species amounted to 18% of the total weight and 27% of the value. To put this into the wider regional context, the contribution of Rectangle 49E6 to total UK landings is moderate. In 2022, 481,398 Te of fish were caught in the UKCS, with a total value of £684,497,956. ICES Rectangle 49E6 alone contributed 4.1% of the live weight of fish caught across the UKCS and 4.2% of the value in that year (Figure 4.4.1). This is higher than for preceding years where the contribution to UKCS fisheries was typically lower [49]. In 2022 fishing effort in ICES rectangle 49E6 was highest in November and December, each accounting for 16% of the total number of days fished (967 days) [49]. The effort was the lowest throughout the year in June, accounting for 2% of the annual effort combined [49]. The main gear types used in Rectangle 49E6 are hooks and lines (approximately 532 days in 2022), and trawls (approximately 431 days in 2022).
Other Users
The Solan infrastructure is located within an area of oil and gas development. There are two oil and gas surface structures within 40 km of the project area, the closest being 15 km away. Shipping activity within Block 205/26 considered to be very low. There are two subsea telecommunication cables within close proximity to Solan. These are the disused TAT 10B West Section located approximately 13 km to the south-southwest and the active TAT 14 SEG Ka located 14 km to the south-southeast [44]. There are no active windfarms in the vicinity of Solan. The closest offshore windfarm is the TCE (Scotland) which is approximately 154 km to the south-southeast of Solan.

Table 1.5.1 Environmental and Societal Sensitivities
Block 205/26 has a Ministry of Defence ('MoD') licence restriction as it lies within training ranges [55]. This restriction is in relation to the siting of an installation that is fixed to the seabed, resting on the seabed, floating, intended for drilling or getting hydrocarbons, or involves injection of fluids. There are two known wrecks, as identified by Historic Environment Scotland ('HES') in November 2015, located approximately 2.5 km to the southwest and 4.2 km to the northeast of the Solan field [53]. There are no Historic MPAs, scheduled monuments (including wrecks) or war graves within the block [53].

1.6 Impact assessment

This EA Report has been prepared in line with the BEIS Guidance [3] and with Decom North Sea's EA Guidelines [11]. The BEIS 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 EA has been informed by several different processes, including the identification of potential environmental issues through environmental specialist review in an Environmental Identification ('ENVID') screening workshop and consultation with key stakeholders.

The impact assessment screening identified ten potential impact areas based on the proposed Solan decommissioning activities:

- Atmospheric emissions;
- Seabed disturbance;
- Physical presence of infrastructure decommissioned *in situ*;
- Physical presence of vessels in relation to other sea users;
- Underwater noise;
- Discharges to sea;
- Resource use;
- Waste;
- Disturbance to nesting seabird; and,
- Accidental events

Of these, the following two were screened in and taken forward for assessment based on the potential severity and/or likelihood of their respective environmental impact: seabed disturbance and disturbance to nesting seabirds.

Disturbance to seabed was investigated further for potential impacts due to the nature of the proposed activities and the location of the Solan area within proximity to conservation areas. The proposed decommissioning activities may impact a temporary (direct and indirect) area of 0.483 km^2 of seabed habitat, with an additional area of 0.028 km^2 of permanent impact associated with rock remediation. While the activities may result in the mortality of some individuals, many of the taxa within the Solan area are relatively resilient; sandy communities are comparatively quick to recover from disturbance. No decommissioning activity will be taking place in a protected area, therefore it is highly unlikely that any habitat or species of conservation interest will be directly or indirectly affected. With regards to the sediment and benthic features within area, the Solan activities are unlikely to affect the natural physical processes of the area. Overall, when considering the spatial and temporal scale of the disturbance, and accounting for the following mitigation measures, the impact of the decommissioning on the seabed was considered **not significant**.

- Cutting and lifting operations will be controlled by a remotely operated vehicle ('ROV') to ensure accurate placement of cutting and lifting equipment and minimise any impact on seabed sediment;
- The requirements for further excavation will be assessed on a case-by-case basis and will be minimised to provide access only where necessary. Internal cutting will be used preferentially where access is available;
- Heavy lift vessels are most likely to be equipped with dynamic positioning rather than relying on anchors to remain in position which interact with the seabed;
- The rock mass will be carefully placed over the designated areas of the pipelines and seabed by the use of an ROV. This will control the profile of the rock covering and accurate placement of rock over the pipeline and on the seabed to ensure rock is only placed within the planned footprint with minimal spread over adjacent sediment, minimising seabed disturbance;
- The profile of the rock-placement over the pipeline ends will allow fishing nets to trawl over the rock unobstructed. Suitably graded rock will be used to minimise the risk of snagging fishing gear;
- Survey data collected in the area will be reviewed for potential sensitive seabed habitats prior to the commencement of operations; and
- Post decommissioning debris clearance, surveys and monitoring shall be carried out using non-intrusive methodologies such as side scan sonar, using ROVs etc.

Disturbance to nesting seabirds was scoped in owing to current stakeholder and regulatory interest. Legislative expectations and requirements determine the protection of wild birds, their eggs and nests in the offshore marine area, including offshore marine installations. Future surveys are proposed by Premier and will be conducted prior to the commencement of decommissioning activities early in the breeding season (during Q2), the results of which will indicate bird presence/absence thereby informing subsequent mitigations and discussions with OPRED. Premier will, if required, outline any proposed methods of surveillance and deterrence in a bird management strategy. The overall impact of decommissioning activities on nesting seabirds is currently considered **not significant** and should this outcome change in the wake of future survey effort, this will be communicated to OPRED.

1.7 Conclusions

This EA has considered the relevant Marine Plans, adopted by the UK Government to help ensure sustainable development of the marine area. Premier consider that the proposed decommissioning activities are in alignment with its objectives and policies.

Having reviewed the project activities within the wider regional context and taking into consideration the mitigation measures to limit any potential impacts, the findings of this EA conclude that the activities do not pose any significant threat to environmental or societal receptors within the UKCS.

2 Introduction

2.1 Background

The Solan field is operated by Premier Oil UK Limited ('Premier'), which is a subsidiary of Harbour Energy plc. Harbour Energy plc was formed through an all-share merger between Premier Oil plc and Chrysaor Holdings Limited on the 31st March 2021.

The Solan field is situated West of Shetland ('WoS') in Block 205/26a of the UKCS, approximately 129 km west of the main island of Shetland and 165 km north of mainland Scotland. In accordance with the Petroleum Act 1998, Premier is applying to the Department for Energy Security and Net Zero ('DESNZ'), formerly the Department for Business, Energy and Industrial Strategy ('BEIS'), to obtain approval for decommissioning the Solan associated surface installation, subsea infrastructure, pipelines and associated structures and protection / stabilisation materials.

This Environmental Appraisal ('EA') has been conducted to assess the potential environmental impacts that may result from undertaking the decommissioning activities as part of the decommissioning of the Solan platform and associated Solan Subsea Oil Storage Tank ('SOST'), Single Anchor Loading ('SAL'), Wellhead Protection Structures ('WHPSs'), pipelines, flowlines, umbilicals and protective materials. This EA supports the combined Decommissioning Programmes ('DPs') submitted to Offshore Petroleum Regulator for Environment and Decommissioning ('OPRED'), under DESNZ.

2.2 Overview of the infrastructure

This section provide an overview of the Solan infrastructure. The Solan facility comprises a jacket substructure, topsides facilities, a SOST and a SAL. Oil is produced via the SOST which is used to store the crude prior to export via the SAL offloading hose and then via a Dynamically Positioned shuttle tanker. The offloading hose is laid on the seabed with a pennant line and buoy to allow recovery to surface when required. An overview of the field layout is shown in Figure 2.2.1.

Solan uses natural reservoir depletion assisted by water injection for pressure support and artificial lift (Electrical Submersible Pumps ('ESP')) to improve production rates. Injection water is supplied by ballast water from the SOST and filtered seawater. Produced oil from the Solan field is separated and metered in the facilities on the platform and collected in the SOST prior to being transferred to tanker for export. The produced gas is used as fuel gas for on-board power generation and surplus gas flared. Produced water is treated and discharged to sea. During periods of water injection downtime and when production is constrained, ballast water is cleaned and discharged to sea via the sea water caisson.

The Solan platform itself comprises an integrated topsides supported by a symmetrical 4-legged jacket substructure anchored to the seabed using a total of 16 piles, four at each leg. The jacket itself is 158.5 m high, measuring 20 m x 20 m at the top and 45 m x 45 m at the base.

Production wells P1 and P2 each export directly to the Solan platform using flexible flowlines PL3580 and PL3581 respectively. The Solan platform provides seawater for water injection to well W1 and W2 using flexible flowlines PL3582 and PL3583 respectively. Solan provides electrical power, chemicals, and hydraulic fluids to well P1 and well P2 using umbilicals PLU3585 and PLU3586 respectively, and from the Subsea Umbilical Termination Unit (SUTU) and controls to W2 (nearest well P1) and W1 (nearest well P2) using jumpers PLU3585JW2 and PLU3586JW1. Over time, the electrical and communication components of both PLU3586 and PLU3586JW1 were found to be damaged and so they were partly disconnected and replaced by PLU4204 and PLU4205, PLU4206, PLU4207, PLU4208 and PLU4209.

Production from well P3 is sent to well P1 using flexible flowline PL4971, and onwards to the Solan platform. The controls for the well P1 wing valve and the electrical submersible pump serving well P3 are interlocked so that production from P1 and P3 to Solan cannot occur simultaneously. The Solan platform provides electrical power, chemicals, and hydraulic fluids to well P3 using PLU4972 that is routed to the local SUTU and distributed to the various connection points at the wellhead using umbilical jumpers and electrical or hydraulic fly leads (PL4973, PL4974, PL4975, PLU4976 and PL4977).

The produced crude oil is exported from the Solan platform to the SOST using flexible flowline PL3578. As oil accumulates from the top of the SOST, the ballast water is displaced from the bottom of the tank back to the platform using flexible flowline PL3579. Periodically, crude oil is exported from the SOST to an oil tanker via the SAL using the displacement method. This involves pumping seawater from the Solan platform using PL3094 into the SOST, forcing the oil out of the storage tank towards the tanker using PL3095. Solan provides electrical power, chemicals, and hydraulic fluids to the control valves at the SOST using PLU3584. This is routed from the platform through a dedicated J tube.

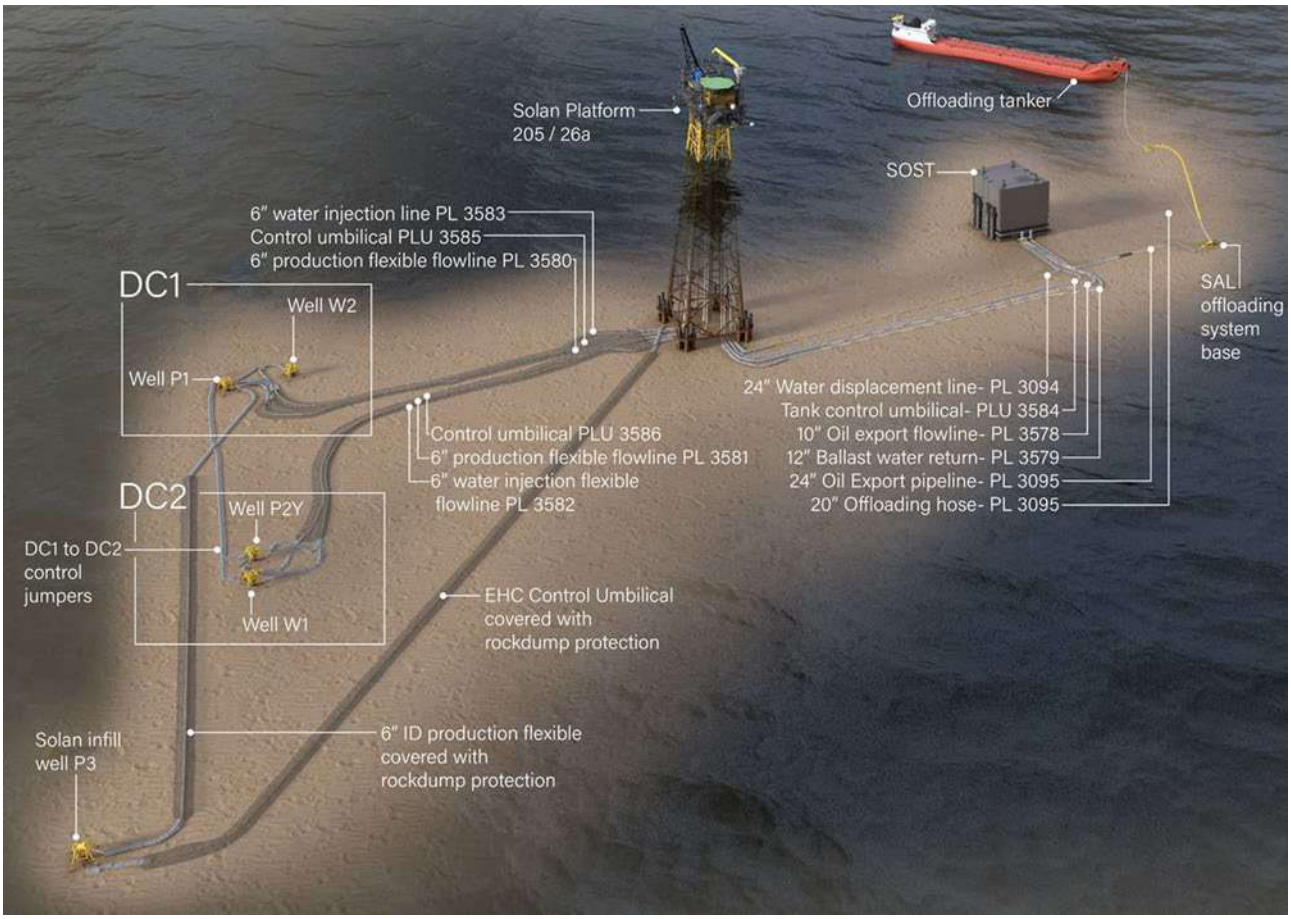

Figure 2.2.1 Solan Development Project Layout

2.3 Regulatory context

The Petroleum Act 1998 (as amended by the Energy Act 2008) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the UKCS. The responsibility for ensuring compliance with the Petroleum Act 1998 rests with DESNZ and is managed through its regulatory body OPRED. OPRED is also the Competent Authority on decommissioning in the United Kingdom ('UK') for OSPAR purposes and relevant legislation. The Petroleum Act requires the operator of an offshore installation or pipeline to submit a draft Decommissioning Programme for statutory and public consultation, and to obtain approval of the DPs from the Secretary of State, deferring to OPRED before initiating decommissioning work. The DPs outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place. Well decommissioning is determined under a different process to the DPs, called Well Operations Notification System ('WONS').

Formal Environmental Impact Assessment ('EIA') to support the DPs is not explicitly required under existing UK legislation. However, the primary guidance for offshore decommissioning that was updated and published by BEIS in 2018 [3], detailed the need for an EA to be submitted in support of the DPs. The guidance describes a proportionate EA process that culminates in a streamlined EA Report, which focuses on screening out of non-significant impacts and presents a detailed assessment of potentially significant impacts. This EA has been written in light of the BEIS 2018 [3] guidance and the 2018 Decom North Sea EA guidance [11].

In terms of activities in the Northern North Sea ('NNS'), the Scottish National Marine Plan ('NMP') has been adopted by the Scottish Government to help ensure sustainable development of the marine area. The NMP has been developed in line with UK, European Union ('EU') and OSPAR legislation, directives and guidance. The NMP states that '*where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage ('CCUS'), 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*' [64]. As part of the conclusions to this assessment (Section 6), Premier demonstrates due consideration to the NMP during project decision making and the interactions between the project and NMP.

2.4 Scope of the Environmental Appraisal

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

2.5 Stakeholder Engagement

Engagement with stakeholders is an important part of the decommissioning process as it enables the issues and concerns of stakeholders to be incorporated into the EA and presented within the DPs, where applicable, and acted upon during the subsequent planning and implementation stages of the project.

Formal stakeholder consultation will begin with the submission of the draft DPs, supported by this EA report, to OPRED.

2.6 Environmental Appraisal process

To evaluate the potential environmental impact of the proposed DPs on the environment, an EIA process is conducted in accordance with the Offshore Oil and Gas Exploration, Production, Unloading and Storage (Environmental Impact Assessment) Regulations 2020. This EA documents the results of the EIA process and is used to communicate the process. An overview of the EIA process is provided in Figure 2.6.1. A detailed methodology is provided in Appendix A: EA Method.

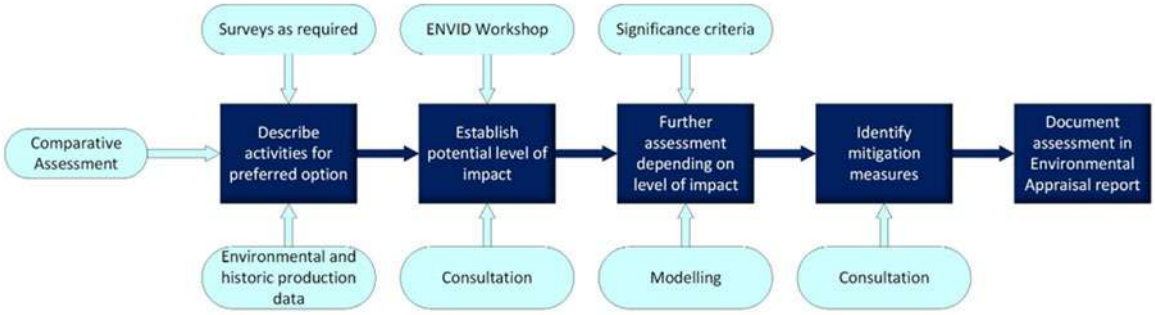

Figure 2.6.1 EA Process

3 Project Description

This section outlines the infrastructure being decommissioned as part of the Solan field decommissioning (covered by this EA) and describes the manner in which the assets will be removed. Details on both Pipeline crossings and Well information can be found within Appendix B: Pipeline Crossing and Well Information.

3.1 Surface installation

The Solan surface installation consists of the Solan platform comprising topsides and jacket (Figure 3.1.2). The Solan jacket is a 4-legged steel pile structure anchored to the seabed using a total of 16 piles, 4 piles per leg. The jacket comprises plan bracing levels at EL. 10.000, EL. -16.000, EL- 43.000, and EL. -71.000, EL. -100.000, and El. -131.500 (Figure 3.1.1).

Above the jacket, the topsides consist of a steel, single lift, integrated deck structure on four main levels – Emergency Shutdown Valve ('ESDV') deck, cellar deck, mezzanine deck and weather deck including helideck, crane, and flare. It is supported directly by the jacket substructure and consists of oil separation facilities, gas separation to fuel gas facilities, utilities and power generation, accommodation for 40 personnel, safety equipment and a helideck. The overall dimensions of the topsides are 44 m long x 20 m wide x 17.5 m high. The interface between the topsides structure and jacket structure is located at elevation +27.000 m. The topsides' mass is 5,204 Te.

Table 3.1.1 Surface installations & stabilisation

Description	Facility type	Location	Topsides / facilities		Jacket (if applicable)		
		WGS84 Decimal WGS84 Decimal Minute	Mass (Te)	Modules	Mass (Te)	No. of legs, piles	Mass of piles (Te)
Solan platform	Fixed steel jacket	60.06158° N 03.97121° W 60° 03.695' N 03° 58.273' W	5,204	1	7,981	4, 16	7,566

NOTES

1. Mass of piles includes full length of 16x piles varying in diameter and wall thickness from 2380Ø105WT to 2420Ø85, nominal length 80 m.

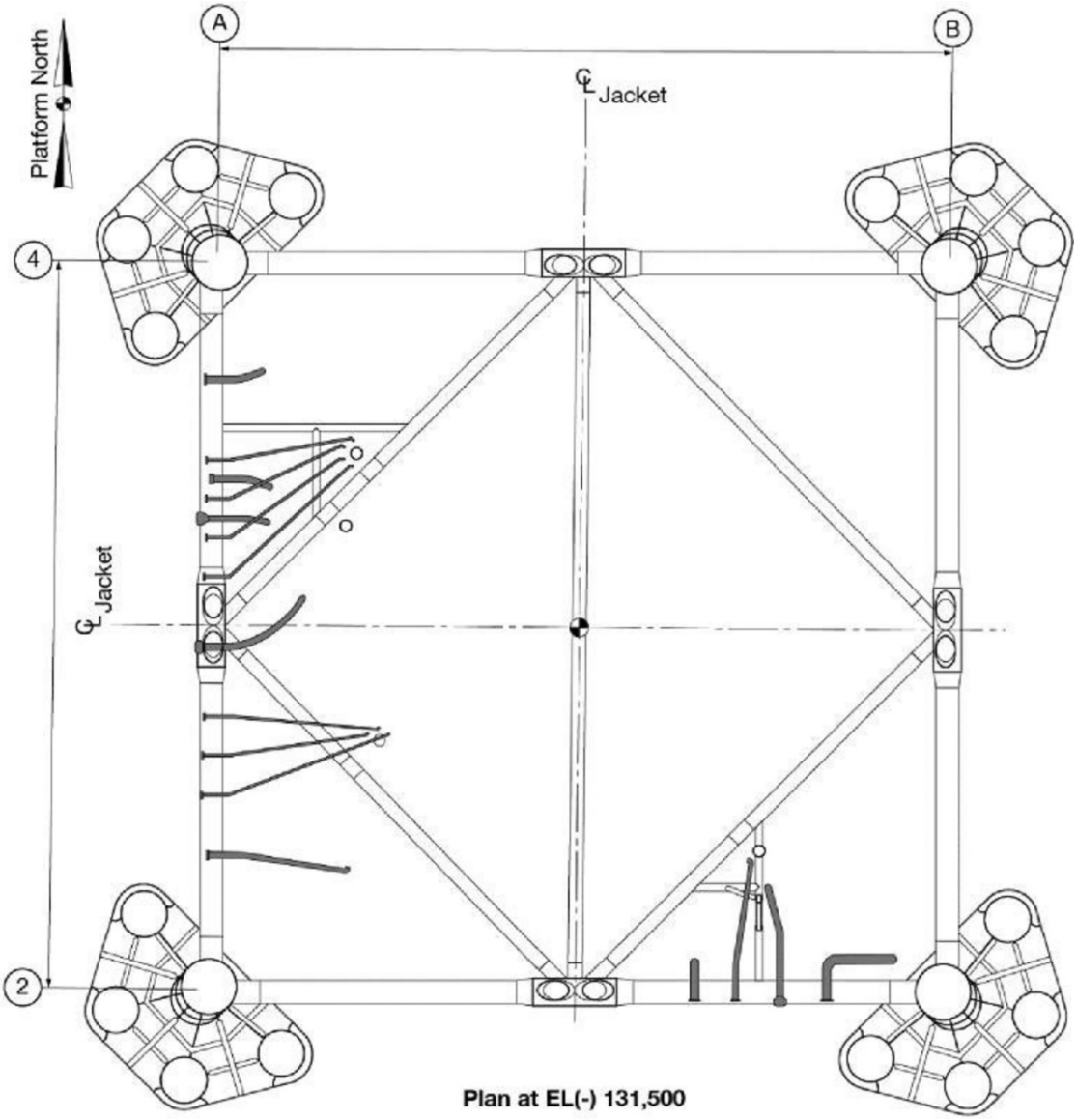

Figure 3.1.1 Solan jacket composite view showing risers, caissons j-tubes and mudmats

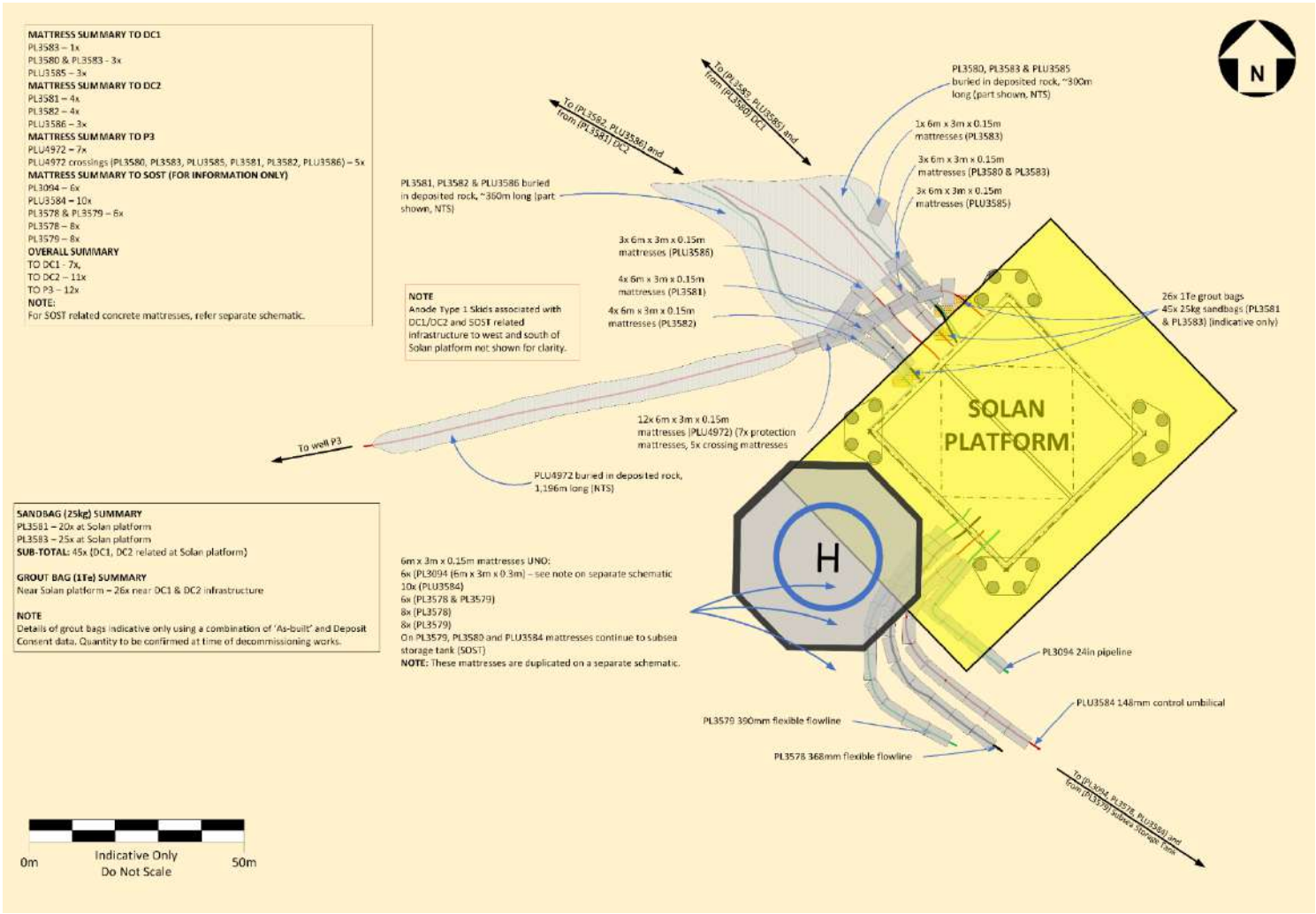

Figure 3.1.2 Solan platform approach schematic

3.2 Subsea Infrastructure

The Solan subsea installations comprise of the SOST and P1, P2, P3, W1 and W2 WHPS, as well as two wet-stored trash caps. A summary of the subsea installations and stabilisation features can be seen in Table 3.2.1 and within Figure 3.3.1, Figure 3.3.2, Figure 3.3.3 and Figure 3.4.1.

Table 3.2.1 Solan subsea installation information

Subsea installations incl. stabilisation features	No.	Mass (Te) / Size (m)	Location: WGS84 Decimal	Location: WGS84 Decimal Minute	Comments / status
SOST [Note 1]	1	14,040 55x45x25	60.06017° N 03.96617° W	60° 03.610' N 03° 57.970' W	8 x piles (2420 Ø85) 68m long.
Prod. well P1 WHPS	1	20.8 7.9x7.9x4.9	60.06388° N 03.97540° W	60° 03.833' N 03° 58.524' W	Not piled. Mass & overall height estimated.
Prod. well P2 WHPS	1	28.7 9.3x8.8x6.9	60.06259° N 03.97792° W	60° 03.755' N 03° 58.675' W	Not piled.
Prod. well P3 WHPS	1	13.0 6.1x5.7x4.6	60.05985° N 03.99278° W	60° 03.591' N 03° 59.567' W	Not piled.
WI well W1 WHPS	1	13.6 7.9x7.9x4.9	60.06242° N 03.97825° W	60° 03.745' N 03° 58.695' W	Not piled. Mass & overall height estimated.
WI well W2 WHPS	1	28.7 9.3x8.8x6.9	60.06362° N 03.97480° W	60° 03.817' N 03° 58.488' W	Not piled.
Trash Cap W1 [Note 4]	1	7 4.4x4.4x4.2	60.06253° N 03.97843° W	60° 03.752' N 03° 58.706' W	Not piled.
Trash Cap W2 [Note 4]	1	7 4.4x4.4x4.2	60.06408° N 03.97534° W	60° 03.845' N 03° 58.521' W	Not piled.

NOTES

1. Mass includes mass of piles (3,390 Te) as well as allowances for residual sediments inside the tank compartments.
2. These figures exclude marine growth. Marine growth might typically amount to ~5% of the overall mass of the SOST (744 Te) and 10% of the overall mass of a subsea installation: WHPS (∑10.5 Te).
3. All WHPS are integrated with the Xmas trees.
4. Following completion of the development drilling campaign in 2015, these trash caps were wet-stored within the DC1 and DC2 drill centre 500m zones for recovery at the time of field decommissioning.

3.3 Pipelines

The pipelines, umbilicals and flowlines included within the scope of this EA are listed below in Table 3.3.1 and within Figure 3.3.1, Figure 3.3.2 and Figure 3.3.3.

Table 3.3.1 Solan pipeline/flowline/umbilical information

Description	Pipeline number (as per PWA)	Diameter (NB) (inches)[1]	Length (m)	Description of component parts	Product conveyed	From – To End points	Burial status	Pipeline status	Current content
24 in tank displacement pipeline	PL3094	24	546	Steel pipeline coated in 3LPP. Neoprene coated riser 116m long. Main pipeline 263m long CWC.	Treated seawater	Solan platform to SOST	Part connected to jacket and part laid on seabed. Concrete mattresses distributed along its length.	Operational	As product conveyed
24/20 in oil export pipeline & offloading hose	PL3095	24/20	1,521	Steel pipeline coated in 3LPP. Main pipeline 1100m long CWC. 20in offloading hose 276m long connected to SAL.	Stabilised crude oil	SOST to tanker offloading connection via SAL	Part laid on the seabed and part suspended in the water column. Part buried in rock 204m long.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
10 in oil export flowline	PL3578	368mm	602	Composite flexible flowline 421m long with riser 172m long and tie-in spools.	Stabilised crude oil	Solan platform to SOST	Part connected to jacket and part laid on seabed.	Operational	As product conveyed
12 in water ballast flowline	PL3579	390mm	613	Composite flexible flowline 437.2m long with tie-in spools. Splits into 2x caissons 55m long at the Solan platform.	Treated seawater	SOST to Solan platform	Part connected to jacket and part laid on seabed.	Operational	As product conveyed
Well P1 6 in production flowline	PL3580	268mm	538	Composite flexible flowline 360m long with riser 165m long and tie-in spools. Riser and tie-in spools coated in 28mm Vikotherm II	Produced fluids	Well P1 to Solan platform	Part connected to jacket and part laid on seabed. Part buried under rock 300m long.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P2 6 in production flowline	PL3581	268mm	596	Composite flexible flowline 416m long with riser 166m long and tie-in spools. Riser and tie-in spools coated in 28mm Vikotherm II	Produced fluids	Well P2 to Solan platform	Part connected to jacket and part laid on seabed. Part buried under rock 360m long.	Operational	As product conveyed
Well W1 6 in water injection flowline	PL3582	268mm	612	Composite flexible flowline 435m long with riser 164m long and tie-in spools. Riser and tie-in spools coated in 28mm Vikotherm II	Treated seawater	Solan platform to well W1	Part connected to jacket and part laid on seabed. Part buried under rock 300m long.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well W2 6 in water injection flowline	PL3583	268mm	577	Composite flexible flowline 371m long with riser 193m long and tie-in spools. Riser and tie-in spools coated in 28mm Vikotherm II	Treated seawater	Solan platform to well W2	Part connected to jacket and part laid on seabed. Part buried under rock 300m long.	Operational	As product conveyed
SOST control umbilical	PLU3584	148mm	584	Umbilical manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Solan platform to SOST	Part connected to jacket and part laid on seabed.	Operational	As product conveyed
Well P1 control umbilical	PLU3585	176mm	538	Umbilical manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Solan platform to well P1	Part connected to jacket and part laid on seabed. Part buried under rock 300m long.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P2 control umbilical	PLU3586	176mm	594	Umbilical manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Solan platform to well P2	Part connected to jacket and part laid on seabed. Part buried under rock 360m long.	Operational	As product conveyed
Well W2 control umbilical jumper	PLU3585JW2	n/a	40	Tied hose bundle manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Well P1 to well W2	Laid on seabed covered by mattresses.	Operational	As product conveyed
Well W1 control umbilical jumper	PLU3586JW1	n/a	40	Tied hose bundle manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Well P2 to well W1	Laid on seabed covered by mattresses.	Operational	As product conveyed
Replacement electrical umbilical	PLU4204	25mm	233	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	SUTU to Umbilical Junction Box 1	Laid on seabed, covered by mattresses and buried under rock.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P2 replacement electrical umbilical jumper	PLU4205	25mm	50	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Umbilical Junction Box 1 to well P2	Laid on seabed covered by mattresses.	Operational	As product conveyed
Well W1 replacement electrical umbilical jumper	PLU4206	25mm	50	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Umbilical Junction Box 1 to well W1	Laid on seabed covered by mattresses.	Operational	As product conveyed
Replacement electrical umbilical	PLU4207	25mm	233	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	SUTU to Umbilical Junction Box 2	Laid on seabed, covered by mattresses and buried under rock	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P2 replacement electrical umbilical jumper	PLU4208	25mm	50	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Umbilical Junction Box 2 to well P2	Laid on seabed covered by mattresses	Operational	As product conveyed
Well W1 replacement electrical umbilical jumper	PLU4209	25mm	50	Electrical umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Umbilical Junction Box 2 to well W1	Laid on seabed covered by mattresses	Operational	As product conveyed
Well P3 6in flexible flowline	PL4971	244mm	1,097	Composite flexible flowline 1094m long with tie-in spools. Tie-in spools coated in 3mm EDPM 30mm GSPU	Produced fluids	Well P3 to well P1	Laid on seabed, covered by mattresses and buried under rock.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P3 control umbilical	PLU4972	205mm	1,463	Umbilical manufactured from composite materials, steel & copper	Hydraulic oil, chemicals, electrical signals, and power	Solan platform to well P3 SUTU	Laid on seabed, covered by mattresses and buried under rock.	Operational	As product conveyed
Well P3 1in electrical fly lead	PL4973	25mm	15	Umbilical manufactured from composite materials, steel & copper	Electrical power	Well P3 SUTU to well P3	Laid on seabed adjacent to WHPS Part protected by concrete mattresses.	Operational	As product conveyed
Well P3 1in electrical & communications fly lead	PL4974	25mm	20	Umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Well P3 SUTU to well P3	Laid on seabed adjacent to WHPS. Part protected by concrete mattresses.	Operational	As product conveyed
Well P3 2in electrical & communications fly lead	PL4975	56mm	20	Umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Well P3 SUTU to well P3	Laid on seabed adjacent to WHPS. Part protected by concrete mattresses.	Operational	As product conveyed

Table 3.3.1 Solan pipeline/flowline/umbilical information									
Description	**Pipeline number (as per PWA)**	**Diameter (NB) (inches)[1]**	**Length (m)**	**Description of component parts**	**Product conveyed**	**From – To End points**	**Burial status**	**Pipeline status**	**Current content**
Well P3 6in hydraulic fluids fly lead	PLU4976	157mm	16	Umbilical manufactured from composite materials, steel & copper	Hydraulic oil	Well P3 SUTU to well P3	Laid on seabed adjacent to WHPS. Part protected by concrete mattresses.	Operational	As product conveyed
Well P3 1in electrical & communications fly lead	PL4977	25mm	15	Umbilical manufactured from composite materials, steel & copper	Electrical signals and power	Well P3 SUTU to well P3	Laid on seabed adjacent to WHPS. Part protected by concrete mattresses.	Operational	As product conveyed

NOTES

1. If diameter is expressed in mm it refers to outside diameter of flowline or umbilical.
2. Reference PWA 7/W/13 varied by 86/V/14, 82/V/17, and 109/V/20.

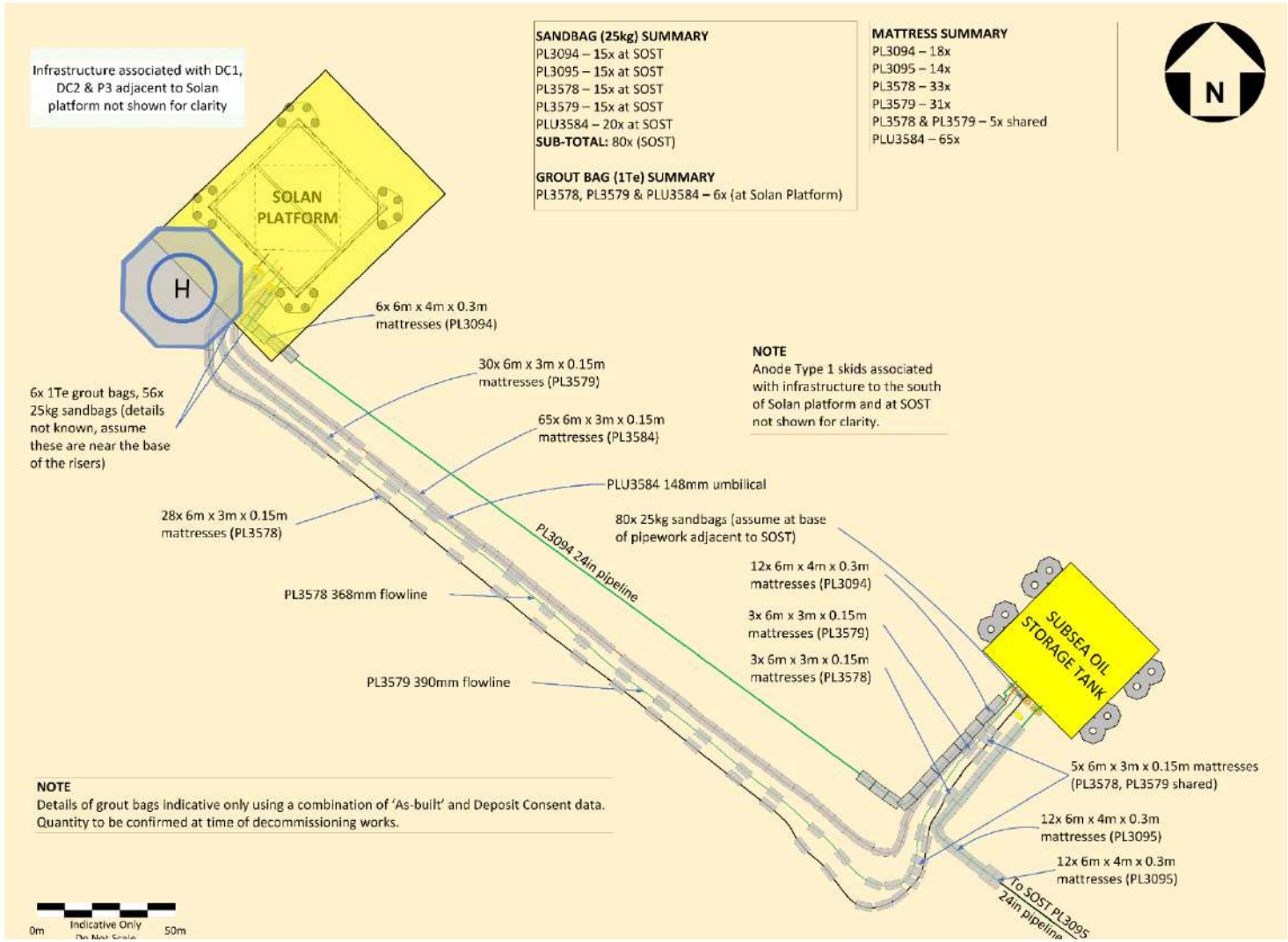

Figure 3.3.1 Solan platform and SOST infrastructure schematic

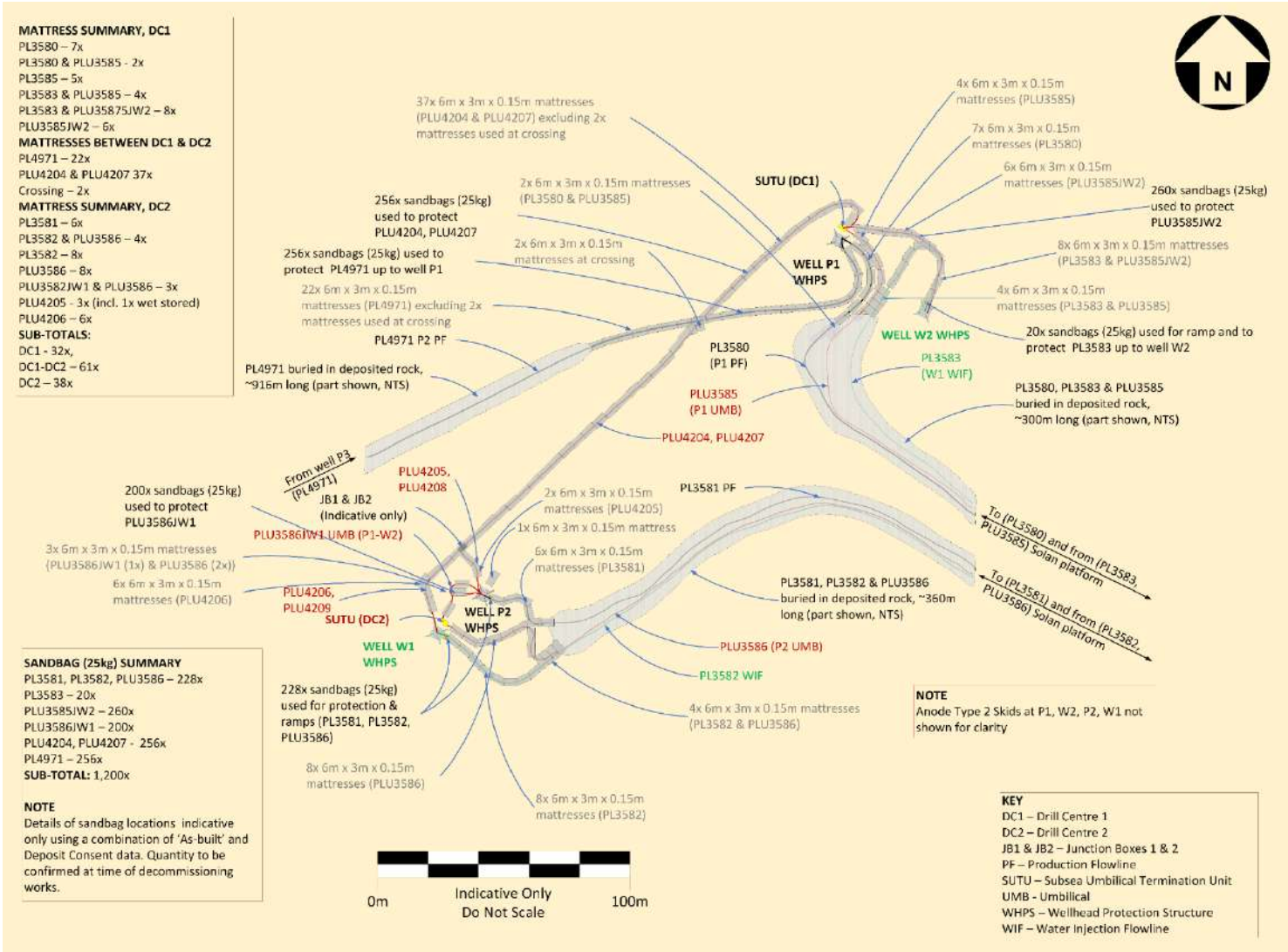

Figure 3.3.2 Infrastructure between DC1 and DC2 and on approaches

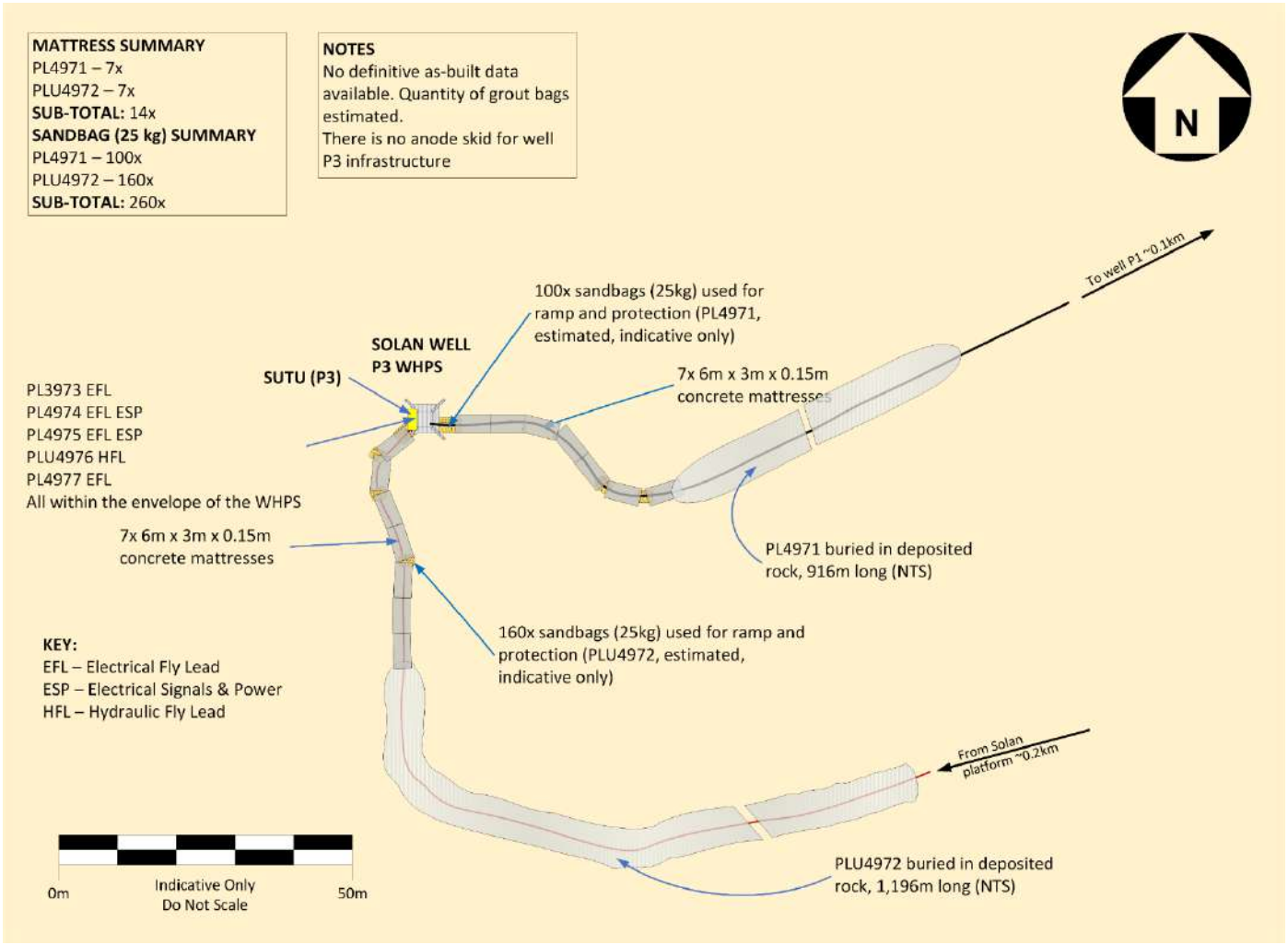

Figure 3.3.3 Infrastructure on approach to well P3

3.4 Pipeline Structures

This section presents the pipeline structures information that are present within the Solan field. A summary of the protection and stabilisation features can be seen in Table 3.4.1 and within Figure 3.4.1.

Table 3.4.1 Solan subsea pipeline structure information

Subsea pipeline structures incl. stabilisation features	No.	Mass (Te) / Size (m)	Location: WGS84 Decimal	Location: WGS84 Decimal Minute	Comments / status
SAL	1	218.8 12x5x4.2	60.05340° N 03.95043° W	60° 03.204' N 03° 57.026' W	SAL anchored to seabed using 1x pile 1835Ø51, 20.3m long.
SAL hose pick-up system	1	118.9 205x0x0	60.05340° N 03.95043° W	60° 03.204' N 03° 57.026' W	Mass excludes the mass of upper and lower hoses that form part of PL3095.
Anode skids at Solan platform	2	1.2 (each) 2.3x2.3x0.5	60.06158° N 03.97121° W	60° 03.695' N 03° 58.273' W	South & west of Solan platform (Type I skid).
Anode skid at SOST	1	1.2 2.3x2.3x0.5	60.06017° N 03.96617° W	60° 03.610' N 03° 57.970' W	At SOST (Type I skid).
Anode skid at well P1	1	0.6 2.3x1.1x0.5	60.06388° N 03.97540° W	60° 03.833' N 03° 58.524' W	At well P1 (Type II skid).
Anode skid at well P2	1	0.6 2.3x1.1x0.5	60.06259° N 03.97792° W	60° 03.755' N 03° 58.675' W	At well P2 (Type II skid).
Anode skid at well W1	1	0.6 2.3x1.1x0.5	60.06242° N 03.97825° W	60° 03.745' N 03° 58.695' W	At well W1 (Type II skid).
Anode skid at well W2	1	0.6 2.3x1.1x0.5	60.06362° N 03.97480° W	60° 03.817' N 03° 58.488' W	At well W2 (Type II skid).

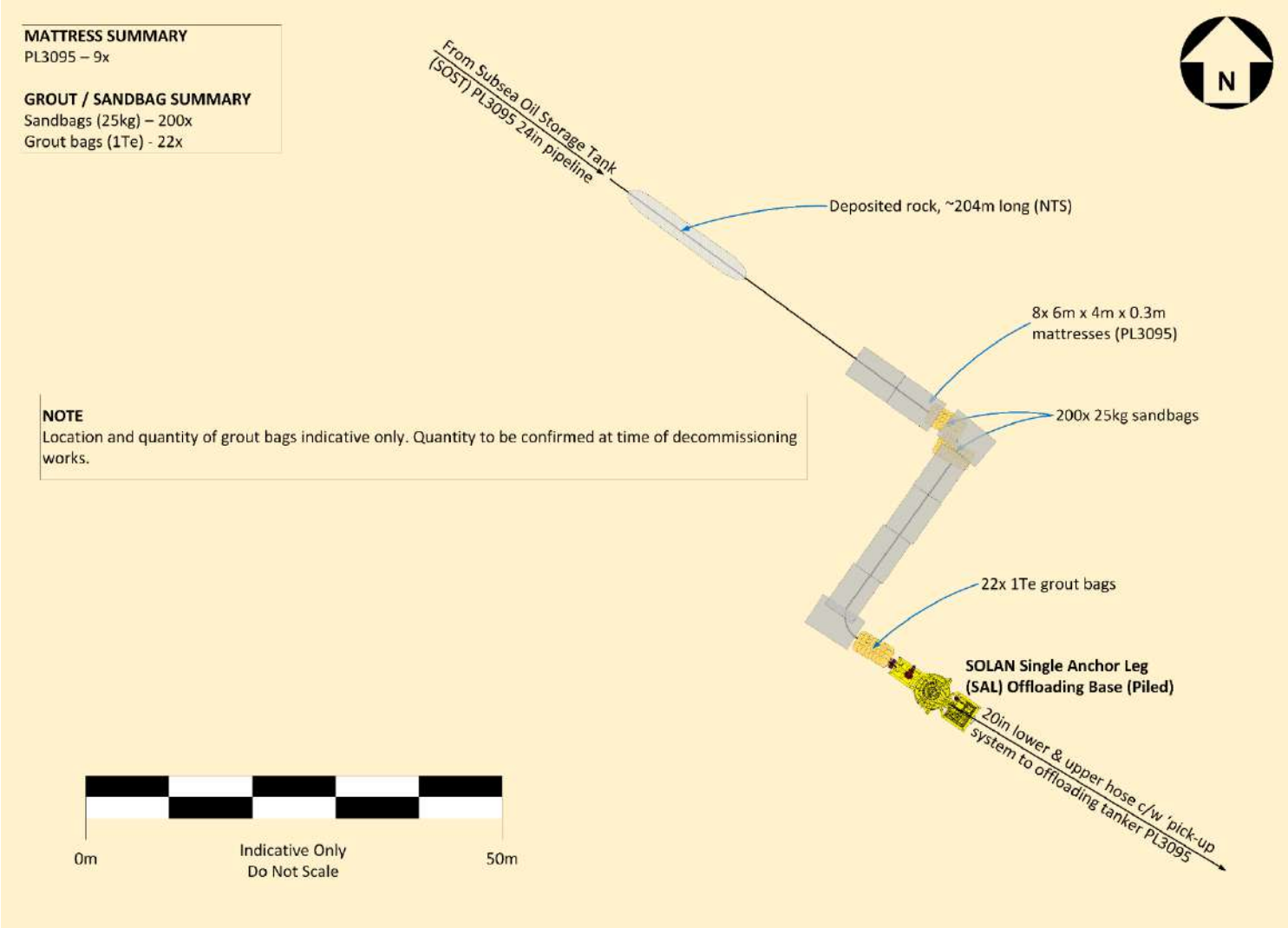

Figure 3.4.1 SAL approach schematic

3.5 Pipeline protection and stabilisation features

This section presents all protection and stabilisation features that are being decommissioned as part of the Solan field decommissioning. A summary of the protection and stabilisation features can be seen in Table 3.5.1.

Table 3.5.1 Solan pipeline protection & stabilisation features

Stabilisation Feature	Total Number	Total Mass (Te)	Location	Exposed/Buried/Condition
FLOWLINE & UMBILICAL PROTECTION FOR DC1, DC2 & WELL P3 INFRASTRUCTURE AT SOLAN PLATFORM				
Concrete mattresses (6 m x 3 m x 0.15 m)	30	147	Infrastructure for DC1, DC2 and well P3 at Solan platform.	Likely exposed, on the seabed. Burial status will be confirmed at the time of decommissioning works.
25 kg sand or grout bags	273	6.8		
1 Te grout bags	26	26		
PIPELINE PROTECTION INFIELD BETWEEN SOLAN PLATFORM, SOST & SAL				
Concrete mattresses (6 m x 3 m x 0.15 m)	134	656.6	Infrastructure between Solan platform, SOST and SAL.	Likely exposed, on the seabed. Burial status will be confirmed at the time of decommissioning works.
Concrete mattresses (6 m x 3 m x 0.3 m)	6	70.7		
Concrete mattresses (6 m x 4 m x 0.3 m)	34	400.5		
25 kg sand or grout bags	280	7.0		
1 Te grout bags	32	32.0		
PIPELINE PROTECTION AT DC1 (WELL P1/W2), DC2 (WELL P2/W1) AND WELL P3				
Concrete mattresses (6 m x 3 m x 0.15 m)	145	710.5	Infrastructure at and in-between DC1, DC2 and at well P3.	A few mattresses are buried under rock, but otherwise the protection and stabilisation features will likely be exposed, on the seabed.
25 kg sand or grout bags	1,232	30.8		
DEPOSITED ROCK				
Deposited rock	204 m	14,383	Between Solan SOST & SAL on PL3095.	Likely exposed, on the seabed. Burial status will be
Deposited rock	300 m	4,228	Between Solan platform and DC1 on PL3580, PL3583, PLU3585.	

Table 3.5.1 Solan pipeline protection & stabilisation features				
Stabilisation Feature	**Total Number**	**Total Mass (Te)**	**Location**	**Exposed/Buried/Condition**
Deposited rock	360 m	5,117	Between Solan platform and DC2 on PL3581, PL3582, PLU3586.	confirmed at the time of decommissioning works.
Deposited rock	916 m	12,562	Between well P2 and well P1 on PL4971.	
Deposited rock	1,196 m	6,935	Between Solan platform and well P3 on PLU4972.	

3.6 Consideration of alternatives and selected approach

3.6.1 Decision-making approach

3.6.1.1 Surface Installations

As a Contracting Party of OSPAR, the UK has agreed to implement OSPAR Decision 98/3, which prohibits leaving offshore installations wholly or partly in place. The legal requirement for Operators to comply with the OSPAR Convention is affected through the Petroleum Act 1998 (as amended by the Energy Act 2008), the BEIS Guidance for which outline the expectations of the UK regulator in terms of complying with the relevant OSPAR decisions. OSPAR Decision 98/3 states that the topsides of all installations should be returned to shore and that all jackets with a weight of less than 10,000 Te are completely removed for reuse, recycling or final disposal on land. The Solan jacket weighs less than 10,000 Te (excluding footings), therefore in compliance with OSPAR Decision 98/3, the topsides and jackets of these installations will be fully removed and transported onshore to an appropriate recycling and disposal facility where the waste materials will be handled in accordance with the Waste Framework Directive.

3.6.1.2 Subsea infrastructure

The latest BEIS Guidance (2018) states that subsea installations (e.g. drilling templates, wellheads and their protective structures, production manifolds and risers) must, where practicable, be completely removed for reuse or recycling or final disposal on land [3]. Any piles used to secure such structures in place should be cut below natural seabed level at such a depth to ensure that any remains are unlikely to become uncovered. Should an Operator wish to make an application to leave in place a subsea installation because of the difficulty of removing it, justification in terms of the environmental, technical or safety reasons would be required. With regards to pipelines (including flowlines and umbilicals), these should be considered on a case-by-case basis. The guidance does provide general advice regarding removal for two categories of pipelines:

- For small diameter pipelines (including flexible flowlines and umbilicals) which are neither trenched nor buried, the guidance states that they should normally be entirely removed; and
- For pipelines covered with rock protection, the guidance states that these are expected to remain in place unless there are special circumstances warranting removal.

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

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

3.6.2 Alternatives to decommissioning

Options to re-use the Solan field infrastructure *in situ* for future hydrocarbon or alternative developments have been considered, but to date none have yielded a viable commercial opportunity. There is an implicit assumption that options for re-use of the pipelines have been exhausted before facilities and infrastructure move into the decommissioning phase and CA. Therefore, the re-use option has been excluded from this assessment.

On the basis, there is no reason to delay decommissioning of the infrastructure in a way that is safe and environmentally and socio-economically acceptable (and the 'do nothing' approach to the infrastructure is thus rejected).

3.7 Comparative Assessment

3.7.1 Pipeline and umbilicals

In line with the guidance summarised above, Premier has committed to fully removing all surface laid infrastructure within the Solan area that are not buried under deposited rock including the following pipelines: PL3094, PL3578, PL3579, PLU3584, PLU3585JW2, PLU3586JW1, PLU4204, PLU4205, PLU4206, PLU4207, PLU4208, PLU4209, PL4973, PL4974, PL4975, PLU4976, and PL4977. To varying extents the following pipelines are buried under rock (burial length quoted in brackets). PL3095 (204 m), PL3580 PL3583, PLU3585 (300 m, shared), PL3581, PL3582, PLU3586 (360 m, shared), PL4971 (916 m), and PLU4972 (1,196 m), and have been considered within a CA in order to arrive at an optimal decommissioning method. The CA methodology is described fully within the CA for pipelines in the Solan, which has been submitted along with this EA [25].

A summary of the infrastructure for which a CA of options was made and the selected option (based on consideration of safety, environmental, technical, societal and economic factors) is given in Table 3.7.1. The CA used a non-weighted process to eliminate any subjectivity. Actual environmental data was considered when comparing options including seabed disturbance, habitat loss and underwater noise in line with the conservation objectives and sensitivities of protected sites in the vicinity.

Table 3.7.1 CA pipeline, umbilical and flowline decommissioning summary

Description	Route	Burial	Length (m)	Removal option
PL3095 24 in steel pipeline	SOST to tanker offloading connection via SAL	Buried	~204	Complete
PL3580 6 in flexible flowline	Well P1 to Solan platform	Buried	~300	Complete
PL3583 6 in flexible flowline	Solan platform to well W2			
PLU3585 176 mm umbilical	Solan platform to well P1			
PL3581 6 in flexible flowline	Well P2 to Solan platform	Buried	~360	Complete
PL3582 6 in flexible flowline	Solan platform to well W1			
PLU3586 176 mm umbilical	Solan platform to well P2			
PL4971 244 mm flexible flowline	Well P3 to well P1	Buried	~916	Complete
PLU4972 205 mm umbilical	Solan platform to well P3 SUTU	Buried	~1,196	Complete

3.8 Proposed schedule

A proposed schedule is provided in Figure 3.8.1. Decommissioning activity in the Solan field is anticipated to commence in 2026 and will continue up to 2031. Environmental surveys and debris clearance will extend beyond these timescales. The activities are subject to the acceptance of the Decommissioning Programmes presented in this document and any unavoidable constraints (e.g., vessel availability) that may be encountered while executing the decommissioning activities. Therefore, activity schedule windows have been included to account for this uncertainty. The commencement of offshore decommissioning activities will depend on commercial agreements and commitments.

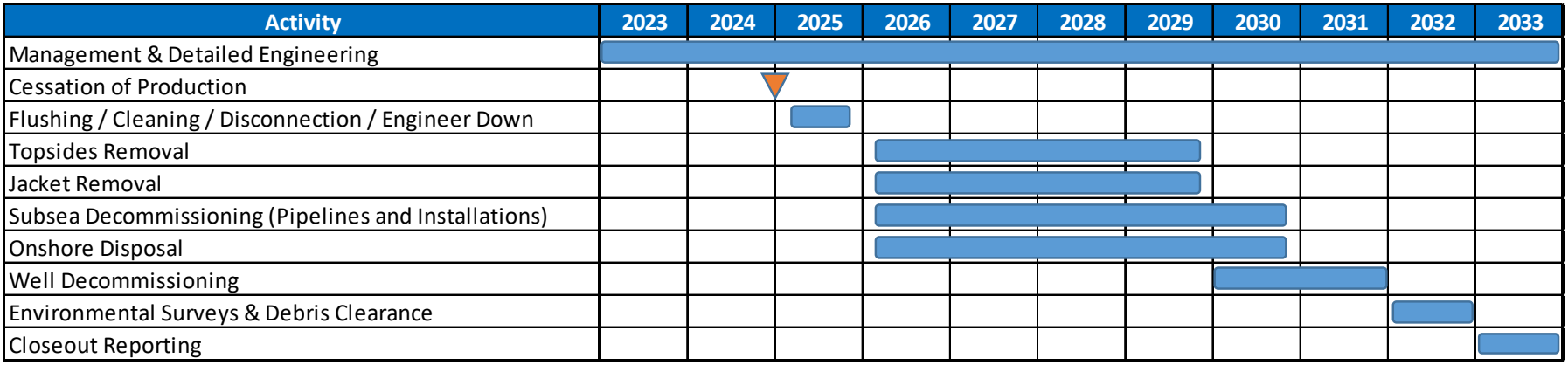

Figure 3.8.1 Gantt chart of project plan

3.9 Decommissioning activities

This section outlines the proposed decommissioning activities for the Solan field. The activities described within include activities that are out with the scope of this EA, however they are included within this section to provide an overview of all decommissioning activities.

3.9.1 Preparation for decommissioning

3.9.1.1 Well decommissioning

Well decommissioning is not within the scope of this environmental appraisal, and it has been or will be assessed as part of appropriate WONS notifications and Portal Environmental Tracking System ('PETS') applications. A description is included here to describe the activities leading up to the point that the decommissioning activities that are assessed here begin.

All well decommissioning activities will be subject to permitting application via PETS and decommissioned to current industry standard. Each well will be systematically and permanently abandoned with reservoir barriers in accordance with well decommissioning best practice. These activities will be carried out using a semi-submersible rig.

3.9.1.2 Flushing and cleaning operations

Flushing and cleaning operations are not within the scope of this EA as they have been assessed as part of the ongoing operations of the facilities and are subject to permitting application via the PETS. A description is included here to describe the activities which have occurred leading up to the point that the decommissioning activities begin.

Premier will flush all the infield production pipelines with seawater, followed by plugs of gel or foam called 'pigs' propelled through the lines. This activity is designed to remove mobile hydrocarbons and achieve an acceptable level of cleanliness, which will be agreed with OPRED as part of the permitting process. Chemical pipelines will be subjected to a turbulent seawater flush to displace all contents.

Following isolation from the wells, gas (nitrogen) will be passed through the platform processing systems to ensure that minimal hydrocarbons remained in the system prior to the final cleaning and disconnect. During the final cleaning and disconnect activities, all the processing systems on the platform will be progressively depressurised, purged with gas (nitrogen) and rendered safe for removal operations. All bulk chemicals surplus to requirement will be backloaded onshore for disposal. The pipework and tanks will be visually inspected where possible and may be further treated should any sources of potential spills of oils and other fluids be identified.

3.9.2 Surface Installations

3.9.2.1 Topsides' decommissioning

The Solan Topsides will be completely removed, transported onshore to an appropriate recycling and disposal facility where the waste will be handled in accordance with the Waste Framework Directive. Removal of the topsides may be achieved using a single lift method, either by semi-submersible crane vessel ('SSCV') or single lift vessel ('SLV'), or by piece small or piece large removal whereby removal of the topsides is achieved in a series of smaller sub-units using a crane vessel or an attendant support vessel such as a monohulled crane vessel ('MCV'). A final decision on the specific decommissioning method will be made following a commercial tendering process, the outcome of which will be communicated by Premier to OPRED at the appropriate time.

3.9.2.2 Jacket decommissioning

The mass of the jacket excluding piles is ~7,981 Te or ~10,625 Te including the mass of piles down to 3m below seabed but excluding any rigging that would be used for lifting operations. The legs will be cut at an appropriate elevation to allow the lifting aids to be installed, and the jacket will ideally be removed in a single lift. Assuming there would be no technical issues, the piles will be cut internally 3 m below the mean seabed. Should any difficulties be encountered when accessing the piles internally such that an external excavation would be required, OPRED will be consulted prior to carrying out the external excavation.

The jacket will be completely removed as a single unit and returned to shore to an appropriate recycling and disposal facility where the waste will be handled in accordance with the Waste Framework Directive. Single lift recovery will be achieved using either a SSCV or SLV. A final decision on the specific decommissioning method will be made following a commercial tendering process, the outcome of which will be communicated by Premier to OPRED at the appropriate time.

3.9.3 Subsea infrastructure decommissioning

3.9.3.1 Overview

A subsea contractor will mobilise a fleet comprising vessels with a range of crane capabilities for lifting objects of different sizes and weights off the seabed, vessels that can support underwater operations including ROV deployment, diving, cutting, and backfilling, excavation and rock placement, survey vessels and guard vessels. The vessels will deploy ROVs (or divers when necessary) to disconnect the subsea installations and tie-in spools and to cut the spools and ends of flowlines. The vessel's cranes will lift the subsea structures to the vessel.

3.9.3.2 Pipelines, flowlines and umbilicals

Pipelines, flowlines and umbilicals will be physically disconnected subsea from all subsea and surface structures and any mattresses and grout bags that cover the disconnection points will be recovered back to the vessel. Following this, the lines will be prepared for decommissioning. The recommendation from the CA is that all pipelines, flowlines, and umbilicals along with the associated concrete mattresses, sandbags and grout bags will be completely removed. Any associated deposited rock will be dispersed to allow access to the pipelines buried beneath.

A suitable vessel will be used to undertake the subsea intervention scopes associated with pipeline disconnection, removal of infrastructure and stabilisation materials and clearance activities.

3.9.3.3 Subsea installations

Subsea installations, including the SOST, the SAL, 5 WHPSs, and two wet-stored trash caps will be fully removed and recovered to a vessel for transfer onshore for recycling or disposal. All piled subsea infrastructure will have their piles cut internally (where possible) and will be fully recovered. Should any difficulties be encountered when accessing the piles internally such that an external excavation would be required, OPRED will be consulted prior to carrying out the external excavation.

3.9.3.4 Protection and support materials

As per the BEIS Guidance [3], the base case for mattresses is full removal, with the exception of any protection structures associated with crossing points and any third-party infrastructure. If any mattresses are found to have insufficient integrity to be removed, then Premier will engage with the regulator regarding decommissioning these mattresses *in situ*.

There are a total of 349 mattresses of varying size, an estimated 1,843 grout bags (1,785 x 25 kg and 58 x 1 Te), supporting infrastructure within the Solan decommissioning area. The burial status of the concrete mattresses and pipeline protection covers will be determined when decommissioning activities are being carried out, however, it is currently proposed that the majority all mattresses and all of the grout bags are removed.

3.9.4 Post-decommissioning activity

A post decommissioning debris survey will be carried out within all 500 m safety zones and 50 m either side of PL3095 where it spans the two 500m safety zones. Oil and gas debris will be recovered for onshore disposal or recycling in line with existing disposal methods.

Verification of seabed state will be obtained. As the area will be available for the resumption of fishing activities an overtrawl will be used to confirm the status of the seabed. A statement of clearance will be provided to all relevant governmental departments and statutory consultees.

The outcomes of the clear seabed verification activities will be reported in the Close Out Report and sent to the Seabed Data Centre (Offshore Installations) at the Hydrographic Office.

3.10 Waste management

The onshore treatment of waste from the Solan decommissioning activities will be undertaken according to the principles of the waste hierarchy, a conceptual framework which ranks the options for dealing with waste in terms of sustainability (Figure 3.10.1). The waste hierarchy is a key element in OSPAR Decision 98/3 and BEIS Guidance [3].

Non-hazardous waste material, such as scrap metal, concrete and plastic not contaminated with hazardous waste, will, where possible, be reused or recycled. Other non-hazardous waste which cannot be reused or recycled will be disposed of to a landfill site. Hazardous waste resulting from the dismantling of the Solan facilities will be pre-treated to reduce hazardous properties or render it non-hazardous prior to recycling or disposing of it to a suitable landfill site. Under the Landfill Directive, pre-treatment is necessary for most hazardous wastes destined to be disposed of to a landfill site.

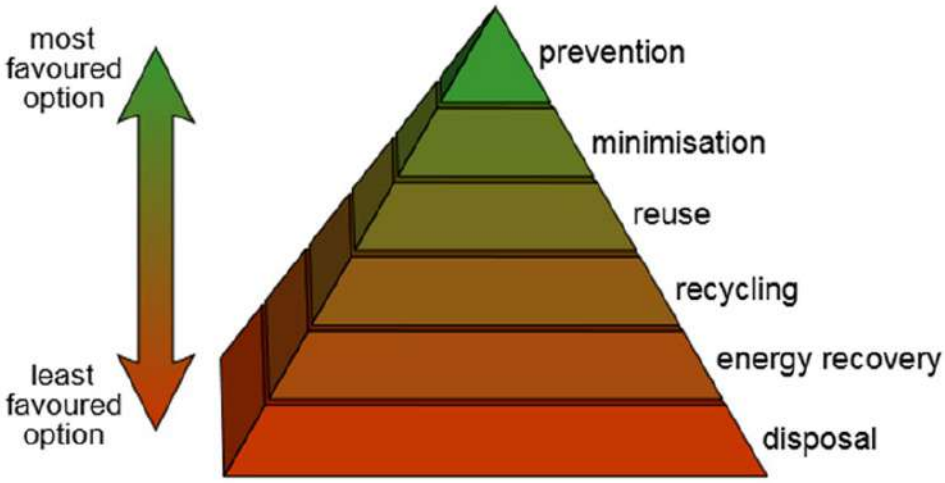

Figure 3.10.1 Waste Hierarchy

The management of waste generated from operations and drilling activities has been addressed by Premier through an ISO14001 certified Environmental Management System ('EMS'). The EMS initially comprised a procedure for waste management designed to ensure that all waste generated during Premier offshore operations are managed according to Harbour Energy's Health, Safety and Environment policy (Appendix C: HSES Policy) and relevant legislation. Procedures and processes for waste management are now embedded in the EMS. A Waste Management Plan will record how handling, storage, transfer and treatment of waste will be conducted by contractors/sub-contractors on behalf of Premier using their own waste management system. The Waste Management Plan will also detail how the reporting of waste for internal and external recording and reporting will be managed. An overview of the removal, disposal and handling procedures for additional and

incidental wastes not outlined previously is presented in Table 3.10.1. Total weights of the Solan infrastructure are provided in Table 3.10.2 which depicts the planned mass of infrastructure to shore and planned mass of infrastructure to be decommissioned in situ. Table 3.10.3 and Figure 3.10.2 provide the breakdown of material inventory for the Solan installations. Table 3.10.4 and Figure 3.10.3 provide the material inventory breakdown for the Solan pipelines.

Table 3.10.1 Waste steam removal and disposal methods

Waste Stream	Removal and disposal method
Bulk liquids	Bulk hydrocarbons will be removed from topsides and SOST and SAL. Further cleaning and decontamination of any residual hydrocarbons will take place onshore prior to reuse or recycling.
Marine growth	Where necessary and practicable, to allow access some marine growth will be removed offshore. The remainder will be brought to shore and disposed of according to guidelines and company policies and under appropriate permit.
Naturally Occurring Radioactive Material ('NORM')	Tests for NORM will be undertaken offshore by the Radiation Protection Supervisor. and recorded. Any NORM encountered onshore will be dealt with and disposed of in accordance with guidelines and company policies and under appropriate permit.
Asbestos	Given the age of the installations asbestos is not expected to be present, but in the unlikely event asbestos is found while conducting hazardous material surveys, it will be recorded and dealt with and disposed of in accordance with guidelines and company policies.
Other hazardous wastes	Other hazardous waste will be recovered to shore and disposed of according to guidelines and company policies and under appropriate permit.
Onshore Dismantling sites	Appropriate licensed sites will be selected. The dismantling site must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver reuse and recycling options. OPRED will be advised when a dismantling site has been selected.

Table 3.10.2 Breakdown of Solan infrastructure

Asset	Inventory	Total Inventory (Te)	Planned mass to shore (Te)	Planned mass decommissioned in situ (Te)
Solan	Installations	34,910	28,224	6,686
	Pipelines	4,118	4,084	34
	Deposited Rock	43,225	0	43,225
Sub-total:	**Excl. Rock**	**82,238**	**32,308**	**49,945**
Sub-total:	**Incl. Rock**	**39,028**	**32,308**	**6,720**

Table 3.10.3 Material Inventory for Solan Installation (Excl. Rock)	
Material	**Tonnage**
Steel	32,261
Plastic/Rubber	237
Non-ferrous (Aluminium assumed for worst case E&E calcs	461
Grout/Concrete	604
Hazardous	1,347
Non-Hazardous	0
Total	**34,910**

Table 3.10.4 Material Inventory for Solan Pipelines (Excl. Rock)	
Material	**Tonnage**
Steel	1,421
Plastic/Rubber	319
Non-ferrous (Aluminium assumed for worst case E&E calcs	10
Concrete	2,365
Hazardous	3
Non-hazardous	0
Total	**4,118**

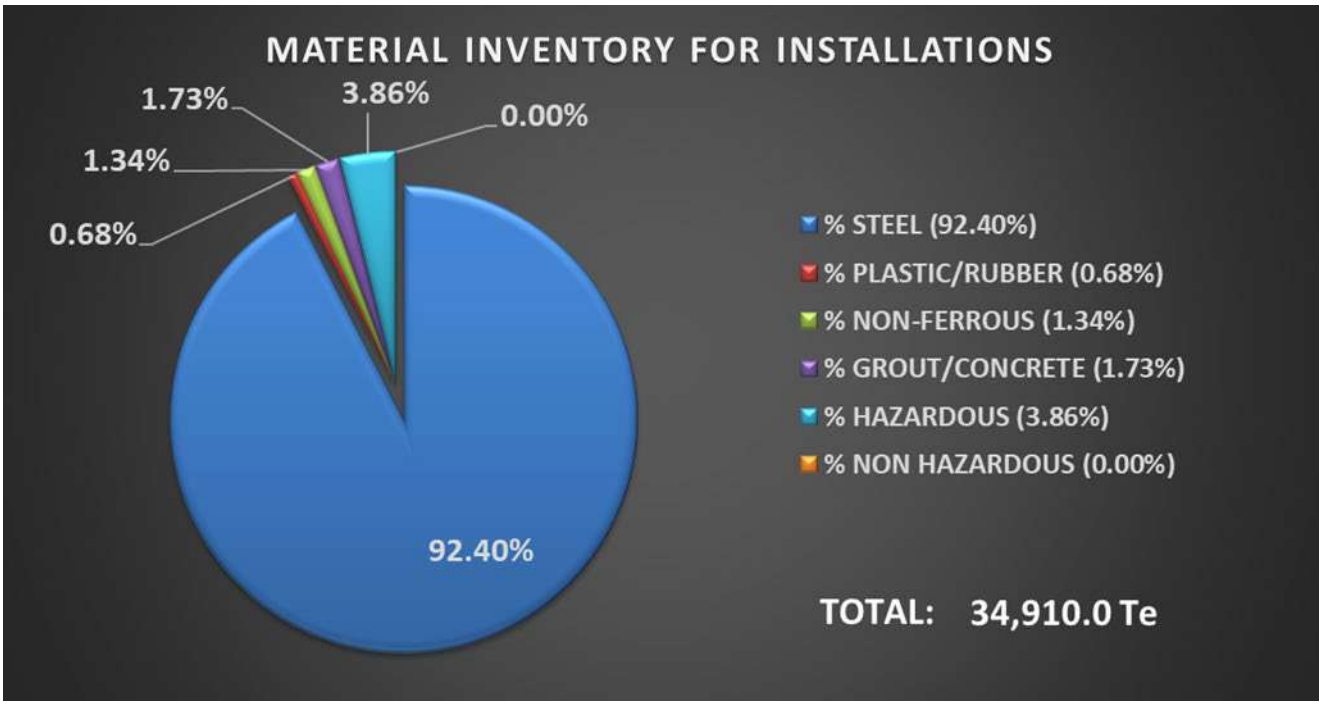

Figure 3.10.2 Material Inventory Breakdown for Installations

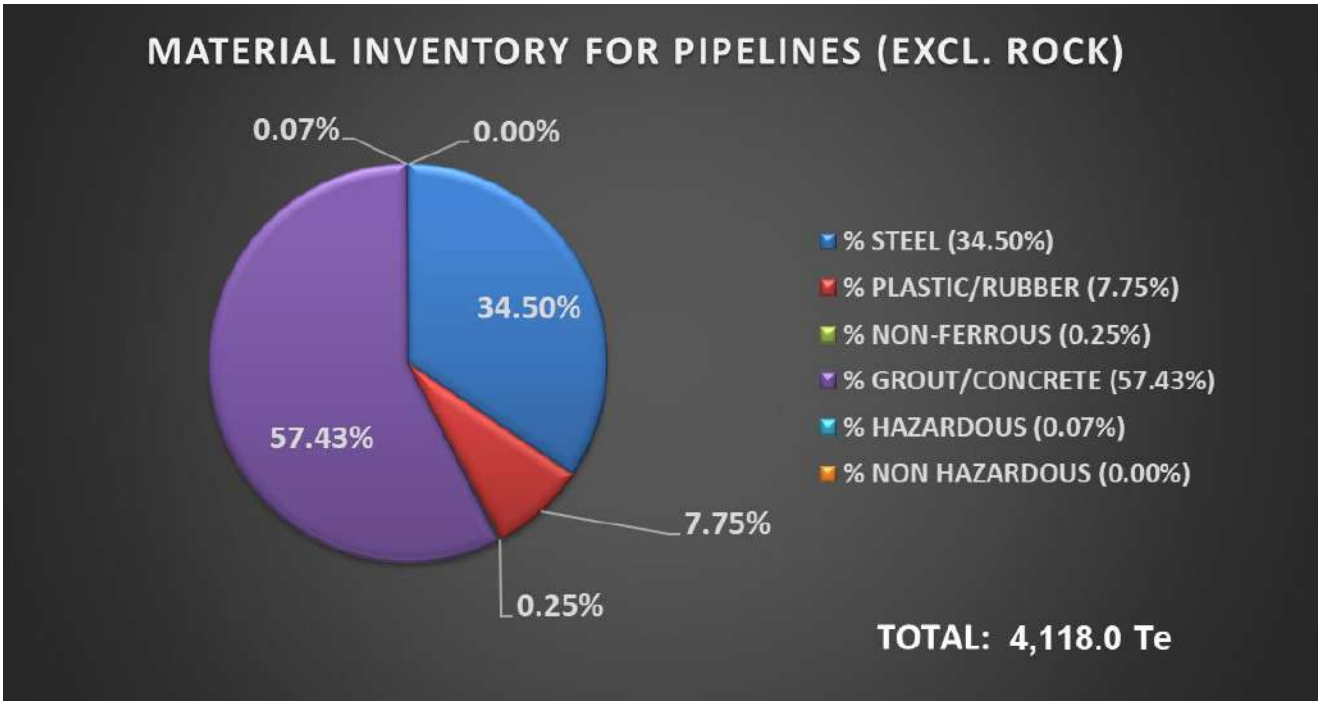

Figure 3.10.3 Material Inventory Breakdown for Pipelines

4 Environmental Baseline

4.1 Summary of receptors

The baseline environment of the project area is summarised in Table 4.1.1. For most receptors, the summarised information provided is considered sufficient to inform the environmental assessment of potential impacts within this EA. The following receptors identified during the Environmental Identification ('ENVID') as of particular interest to stakeholders are assessed in more detail in the following Sections:

- Seabed environment (Section 4.2)
- Marine Mammals (Section 4.3)
- Commercial fisheries (Section 4.4)
- Conservation sites (Section 4.5)

Table 4.1.1 Environmental Baseline Summary

Environmental Receptor	Description
Physical Environment	
Meteorology and Hydrology	The WoS area is characterised as relatively high energy, in terms of near-bed current velocities and wave climate although the large differences in water depth and water column structure result in variations from place to place. In broad terms, hydrographic characteristics differ between shelf, slope and deep channel/basin components of the WoS area [14]. Five current systems exist in the WoS area, distinguishable by geographical origin and vertical distribution in the water column. The surface layer is composed of North Atlantic Water ('NAW') and Modified North Atlantic Water ('MNAW'). The circulation of water in the region is dominated by two main flows. The first of these is the northeasterly flow of relatively warm and saline NAW from the Rockall Trough, which flows north over the Wyville-Thomson Ridge and into the Faroe-Shetland Channel along the shelf break. This surface flow is amplified by the prevalent westerly winds of the region and assists offshoots from this to diverge across the shelf through the Fair Isle Channel and around the north of Shetland into the North Sea. The second current occurs below this, at more than 450 m depth, and consists of cold and less saline water from the Norwegian Sea flowing in the opposite direction to the southwest along the Faroe-Shetland Channel [16]. The mean residual currents surrounding the Solan field are approximately 0.2 m/s [71]. Variations in seawater temperature in the vicinity are complex and the rate of change in temperature with depth and time is particularly high. Mean May Sea temperatures in the region range from 8ºC at the surface to -1.5ºC at 1,000 m. Salinity of the surface water in the vicinity varies annually but is typically around 35.25% [53]. The WoS is known for long period ocean swells, complex current regimes and rapidly changing weather conditions. The deep water over the edge of the continental shelf is exposed to a large fetch and as such strong winds, particularly from the west and southwest generate an extreme wave regime in the area, which is more severe than that experienced in the North Sea. Wave heights across the WoS region range from

Table 4.1.1 Environmental Baseline Summary	
	1.21–1.50 m over the course of the year, with higher waves ranging between 3.01–3.30 m being recorded offshore [53][50] shows wave energy at seabed as 'low' (0.21–1.2 N/m^2) in offshore waters WoS, increasing towards the shore to more than 12 N/m^2. The wave height within the vicinity of the Solan field ranges from 2.71–3.0 m and the annual mean wave power ranges between 42.1-48.0 kW/m [53].
Bathymetry	The water depths within the Solan area are relatively shallow for the WoS, with depths of approximately 138 m LAT. The seabed shallows from northwest to southeast with gradients considered to be gentle (<1%) [20]. The seabed along pipeline routes is essentially flat between KP 0.000 and KP 0.050, where a minimum water depth of 136.0 m LAT is observed. From KP 0.050 the seabed deepens very gently to KP 0.400, where it reaches a maximum water depth of 137.1 m LAT. Beyond KP 0.410 the seabed shallows very gently until the end of the route [20].
Conservation Interests and Sites	
OSPAR threatened and/or declining species and habitats	The WoS region hosts a number of seabed features that may be of ecological importance, including reef habitats, and iceberg ploughmarks, which are scars in the seabed caused by the scouring action of icebergs during past glacial ice ages. Over time these scars have been partially filled with sediments, which support specific habitats. The Solan location is located within a wide area delineated as potentially featuring the Annex I habitat 'stony and/or bedrock reef', as listed under the EU habitats Directive (92/409/EEC). Stony reefs are extremely variable, both in structure and in the communities they support. It should be noted that the site-specific survey [21] recorded no indication for the presence of any potential Annex I habitats within the Solan area. It should also be noted that the Priority Marine Feature ('PMF') 'Offshore subtidal sands and gravel' was identified in Block 205/26 [53] which could give rise to the presence of ocean quahog. However, no specimens were observed during the rig site survey [21].
Special Areas of Conservation ('SACs')	The closest SAC is the Wyville Thomson Ridge SAC, located approximately 110 km southwest of the Solan field. The SAC is situated in the Atlantic Ocean in the north-eastern part of the Rockall Trough. The Wyville Thomson Ridge is a rocky plateau composed of extensive areas of stony reef interspersed with gravel areas and bedrock reef along its flanks and supports diverse biological communities. The site is designated for Annex I habitat 'Reefs'.
Special Protection Areas ('SPAs')	The closest SPA to the Solan field is the Seas off Foula SPA, located approximately 38 km northeast. Lying about 15 km west of mainland Shetland, the Seas off Foula SPA covers the waters around and to the north-west of Foula. This island hosts more than 190,000 breeding seabirds, making it one of the largest seabird colonies in Britain. The SPA is designated for the following bird features: great skua (*Stercorarius skua*) (breeding and non-breeding); northern fulmar (*Fulmarus glacialis*) (breeding and non-breeding); Arctic skua (*Stercorarius parasiticus*) (breeding); common guillemot (*Uria aalge*) (breeding and non-breeding); Atlantic puffin (*Fratercula arctica*) (breeding); and assemblages of both breeding and non-breeding seabirds.

Table 4.1.1 Environmental Baseline Summary	
Nature Conservation Marine Protected Area ('NCMPA')	The Solan field lies approximately 26 km southeast of the Faroe-Shetland Sponge Belt NCMPA, approximately 28 km north of the West Shetland Shelf NCMPA, and approximately 57 km northwest of the North-west Orkney NCMPA. The Faroe-Shetland Sponge Belt NCMPA is located in offshore waters on the Scottish side of the Faroe-Shetland Channel, which separates the Scottish and Faroese continental shelves. The continental shelf slope hosts boreal 'ostur' type 'Deep-sea sponge aggregations'. 'Offshore subtidal sands and gravels' are also present, supporting a diversity of species, including ocean quahog (*Arctica islandica*). In addition to these species and habitats which are designated features of the site, there are a number of geomorphological features which also contribute to the designation of the site: 'Continental slope'; 'Continental slope channels, iceberg plough marks, prograding wedges and slide deposits representative of the West Shetland Margin paleo-depositional system Key Geodiversity Area'; and 'Sand wave fields and sediment wave fields representative of the West Shetland Margin contourite deposits Key Geodiversity Area'. The West Shetland Shelf NCMPA is designated for 'Offshore subtidal sands and gravels'. The range of sediments, from fine-grained sands to coarse gravels, provide conditions suitable for a diverse range of animals to thrive in and on the seabed. The North-west Orkney NCMPA covers a shallow area lying to the north and west of the Orkney Isles on the continental shelf. The area is considered important as an export ground for sandeels. In addition to sandeels, the site is also designated for 'Sandbanks, sand wave fields and sediment wave fields representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area'.
Coastal and Offshore Annex II species most likely to be present in the project area:	
Atlantic white-sided dolphin	Atlantic white-sided dolphins (*Lagenorhynchus albirostris*) are usually sighted in large groups of up to 1,000 individuals in UK waters. The relative density of Atlantic white-sided dolphin is estimated at 0.0100 animals/km^2 in the project area [61]. Atlantic white-sided dolphin are PMFs, EPS and are covered by OSPAR and the UK Biodiversity Action Plan ('UKBAP'). They are also listed on the International Union for Conservation of Nature ('IUCN') Global Red List as species of lower risk.
Harbour porpoise	The harbour porpoise (*Phocoena phocoena*) is a small, highly mobile species of cetacean that is the most commonly occurring cetacean in UK waters. Minke whale are PMFs, EPS and are covered by OSPAR and the UKBAP. They are listed on the IUCN Global Red List as species of lower risk. Harbour porpoises are frequently found throughout UK waters. They are common throughout the year within the vicinity of the Solan facility in low densities [61]. The density of harbour porpoise in the project area is estimated to be 0.152 animals/km^2 [24].
Killer whale	Killer whales (*Orcinus orca*) are the largest member of the oceanic dolphin family. Most sightings in UK waters are of singles or groups of less than eight individuals (mean = 4.6), although groups of up to one hundred have been observed [61]. Recent surveys north and west of Scotland suggest that killer whales concentrate along the continental slope north of Shetland during May and June [61]. The annual distribution and relative abundance of killer whales within the vicinity of the project area is between >0.000 –

Table 4.1.1 Environmental Baseline Summary	
	0.227 animals per standard km^2. Killer whales are PMFs, EPS and are covered by OSPAR and the UKBAP [24].
Minke whale	Minke whales (*Balaenoptera acutorostrata*) are usually observed in pairs or in solitude, though groups of up to 15 individuals can be sighted feeding within their seasonal feeding grounds. The relative density of minke whales is estimated at 0.0095 animals/km^2 in the project area [24]. Minke whale are PMFs, EPS and are covered by OSPAR and the UKBAP. They are listed on the IUCN Global Red List as species of lower risk.
White-beaked dolphin	White-beaked dolphins (*Lagenorhynchus albirostris*) are usually found in water depths of between 50 and 100m in groups of around 10 individuals, though groups of up to 500 animals have been seen. They are present in the UK waters throughout the year, however more sightings have been made between June and October. The density of White-beaked dolphins in the project area is estimated to be 0.021 animals/km^2 [24].
Benthic Environment	
Seabed sediments	Mapped information [33] indicate benthic sediments in the WoS consist of a mixture of rock and coarse sediment close to shore, with areas of mud and sandy mud, sand and muddy sand and mixed sediment further offshore. The WoS region hosts a number of seabed features that may be of ecological importance, including reef habitats, and iceberg ploughmarks, which are scars in the seabed caused by the scouring action of icebergs during past glacial ice ages. According to sediment data from the British Geological Society ('BGS') provided in the NMPi (2022), the sediments within Block 205/26 vary with the majority of sediment characteristic of sand and muddy sand (associated with the identified European Nature Information System (EUNIS) biotope A5.27 'Offshore circalittoral sand'. The area also features coarse sediment in some parts (associated with EUNIS biotope A5.15 'Offshore circalittoral coarse sediment') [53]. Seabed sediments within the area are expected to comprise fine to coarse gravelly sand with cobbles and boulders, with the presence of Holocene sandy sediment to depths of around 0.8 m below the seabed and over-consolidated firm to hard glacial till at deeper depths [21].
Benthic fauna	The survey conducted by Gardline (2008) recorded sparse benthic communities in relatively low abundances which were not uniform across the area. In total, 1,295 faunal individuals were collected during the survey, representing 163 taxa. Of the 163 taxa, 87 were polychaete annelids (bristle worms) accounting for 64% of the recorded individuals and 53% of the taxa. There were 29 crustacean taxa (crabs, shrimps etc.) and 24 mollusc taxa (bivalves and snails) identified [21]. The area in the vicinity of the Solan field occurs within a delineated area considered to potentially support Annex I habitat 'stony and bedrock reefs'. However, no protected species or habitats of conservational concern were observed in the site survey [21].
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

Table 4.1.1 Environmental Baseline Summary	
	marine ecosystem food webs and therefore directly influences the movement and distribution of other marine species. The WoS region is influenced by the warm waters of the continental shelf current and the currents entering the North Sea from the northeast Atlantic and the Norwegian Sea [32]. The phytoplankton community in these waters is dominated by the dinoflagellate genus *Ceratium* (mainly *C. fusus, C. furca and C. tripos*), with diatoms such as *Thalassiosira* spp. and *Chaetoceros* spp. also abundant. To the west of Scotland, diatoms such as *Rhizosolenia* spp. and *Fragillariopsis* spp. and coccolithophores increase in abundance towards the shelf edge, while dinoflagellates such as *Protoperidinium* spp., *Gymnodinium* spp. and *Scripsiella* spp. are also abundant in late summer. The zooplankton communities of the Scottish continental shelf region are dominated in terms of biomass and productivity by calanoid copepods, particularly *Calanus finmarchicus* and *C. helgolandicus*, *Paracalanus* spp. and *Pseudocalanus* spp. Meroplanktonic echinoderm larvae and decapod larvae are also abundant. Other important species in the region include *Acartia* spp., *Evadne* spp., *Oithona* spp. and *Metridia lucens*. Observed jellyfish species include *Aurelia aurita* and *Cyanea capillata* [59].
Fish – Spawning and Nursery Grounds	
Spawning grounds	Only Norway pout (*Trisopterus esmarkii*) and sandeel (*Ammodytidae spp.*) are likely to use the Solan area as spawning grounds. Spawning for these species is limited to the winter months. Norway pout spawn from January to April (with peak spawning occurring in February/March), and sandeel spawn from November through to February [17]. Norway pout and sandeel are PMF species in offshore waters. Cod are also listed as vulnerable on the IUCN Global Red List.
Nursery grounds	The following species use the area as nursery grounds: anglerfish (*Lophius piscatorius*), blue whiting (*Micromesistius poutassou*), cod (*Gadus morhua*), European hake (*Merluccinus merluccinus*), herring (*Clupea harengus*), ling (*Molva molva*), mackerel (*Scomber scombrus*), Norway pout; sandeel; spurdog (*Squalus acanthias*); and whiting (*Merlangius merlangus*). This information is presented by month in the table below [17]. Cod and whiting are also PMF species in offshore waters. Cod are also listed as vulnerable on the IUCN Global Red List.
Probability of juvenile fish aggregations	Fisheries sensitivity maps detail the likelihood of aggregations of fish species in the first year of their life (i.e. group 0 or juvenile fish) [1]. The modelling indicates the presence of juvenile fish for multiple species: haddock (m*elanogrammus aeglefinus*), whiting, Norway pout, herring, mackerel, hake, blue whiting, anglerfish. Across the project area the probability of juvenile fish aggregations occurring is very low for most species (<0.2), except for hake for which the probability is up to medium [1].

Spawning/Nursery Grounds

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Anglerfish	N	N	N	N	N	N	N	N	N	N	N	N
Blue whiting	N	N	N	N	N	N	N	N	N	N	N	N
Cod	N	N	N	N	N	N	N	N	N	N	N	N

Table 4.1.1 Environmental Baseline Summary												
European hake	N	N	N	N	N	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
Sandeel	SN	SN	N	N	N	N	N	N	N	N	SN	SN
Spurdog	N	N	N	N	N	N	N	N	N	N	N	N
Whiting	N	N	N	N	N	N	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 nursery intensity and high intensity spawning as per Ellis *et al.*, (2012) [17]

Seabirds

The Faroe Islands, Norway, Shetland and Orkney and their surrounding waters are of national and international importance for their breeding colonies of seabirds. Seabirds from these breeding colonies are likely to be the main source of seabirds found in offshore waters to the west of Shetland. The WoS area is also visited by over-wintering and migratory birds from Norway, Iceland and the UK Mainland.

According to the density maps provided in Kober *et al.* (2010), the following species have been recorded within the Solan field: northern fulmar, European storm-petrel (*Hydrobates pelagicus)*, northern gannet (*Morus bassanus)*, Arctic skua (*Stercorarius parasiticus)*, great skua (*Stercorarius) skua*, black-legged kittiwake, great black-backed gull (*Larus marinus)*, lesser black-backed gull (*Larus fuscus)*, herring gull (*Larus argentatus)*, Iceland gull (*Larus glaucoides)*, glaucous gull (*Larus hyperboreus)*, common guillemot, razorbill (*Alca torda)* and Atlantic puffin (*Fratercula arctica)* [45].

The sensitivity of seabirds to oil pollution is shown below by the Seabird Oil Sensitivity Index [69]. SOSI identifies areas at sea where seabirds are likely to be most sensitive to surface pollution. SOSI is shown by UKCS Block. The Solan area sits within Block 205/26. Seabird sensitivity to oil within the area of the Solan infrastructure varies considerably throughout the year. For a large part for the year the sensitivity remains 'Low' to 'Medium', however within the months of October, November, December and January it jumps to 'High'. The risk of an oil spill from the proposed operations at the project area is considered remote and therefore the overall risk to birds is considered negligible.

Seabed Oil Sensitivity Index ('SOSI')

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
204/25	2	5	5	4	5	5	5	5	5	4	2	5
205/21	2	5	5	4	4	5	5	5	5	4	2	5
205/22	2	5	3	5	4	5	5	4	5	3	2	5
204/30	3	5	4*	4	5	5	5	5	5	4	3	5
205/26	3	5	4*	4	4	5	5	5	5	3	3	3*
205/27	2	5	3*	3	4	4	5	5	5	3	2	5
202/5	3	5	3*	3	4	4	5	5*	5	4*	4	3*
203/1	3	5	2*	2	4	5	5	5*	5	3*	3	3*
203/2	3	5	2*	2	2	4	5	5	5	3*	3	5

Key	1 = Extremely high	2 = Very high	3 = High	4 = Medium	5 = Low	N = No data

Table 4.1.1 Environmental Baseline Summary

Commercial Fishing

The Solan field infrastructure is located in ICES Rectangle 49E6. This ICES Rectangle is predominantly targeted for demersal and pelagic species. However, proportionately the value of demersal catch exceeds that of pelagic species, with demersal fisheries landing 27% of the total weight and 40% of the total value of fish landed in 2021. Comparatively, pelagic species amounted to 73% of the total weight and 59% of the value. Across all years, the contribution of shellfish has been negligible at ≤1% of live weight and value each year.

The contribution of Rectangle 49E6 to total UK landings is moderate. In 2021, 538,343 te of fish were caught in the UKCS, with a total value of over £685 million. ICES Rectangle 49E6 alone contributed 2.48% of the live weight of fish caught across the UKCS and 2.32% of the value in that year. In 2021 fishing effort in ICES rectangle 49E6 was highest in January, accounting for 17% of the total number of days fished, followed by the months of February and November, both contributing 11% respectively of fishing effort [49]. In June and July, the effort was the lowest throughout the year, with both months accounting for 7% of the annual effort combined.

The main gear types used in Rectangle 49E6 are trawls (approximately 527 days in 2021), and hooks and lines (approximately 383 days in 2021).

Other Users

Shipping activity	A shipping intensity study was carried out at the Solan field in August 2019 [2]. This indicated that there are 20 shipping routes trafficked by an estimated 372 vessels per year passing within 10 nautical miles (nm) of the Solan P3 well. This corresponds to an average of 1 vessel per day. The main vessel types operating within 10 nm of Solan were primarily offshore support vessel and cargo vessels, with the predominant size range being 1,500 to 5,000 dead weight tonnes. Overall, shipping activity within Block 205/26 is considered to be very low.		
Oil and Gas	The following installations are located within 40 km of the Solan infrastructure:		
	Name	Operator	Distance / direction
	Aoka Mizu Floating Production Storage and Offloading (FSPO)	Bluewater	15 km northeast
	Glen Lyon FSPO	BP	33 km northwest
Telecommunications	There are two subsea telecommunication cables within close proximity to Solan. These are the disused TAT 10B West Section located approximately 13 km to the south-southwest and the active TAT 14 SEG Ka located 14 km to the south-southeast [44].		
Military activities	Block 205/26 has a Ministry of Defence ('MoD') licence restriction as it lies within training ranges [55]. This restriction is in relation to the siting of an installation that is fixed to the seabed, resting on the seabed, floating, intended for drilling or getting hydrocarbons, or involves injection of fluids.		
Renewables	There are no active windfarms in the vicinity of Solan. The closest offshore windfarm is the TCE (Scotland) which is approximately 154 km to the south-southeast of Solan.		

Table 4.1.1 Environmental Baseline Summary	
Wrecks	There are two known wrecks, as identified by Historic Environment Scotland in November 2015, located approximately 2.5 km to the southwest and 4.2 km to the northeast of the Solan field [53]. There are no Historic MPAs, scheduled monuments (including wrecks) or war graves within the block [53].

4.2 Seabed environment

4.2.1 Regional Context

Mapped information [33] indicates benthic sediments in the WoS consist of a mixture of rock and coarse sediment close to shore, with areas of mud and sandy mud, sand and muddy sand and mixed sediment further offshore. The WoS region hosts a number of seabed features that may be of ecological importance, including reef habitats, and iceberg ploughmarks, which are scars in the seabed caused by the scouring action of icebergs during past glacial ice ages. Over time these scars have been partially filled with sediments, which support specific habitats. As can be seen in Figure 4.5.1, the Solan location is located within a wide area delineated as potentially featuring the Annex I habitat 'stony and/or bedrock reef', as listed under the EU habitats Directive (92/409/EEC). Stony reefs are extremely variable, both in structure and in the communities they support. It should be noted that the site-specific survey [21] recorded no indication for the presence of any potential Annex I habitats within the Solan area.

4.2.2 Solan Seabed Environment

4.2.2.1 Physical Composition

According to sediment data from the British Geological Society ('BGS') provided in the NMPi (2022), the sediments within Block 205/26 vary with the majority of sediment characteristic of sand and muddy sand (associated with the identified European Nature Information System ('EUNIS') biotope A5.27 'Offshore circalittoral sand'. The area also features coarse sediment in some parts (associated with EUNIS biotope A5.15 'Offshore circalittoral coarse sediment') [53]. Seabed sediments within the area are expected to comprise fine to coarse gravelly sand with cobbles and boulders. Megaripples were also identified in the area orientated in an east-northeast to west-southwest direction [20]. Gardline (2008) recorded sediments consisting predominantly of coarse sandy sediments at all survey stations, with varying amounts of shell fragments (see Figure 4.2.1). Sediments were consistent in composition across the survey area with a mean particle size of ≥ 404 micrometres (µm) and ≤ 596 µm. The sediment was recorded as being moderately to poorly sorted with fine content for all stations being ≤ 3.9% and gravel content being ≤ 4.0% at the majority of stations. Seabed photography and video footage supported the geophysical interpretation of a gravelly shelly sandy seabed, with gravel and cobble patches and the occasional boulders (see Figure 4.2.1). Habitat boundaries were generally represented by increases in the density of gravel and cobbles compared to the surrounding seabed. There was no evidence of any Annex I habitats within the surveyed area [21].

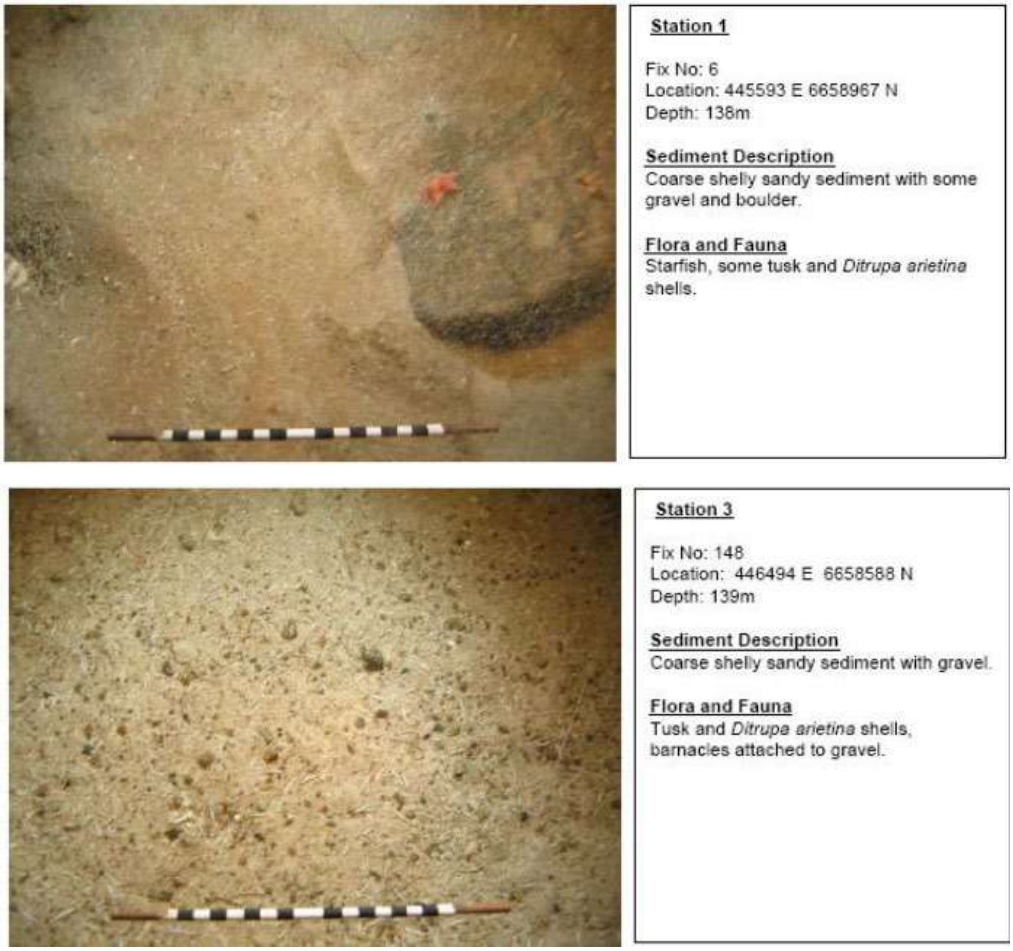

Figure 4.2.1 Example images of the seabed characteristics within the project area [21]

4.2.2.2 Habitats and Benthos

The biota living near, on or in the seabed is collectively termed benthos. The diversity and biomass of the benthos is dependent on a number of factors including substrata (e.g. sediment, rock), water depth, salinity, the local hydrodynamics and degree of organic enrichment [21]. 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. Site specific surveys [21] recorded sediments consisting predominantly of coarse sandy sediments at all survey stations, with varying amounts of shell fragments. Similarly, the Broad Scale Predictive Habitats from the National Marine Plan interactive ('NMPi') [53] for Block 205/26 comprise predominantly of EUNIS biotope complex 'Offshore circalittoral sand' (A5.27) mixed with smaller sections of 'Offshore circalittoral coarse sediment' (A5.15). The taxa typically associated with these sandy sediments were recorded in previous environmental surveys conducted in the Solan area [21]. The survey conducted by Gardline (2008) recorded sparse benthic communities in relatively low abundances which were not uniform across the area [21]. In total, 1,295 faunal individuals were collected during the survey, representing 163 taxa. Of the 163 taxa, 87 were polychaete annelids (bristle worms) accounting for 64% of the recorded individuals and 53% of the taxa. There were 29 crustacean taxa (crabs, shrimps etc.) and 24 mollusc taxa (bivalves and snails) identified. Figure 4.2.2 shows an example of epifauna species observed during the Gardline (2008) environmental survey in the Solan area.

Figure 4.2.2 Examples of Seabed Epifauna within the project area [21]

4.2.2.3 Chemical Composition

Prior to the commencement of any decommissioning activities, a pre-decommissioning environmental survey will be conducted to analyse the chemistry of sediments around the Solan infrastructure. The latest available information is from the 2008 Gardline EBS Survey, where Total Hydrocarbon Content ('THC') of sediments ranged from 0.7 to 4.0 $\mu g.g^{-1}$ [21], which is less than, but comparable to that recorded in the AFEN (1996) survey. To put these results into context UKOOA (2001) [69] recorded that THC's in similar sediment, more than 5 km from installations, in the region, are typically in the region of 11 $\mu g.g^{-1}$, and tend to be higher within 5 km. THC results recorded at all stations within the Solan survey area can therefore be considered within background limits for the region [21].

Polycyclic aromatic hydrocarbon ('PAH'), heavy and trace metal concentrations were low and below the expected range for the region, with an average value of 0.029 $\mu g.g^{-1}$ (±0.012 SD). This was the same as that recorded in the AFEN (1996) survey, and values were well below the Effects Range-Low ('ERL') quoted by Long *et al*., (1995) and are therefore likely to be representative of background levels [21].

Barium in the survey area were well below the UKOOA mean concentrations of Ba in the region, indicating that sediments recovered from the survey area had not been subject to contamination from nearby drilling activity. Cr, Cu, Pb, Hg, Ni and Zn were all below their respective background concentrations ('BC's') quoted by OSPAR (2005), at every station. Arsenic concentrations were above OPSAR BC and Cd at four stations, however all of these values were below the respective Apparent Effects Thresholds ('AET') provided by Buchman (2006) and therefore unlikely to be of ecological consequence [21].

4.3 Marine Mammals

4.3.1 Cetaceans

A series of Small Cetacean Abundance in the North Sea ('SCANS') surveys have been conducted to obtain an estimate of cetacean abundance in North Sea and adjacent waters, the most recent of which is SCANS-III. Aerial and shipboard surveys were carried out during the summer of 2016 [24]. The Joint Nature Conservation Committee ('JNCC') have published the 'regional' population estimates for the most common species of cetacean occurring in UK waters. Divided into local management units ('MUs'), these provide an indication of the spatial scale and the relevant populations at which potential impacts should be assessed. All cetacean species in UK waters are classified as EPS. As such it is an offence to deliberately kill, capture, or disturb an EPS, or to damage or destroy the breeding site or resting place of such an animal.

Of the 27 species of cetacean recorded in UK waters, 23 are known to be present in the west of Shetland area [61]. The Faroe-Shetland Channel and adjacent waters are regarded as important areas for cetaceans in a national and international context.

The regularly sighted whales in the wider region include blue whale (*Balaenoptera musculus)*, fin whale (*Balaenoptera physalus)*, sei whale (*Balanoptera borealis)*, minke whale (*Balanoptera acutorostrata)*, humpback whale (*Megaptera novaeangliae)*, sperm whale (*Physeter macrocephalus)*, northern bottlenose whale (*Hyperoodon ampullatus)* and the killer whale (*Orcinus orca)*. In addition, Risso's dolphin (*Grampus griseus)*, bottlenose dolphin (*Tursiops truncates)*, white-beaked dolphin (*Lagenorhynchus albirostris)*, Atlantic white-sided dolphin (*Lagenorhynchus acutus)* and harbour porpoise (*Phocoena phocoena)* have all been regularly sighted in the waters to the west of Shetland and are therefore considered to be 'within their natural range'. There is increasing evidence that many of the species present in the WoS region are breeding and rearing young (including white-beaked and Atlantic white-sided dolphins, common dolphins, humpback whales and probably blue and fin whales). It is also likely that many of those species reported regularly in this area are feeding. In addition, several species make migrations through these waters (humpback whales and possibly blue and fin whales) [61][53].

White-sided dolphin, harbour porpoise, killer whale, pilot whale, minke whale and white-beaked dolphin have been recorded in the immediate vicinity of the Solan field at varying times and densities throughout the year [61][53].

Of the species likely to be present, harbour porpoise is listed under Annex II of the Habitats Directive. Harbour porpoises are likely to occur at moderate to high densities in the summer months of July and August. All species likely to be present at various times of the year are listed as PMFs and EPS.

4.3.2 Pinnipeds

Six species of pinniped have been identified in the North Sea as a whole; these are the bearded seal (*Erignathus barbatus)*, grey seal (*Halichoerus grypus)*, harbour seal (*Phoca vitulina)*, harp seal (*Phoca groenlandica)*, hooded seal (*Cystophora cristata)* and ringed seal (*Pusa hispida)* (Sea Around Us, 2008). Whilst none are likely to be sighted in large numbers at great distances offshore, there are three species that are more likely to be encountered in the vicinity of the Solan field than others, namely grey, harbour and hooded seals. Grey and harbour seals both live and breed in UK waters and are protected under Annex II of the EU Habitats Directive. Bearded, ringed, harp and hooded seals are Arctic species, and have generally only been sighted on an occasional basis in Scottish waters.

The grey seal is a resident breeder in Orkney, Shetland, the Western Isles and the northwest coast of mainland Scotland (Pollock *et al*., 2000). Internationally important grey seal breeding populations are found in Orkney and the Western Isles; however, they are less abundant in Shetland. There is also known to be a breeding population of grey seals in the Faroe Islands [4] Foraging or migrating grey seals are distributed across the WoS

area but are generally restricted to foraging in waters less than 500 m in depth, and most frequently in water depths of less than 200 m [60]. Harbour seals are most abundant in inshore waters but are recorded offshore, although rarely seen in waters deeper than 200 m (Pollock *et al*., 2000). The average number of both grey and harbour seals in the vicinity of the area is predicted to be low, between 0 - 5 per 25 km^2 as can be seen in Figure 4.3.1.

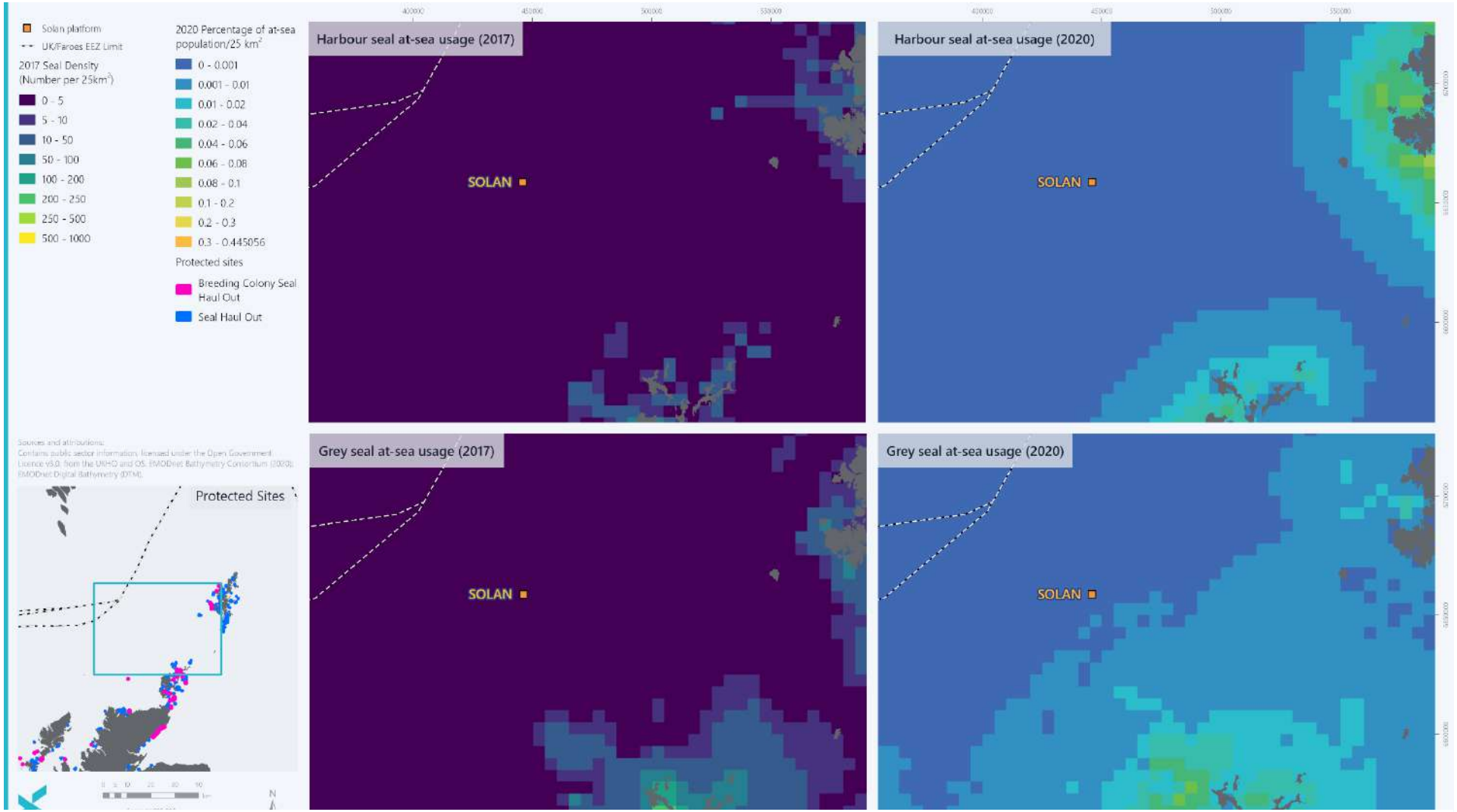

Figure 4.3.1 At sea usage data for Harbour and Grey Seal within the project area

4.4 Commercial fisheries

Fisheries statistics are assigned to statistical areas called ICES Rectangles, each measuring 30 x 30 nm. The Solan field infrastructure is located in ICES Rectangle 49E6. This ICES Rectangle is predominantly targeted for demersal and pelagic species. However, proportionately the value of pelagic catch exceeds that of demersal species, with pelagic fisheries landing 82% of the total weight and 72% of the total value of fish landed in 2022. Comparatively, demersal species amounted to 18% of the total weight and 27% of the value (Table 4.4.2).

There has been variation in in the composition of catch from Rectangle 49E6 between years; in 2018 and 2022 pelagic catch made up <1% and 82% of the total weight, respectively. Across all years, the contribution of shellfish has been negligible at ≤1% of live weight and value each year (Table 4.4.2). Average demersal fishing trawl effort for the years between 2016 to 2019, can be seen in Figure 4.4.2.

To put this into the wider regional context, the contribution of Rectangle 49E6 to total UK landings is moderate. In 2022, 481,398 Te of fish were caught in the UKCS, with a total value of £684,497,956. ICES Rectangle 49E6 alone contributed 4.1% of the live weight of fish caught across the UKCS and 4.2% of the value in that year (Figure 4.4.1). This is higher than for preceding years where the contribution to UKCS fisheries was typically lower [49].

In 2022, fishing effort in ICES rectangle 49E6 was highest in November and December, each accounting for 16% of the total number of days fished (967 days) [49]. The effort was the lowest throughout the year in June, accounting for 2% of the annual effort combined [49].

The main gear types used in Rectangle 49E6 are hooks and lines (approximately 532 days in 2022), and trawls (approximately 431 days in 2022). The five top species in Rectangle 49E6 by weight and value were mackerel, monkfish/anglerfish, hake, cod, and haddock [49].

Table 4.4.2 Recent fisheries landings in ICES Rectangle 49E6, by weight and value											
ICES Rectangle	Fisheries type	2022		2021		2020		2019		2018	
		Value (£)	Landed weight (Te)	Value (£)	Landed weight (Te)	Value (£)	Landed weight (Te)	Value (£)	Landed weight (Te)	Value (£)	Landed weight (Te)
49E6	Demersal	7,706,242	3,555	6,349,875	3,600	6,275,407	3,802	8,463,868	4,080	8,466,001	4,444
	Pelagic	20,472,760	16,079	9,357,465	9,680	296,993	434	7,411,588	6,118	855	1
	Shellfish	258,964	58	162,096	55	131,129	44	129,194	34	58,249	14
Total		**28,437,966**	**19,693**	**15,888,915**	**13,335**	**6,703,529**	**4,280**	**16,004,651**	**10,232**	**8,525,105**	**4,459**

Table 4.4.1 Fishing effort, in days fished, for ICES Rectangle 49E6														
ICES Rectangle	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
49E6	2022	107	115	130	80	22	16	32	22	56	79	156	153	**967**
	2021	162	107	82	71	49	31	33	81	55	88	107	106	**971**
	2020	115	109	50	87	78	54	50	89	117	112	96	186	**1,143**
	2019	184	101	119	72	24	31	42	20	109	74	101	144	**1,020**
	2018	79	69	101	68	61	16	15	11	50	28	56	112	**667**
Note: Monthly fishing effort by UK vessels landing into Scotland: Blank = no data, D = Disclosive data (indicating very low effort, specifically less than 5 over 10 m vessels undertook fishing activity in that month), green = 0 – 100 days fished, yellow = 101 – 200, orange =201-300, red = ≥301														

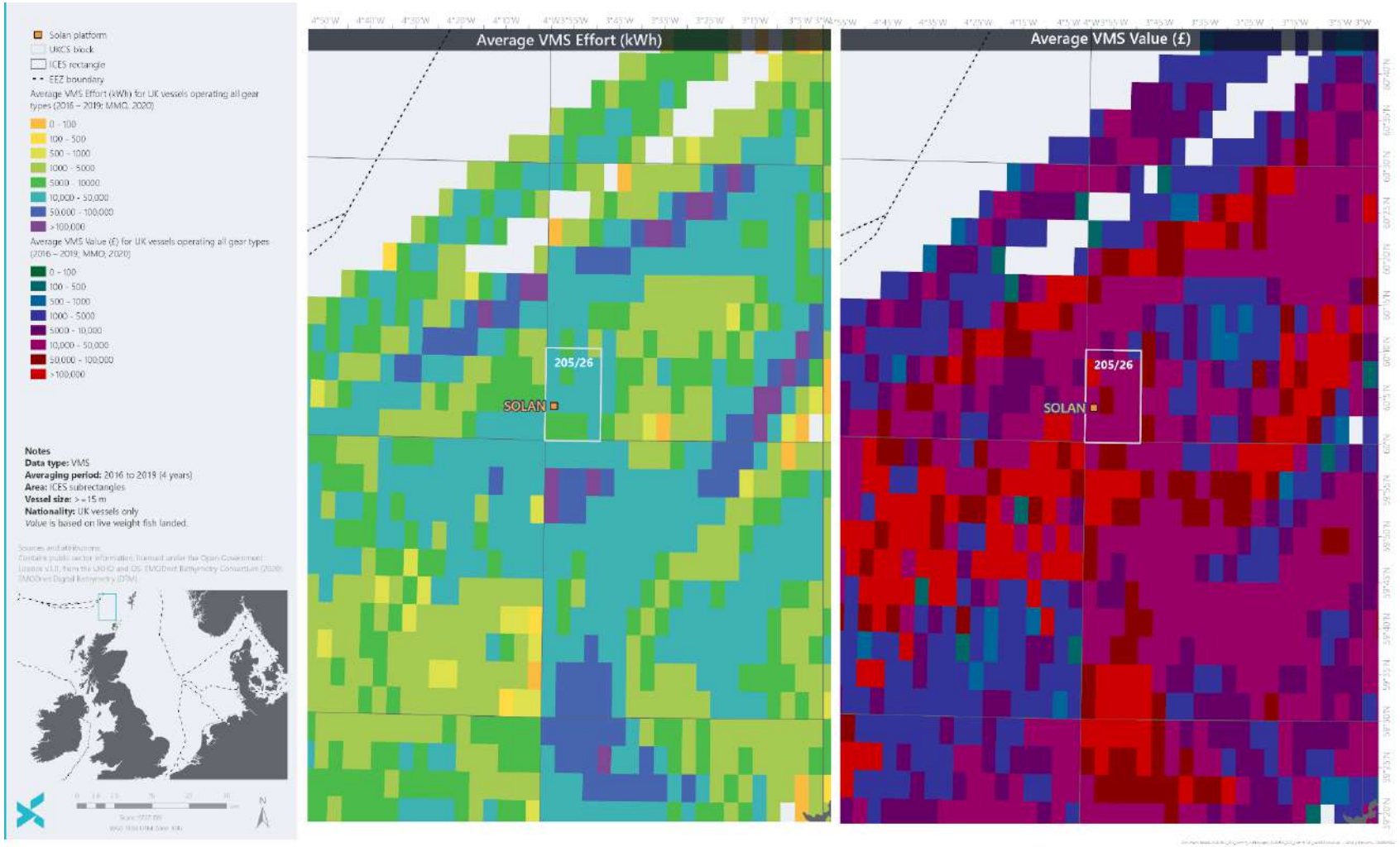

Figure 4.4.1 Average Fishing VMS Value and Effort (2016 – 2019) for all gear types (UK Vessels)

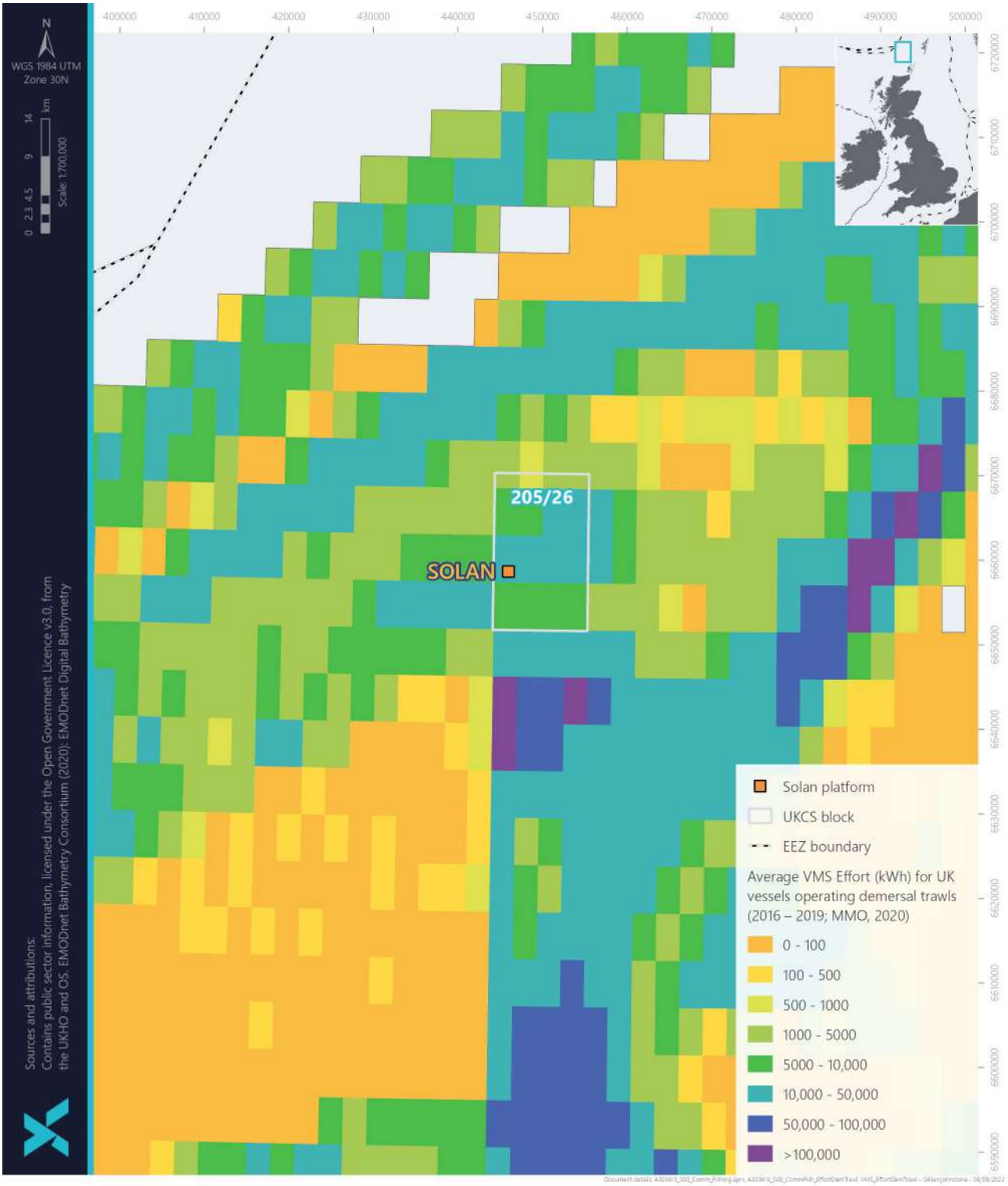

Figure 4.4.2 Average fishing VMS effort (2016 – 2019) for demersal trawls (UK Vessels)

4.5 Conservation sites

Sites of conservation importance located within the vicinity of the Solan field are shown in Table 4.5.1. Sites for which potential interaction has been identified are described in Table 4.5.1 below, along with those within 40 km of the infrastructure and the Conservation Objectives outlined for the various sites.

Table 4.5.1 Conservation sites within 40 km of the Solan infrastructure

Offshore protected area	Approximate distance (km) and direction from Solan	Features of concern
Faroe-Shetland Sponge Belt MPA	26	The Faroe-Shetland Channel is a huge rift basin that separates the Scottish and the Faroese continental shelves to the north of Scotland. The Faroe-Shetland Sponge Belt MPA lies on the Scottish side of the channel. Warmer North Atlantic water flowing over sub-zero deep water from the Norwegian Sea supports a wider diversity of sea life in the area, including fields of slow-growing deep-sea sponges known as “Ostebund” or “Cheesebottoms” by local fishermen owing to their appearance. The sponges provide shelter for a range of small sea life and an elevated perch for animals such as brittlestars that filter food from the passing water currents. The seabed within the Faroe-Shetland Sponge Belt MPA is characterised by iceberg scars in the seabed caused by the scouring action of icebergs during past ice ages. Over time these scars have been partially filled with sediments, creating a mosaic of habitats which are home to animals such as squat lobsters and burrowing heart urchins. The MPA includes protection for a special type of deep-sea sponge aggregation known as ‘boreal ostur’. Within the MPA, the seabed descends into the deep sea and the changing environmental conditions with depth create zones that support different types of animal communities. For example, the offshore subtidal sand and gravel habitats are home to the ocean quahog, a large and slow growing clam which can live up to 400 years and is one of the oldest living animals on Earth [37].
West Shetland Shelf MPA	28	Lying to the north of Scotland in offshore waters, the West Shetland Shelf MPA overlaps with the Windsock Fisheries Area which is managed for the recovery of the cod population. The MPA was chosen for the wide variety of sand and gravel habitats present in the area,

Table 4.5.1 Conservation sites within 40 km of the Solan infrastructure		
		providing an important example of the northern extent of their range on the continental shelf in Scotland's seas. From coarse gravels to fine-grained sands, the different habitats provide conditions suitable for a diverse range of animals to thrive in and on the seabed. Although a relatively common habitat in Scotland seas, the range of different types of sand and gravel habitats present within the MPA support a particularly rich diversity of wildlife. On the surface, anemones and several types of crab can be found living between small rocks, whilst urchins and starfish roam the surface looking for their next meal. Sea snails, bivalves (shellfish with a pair of shells) and sand mason worms (so named for the tube they build by cementing together grains of sand and shell) are adapted to living buried in the sand to avoid passing predators. The area enclosed within the MPA is also important for several species of fish, including cod, plaice, bass, skate and rays. Certain types of fishing are already managed within the overlapping Windsock Fisheries Area to help cod populations recover [38].
Seas off Foula SPA	38	The Seas off Foula SPA is located in Scottish marine waters, north of the Scottish mainland and Orkney, and about 15 km west of Shetland. It covers 3,412 km^2 of inshore and offshore waters and surrounds the island of Foula and the Foula SPA. The site protects five species of seabird: great skua (*Stercorarius skua*), northern fulmar (*Fulmarus glacialis*) and common guillemot (*Uria aalge*) throughout the year, and Arctic skua (*Stercorarius parasiticus*) and Atlantic puffin(*Fratercula arctica*) during the breeding season. These species jointly form important seabird assemblages with more than 20,000 individuals present at the site. Tracking of great skuas breeding on Foula shows that these individuals use the marine areas close by their breeding colonies for foraging, particularly to the west of Shetland, indicating that there is a strong link between great skuas breeding on Foula and the marine Seas off Foula SPA. Given the large foraging ranges of great skuas and northern fulmars, individuals from other breeding colonies on Orkney and Shetland could potentially use the SPA as a foraging site, too. The waters around Shetland, including the Seas off Foula SPA, were once areas of high sandeel productivity. Since the 1980s, however, sandeel stocks

Table 4.5.1 Conservation sites within 40 km of the Solan infrastructure		
		have declined markedly and the reduced availability of this important prey species has had an impact on many of the seabirds breeding on Foula. Nevertheless, these remain important spawning and nursery grounds for sandeels, with the sandeel remaining an essential part of the diet of local seabirds. Sandeel spawning areas immediately south of the Seas off Foula were designated as the North-west Orkney Marine Protected Area in 2014. Newly hatched sandeel larvae are likely to migrate from the MPA to Shetland waters where they settle and provide prey for larger predatory fish and seabirds [39]. In the SPA, the combined effect of currents and waves creates moderate-energy seabed environments in the west, and high-energy seabed environments in the east of the site. The seabed is a mosaic of subtidal coarse sediments and moderate-energy circalittoral rock, with some sand and muddy sand habitats in the north-west. In addition, the Shetland-Orkney thermal front overlaps with Seas off Foula, which might create relatively predictable foraging areas for seabirds. Water depths range between 50 m and 150 m, with shallower areas adjacent to the island [39].

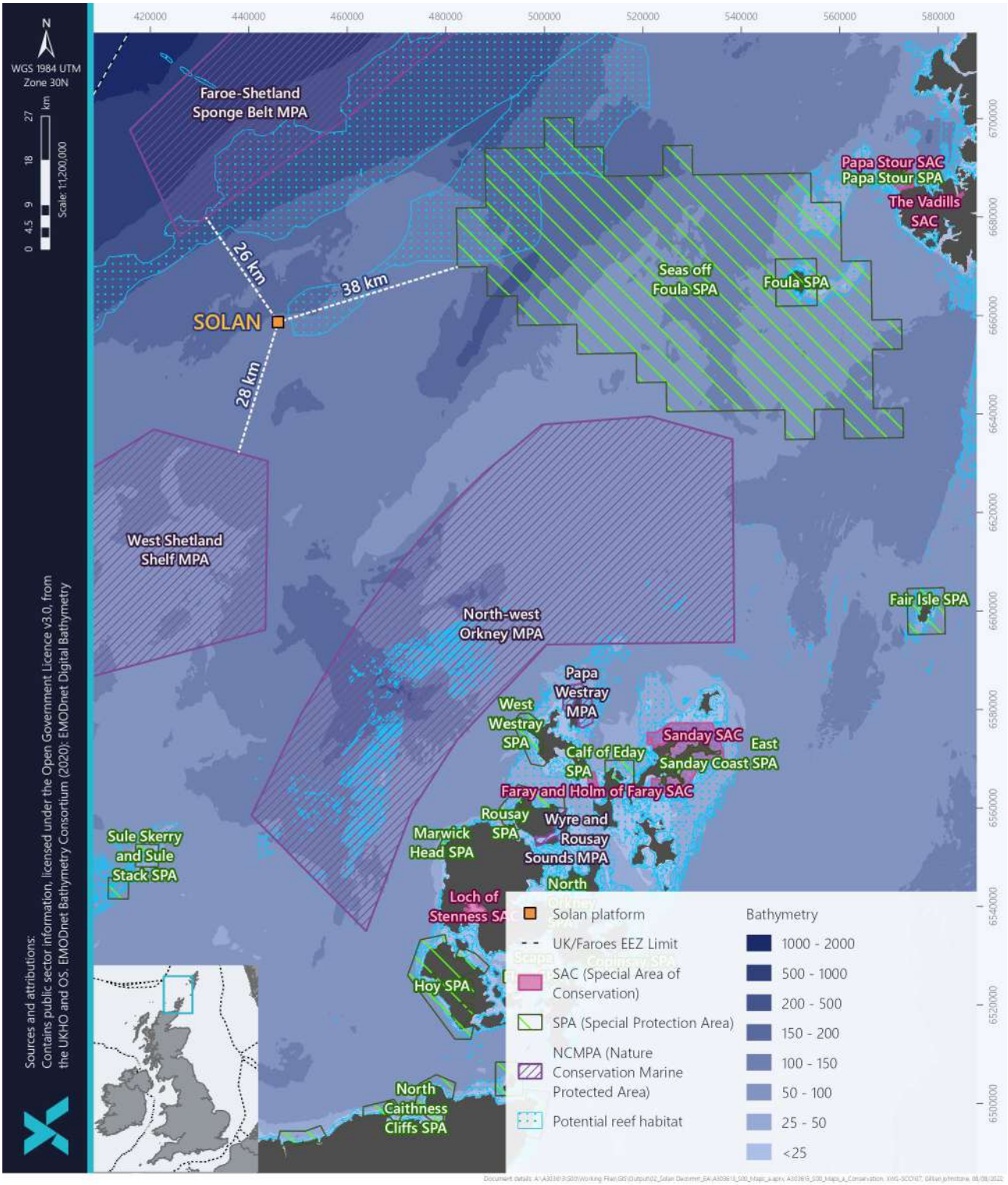

Figure 4.5.1 Location of the Solan infrastructure and designated conservation areas

4.6 National Marine Plan

In addition to adhering to the suite of marine policies, regulations, and guidance for the offshore oil and gas industry, this project considers the objectives set by the Scottish NMP. The NMP covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The aim of the NMP is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the Marine Plan areas. The proposed operations described in this EA have been assessed against the NMP's objectives and policies, specifically GEN 1, 4, 5, 9, 12, 14 and 21 and OIL AND GAS 2, 3 and 6 [64].

Assessment of compliance against relevant policies has already been achieved through the ENVID process. The proposed operations do not contradict any of the marine plan objectives and policies. Premier will ensure they comply with any new policies that have been introduced; with particular attention being made to the following existing policies:

GEN 1 – General Planning and Principle

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

Decommissioning of the Solan field will result in the removal of infrastructure, the recovery of debris and the cessation of produced water discharges, all of which will enhance the local marine environment in the longer term.

GEN 4 – Co-existence

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

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

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 gases ('GHGs').

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

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; and*
- *Protect and, where appropriate, enhance the health of the marine area.*

Legal requirements will be adhered to throughout the duration of the project, including those relating to the protected species which may be present within the project area. There are a number of PMFs expected within the project area however the proposed operations will not result in significant impact on their national status.

As previously mentioned, decommissioning of the Solan field will result in the removal of infrastructure, the recovery of debris and the cessation of produced water discharges, all of which will enhance the local marine environment in the longer term.

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.

All pipelines, umbilicals and subsea infrastructure will be cleaned and flushed prior to decommissioning. Therefore, any residual discharges during decommissioning activities will be negligible and managed/risk assessed under the existing permitting regime. Discharges from vessels are typically well-controlled activities that are regulated through vessel and machinery design, management and operation procedures. Controls will be in place, as required, through compliance with the Offshore Chemical Regulations and the Oil Pollution Prevention and Control Regulations.

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 gases. 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.

Premier will ensure that the minimal number of vessels will be deployed and the streamlining of activities through planning to reduce the time required for vessels to undertake these activities and, in doing so, will support the drive to reduce emissions. Each vessel will have a SEEMP which contains information on minimising fuel consumptions.

GEN 21 – Cumulative Impacts

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

In terms of air and water quality, Premier's approach and project-specific mitigation measures will minimise the potential negative aspects contributing towards cumulative impacts as detailed in the responses to GEN 12 and GEN 14. In terms of seabed disturbance, it is reasonable to presume that the proposed operations are not of significant magnitude to have any discernible contribution to cumulative impacts in the broader context though this presumption is qualified in Section 5.2.5.

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.

Premier is committed to establishing and maintaining environmentally acceptable methods for managing wastes in line with the Waste Framework Directive and principles of the Waste Hierarchy. In accordance with the Waste Hierarchy, Premier will continue review reuse options for elements of the Solan infrastructure.

OIL AND GAS 3 - Minimising environmental and societal 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 societal constraints.

Premier will identify an appropriately authorised disposal company and fit for purpose yard through a selection process that will ensure that the chosen facility demonstrates a proven track record of waste stream management throughout the deconstruction process, the ability to deliver innovative reuse / recycling options, and thus minimises the space required to process recovered items.

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

5 Impact Assessment

5.1 Impact identification outcome

Table 5.1.1 summarises the findings of the impact identification workshop, providing justification for the inclusion and exclusion of impact mechanisms. More information regarding industry standard and project-specific mitigation and controls can be found in the ENVID tables in Appendix D: ENVID.

Table 5.1.1 Impact identification

Impact	Further assessment	Justification	Mitigation
Atmospheric emissions	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur following CoP. Emissions generated by infrastructure, equipment and vessels associated with operation of the assets will be replaced by those from vessel use as well as the recycling of decommissioned materials. Reviewing historical EU Emissions Trading Scheme data and comparison with the likely emissions from the proposed workscope suggests that emissions relating to decommissioning will be minor relative to those generated during production. The estimated CO_2e emissions to be generated by the selected decommissioning options are **56,718**, this equates to **0.40%** of the total UKCS emissions in 2022 (14,300,000 Te) [54]. These emissions present a total value for the overall project; the figure has been calculated assuming approximately **215** days of vessel emissions across the	• Vessel management • Minimal vessel use/movement • Vessel sharing where possible • Engine maintenance

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		duration of the project and includes any theoretical emissions associated with the recovery of items. The project vessel time is split across **four** types of vessels which will participate in a variety of activities including: removal of installations, structures, pipelines, flowlines and umbilicals and post-decommissioning debris clearance and verification surveys. The total emissions estimate also includes any emissions associated with the recycling of infrastructure being removed. See Appendix A.5 & Appendix A.6 for a summary of the emissions associated with the project vessels, operational activity and recovery of remaining materials. Review of available decommissioning EAs shows conclusively that atmospheric emissions in highly dispersive offshore environments do not present significant impacts and are extremely small in the context of UKCS and global emissions. Most submissions also note that emissions from short-term decommissioning activities are small compared to those previously arising from the asset over its operational life. Considering the above, atmospheric emissions do not warrant further assessment.	
Seabed disturbance	Yes	There is potential for decommissioning activities to generate disturbance to the seabed; including the	• Mitigation addressed in Section 5.2.4.

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		removal of the jacket, SOST, subsea structures, pipelines and stabilisation materials. This aspect has therefore been assessed further in Section 5.2**.**	
Physical presence of infrastructure decommissioned *in situ*	No	All surface and subsea structures (including concrete protection structures and grout bags) and surface laid pipelines, umbilicals and flowlines will be fully removed and any local excavations will be left to backfill naturally with the exception of the pile excavations, which will be remediated via rock placement. Sections of various pipelines are currently buried under rock placement, the overlying deposited rock will need to be dispersed to expose the underlying infrastructure, once exposed this infrastructure is also to be completely removed and returned to shore. The dispersed rock will be left *in situ.* In order to confirm that Premier has left the site in an over trawlable state following decommissioning activities, seabed clearance survey will be conducted in agreement with OPRED and statutory consultees. Due to the above reasoning, Physical presence of infrastructure decommissioned *in situ* does not require further assessment.	• The Solan subsea infrastructure is currently shown on Admiralty Charts and the FishSAFE system. Once decommissioning activities are complete, updated information on the Solan subsea area (i.e. which infrastructure has been removed) will be made available to allow the Admiralty Charts and the FishSAFE system to be updated • All infrastructure, including surface laid and buried pipelines (including associated stabilisation material) will be removed • Evaluation of post-decommissioning surveys will identify the requirement for remediation of depressions generated through dredging around piles, although metocean conditions and sediment composition are likely to be sufficient to naturally backfill any such depressions • Any objects dropped during decommissioning activities, or any existing debris identified will be removed from the seabed where appropriate • An appropriate vessel will be engaged to carry out survey work within the 500 m safety exclusion zones, at locations where infrastructure have been

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
			removed. Decommissioning activities will be considered to be complete subject to acceptance of the Decommissioning Close-out Report by OPRED. The existing 500 m safety exclusion zones will then be removed.
Physical presence of vessels in relation to other sea users	No	The presence of a small number of vessels for decommissioning activities will be short-term in the context of the life of the Solan field. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities across the Solan area. Furthermore, the majority of decommissioning works will be carried out within the 500 m zone (with the exception of some pipeline remediation activities), thereby using the area around existing infrastructure and not occupying 'new' areas. Vessel presence will be spatially and temporally restricted so exclusion will only be short-term. Other sea users will be excluded from the 500 m safety zone during active operations. The 500 m safety zones will remain until such time the installations are fully removed. Thereafter applied safety zones will remain until such time debris clearance and seabed remediation has been completed. The decommissioning of the Solan area will result in a positive impact by opening up new fishing grounds previously unavailable due to the 500 m	• Minimal vessel use/movement • Notification to Mariners • Opening up of 500 m safety exclusion zones following seabed-clearance

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		safety exclusion zones currently imposed around the Premier installation. The proposed decommissioning of the Solan area is estimated to require **four** different vessel types. These would not all be on location at the same time. Vessel activities are expected to cover approximately **215** days. Overall levels of vessel activity attributed to the decommissioning are likely to be similar to those experienced under typical conditions. The nearshore activities associated with this project are very likely to be limited in duration (i.e. limited to passing survey vessels). While the offshore Solan area experiences low shipping, with standard mitigation measures in place, and the short-term nature of these operations, the risk of collision is not expected to be significant. Such measures include Notice to Mariners, the maintained presence of 500 m safety exclusion zone around the platforms and use of navigation aids and safety standby vessels. Other sea users will be notified in advance of planned activities through the appropriate mechanisms, meaning those stakeholders will have time to make any necessary alternative arrangements during the finite period of operations. Considering the above, the physical presence of vessels does not warrant further assessment.	

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
Underwater noise	No	There is potential for localised injury and disturbance to marine mammals and fish through noise from cutting operations and vessels across the project area, however, recent research findings regarding noise levels emitted during diamond wire cutting procedures determined they were not easily discernible above the background noise levels (mostly attributed to vessel activity) [58]. In the absence of recorded field measurements, it seems likely that this form of cutting would not generate a great deal of noise and may not be detectable above other sources operating simultaneously (i.e. vessels) within the Solan area. The need for geophysical surveys undertaken for post-decommissioned infrastructure left *in situ* will be determined in the future and assessed through the process of permit applications as appropriate. The JNCC (2020) Guidelines will be employed for mitigation of noise impacts to marine mammals for future survey work involving seismic survey equipment [39]. As presented in the ENVID exercise, the activities associated with the decommissioning of the Solan are likely to be minor and are unlikely to generate significant noise levels. As the project is not located within a marine mammal protection area and EAs for offshore oil and gas decommissioning projects generally show no potential injury or significant disturbance associated with the non-	• Vessel management; • Minimal vessel use/movement; • Vessel sharing where possible; and • Cutting activities will be minimised and carried out in isolation where possible.

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		survey decommissioning activities. Further assessment of the impact of the decommissioning on this receptor is therefore not required.	
Discharges to sea	No	Discharges from vessels are regulated activities that are managed on an ongoing basis through existing legislation and compliance controls. All subsea infrastructure in the Solan area will have been drained and flushed at CoP. This is a pre-decommissioning activity which has been permitted as appropriate, and therefore, falls outside the scope of this EA. Any discharges from infrastructure occurring during decommissioning activities will similarly be assessed in more detail as part of the environmental permitting process (e.g., through Master Application Templates/Subsidiary Application Templates). Controls will be in place, as relevant, through the Offshore Chemical Regulations and the Oil Pollution Prevention and Control regulations. Residual liquids present during the decommissioning of pipelines and subsea infrastructure will be treated before being discharged to sea, such that the discharge will comprise treated water. Pipelines will be flushed to an acceptable level of cleanliness, which will be agreed with OPRED as part of the permitting process. All residual solids will be shipped to shore for disposal.	• MARPOL compliance • Bilge management procedures • Vessel audit procedures • Contractor management procedures

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		Considering the above, discharges to sea during decommissioning activities are not assessed further herein.	
Resource use	No	Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Any opportunities for increasing fuel efficiency and reducing use of resources will be identified and implemented by Premier where possible. The estimated total energy usage for the project is **171,754** GJ. This number accounts for all operations and material recycling. This is considered very low, compared to the resources generated during the production phase of the project. A summary breakdown of energy use associated with the project is available in Appendix A.5 and Appendix A.6. Considering the above, resource use does not warrant further assessment.	• Adherence to the Waste Hierarchy • Vessel management • Minimal vessel use/movement • Vessel sharing where possible • Engine maintenance
Waste	No	The onshore treatment of waste from the Solan decommissioning activities will be undertaken according to the principles of the waste hierarchy, a conceptual framework which ranks the options for dealing with waste in terms of sustainability. The waste hierarchy is a key element in OSPAR Decision 98/3 and BEIS Guidance [3]. Waste material will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of	• Overall 'Duty of Care' • Waste Management Plan • Active waste tracking (cradle to grave) • Adherence to the Waste Hierarchy • Transfrontier Shipment of Waste (if applicable) • Permitting for hazardous wastes • Communication with relevant Regulator(s) • EEMS tracking • Close-out reporting

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned non-hazardous material. Other non-hazardous waste which cannot be reused or recycled will be disposed of to a landfill site. The Solan facility will be transported to shore for decontamination, dismantlement, reuse, recycling or disposal. Typically, around 95% of the materials from decommissioning projects can be recycled [56]. There may be instances where infrastructure returned to shore is contaminated (e.g., by Naturally Occurring Radioactive Material ('NORM'), hazardous, and/or special wastes) and cannot be recycled. In these instances, the materials will require disposal. Hazardous waste resulting from the dismantling of the Solan facility will be pre-treated to reduce hazardous properties or render it non-hazardous prior to recycling or disposing of it to a suitable landfill site. Under the Landfill Directive, pre-treatment is necessary for most hazardous wastes destined to be disposed of to a landfill site. However, the weight and/or volume of such material is not expected to result in substantial landfill use. The recycling and disposal of wastes are covered by Premier's Waste Management Strategy, which is compliant with relevant regulations relating to the	• Contractor management

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		handling of waste offshore, transfer of controlled, hazardous (special) waste, and Trans-Frontier Shipment of Waste ('TFSW'). The Waste Management Strategy is guided by Harbour Energy's HSES Policy (Appendix C: HSES Policy) and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for ongoing monitoring of waste procedures and performance review against target Key Performance Indicators ('KPIs'). It should be noted that, only licenced contractors which can demonstrate they are capable of handling and processing the material to be brought ashore will be considered for onshore activities and this will form an integral part of the commercial tendering process. Due diligence audits will take place of waste contractors/sub-contractors to ensure that all necessary handling and reporting measures (including tracking of wastes, accounting and identification of wastes, wastes generated per asset and waste segregation) are taking place. Specific audit/monitoring schedules will be set up as part of the disposal yard contract award. No further assessment of waste is necessary.	
Disturbance to nesting seabirds	Yes	All nesting birds and nesting activities are protected from damage by conservation legislation. under the	• Mitigation addressed in Section 5.3.4

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017, it is an offence to: • Take, damage or destroy the nest of any wild bird while that nest is in use or being built; or • Take or destroy an egg of any wild bird. This legislation is relevant to installations more than 12nm from the coast, applies to all species of bird and applies irrespective of the number of nests found. i.e., there is no de-minimus. The preferred practice is to avoid disturbance by undertaking works out with the breeding season, however, this is not always practicable. Where required, Premier are committed to deterring birds from their installations out with the breeding season to mitigate against nesting birds on the platform. Premier will engage with OPRED to agree any further licensing requirements, as appropriate and will also engage in the appropriate monitoring and surveys prior to decommissioning. Due to both stakeholder and regulatory interest, potential disturbance to seabird nests has been scoped in for further assessment in Section 5.3.	
Accidental events (Vessel inventory loss and dropped objects)	No	Well decommissioning is outside of the scope of this specific impact assessment, since it not dependent on approval of the DP. The possibility of a well blowout therefore does not require consideration in this assessment (it is assessed as part of separate well	• OPEP and SOPEP in place for operations • Navaids (Cardinal Buoys) in place • 500 m zones operational until seabed clearance certified

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		intervention and marine licence applications). Pipelines and umbilicals will have been flushed and cleaned prior to the decommissioning activities described herein being carried out. Release of a hydrocarbon and chemical inventory is therefore also out of scope of this assessment. Therefore, the most likely origin of an accidental event would be from an unplanned instantaneous diesel release from the largest vessel employed in the decommissioning activities. This is expected to be an HLV with a maximum fuel capacity of approximately 1,569 m^3. The fuel inventory of the HLV vessel is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of the full inventory. Any spills from vessels in transit or participating in decommissioning activities are covered by a Communication and Interface Plan of the Solan Offshore Oil Pollution Emergency Plan, and by separate Shipboard Oil Pollution Emergency Plans ('SOPEPs'). Premier will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP. There is a very low likelihood of vessel-to-vessel collision occurrence, an estimated one collision in 685 years. Considering this, and in line with the mitigation measures in place, a vessel collision scenario does not	• SOPEP on all vessels • Spill response procedures • Bunkering procedures in place (if necessary) • Contractor management and communication • Lifting operations management of risk • Dropped object recovery and debris clearance surveys • PON2 submission

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		require further assessment here. Vessel collision with any of the surface installations is in some cases an order of magnitude less likely. In addition to the mitigation measures outlined in the individual vessel SOPEPs, Premier maintains manned bridges, navigational aids and monitoring of safety zones. Only project vessels will be present when activity is taking place within 500 m safety exclusion zones. Other vessels will not be present within the 500 m zone at any time prior to well decommissioning, therefore the likelihood of fishing vessels trawling in the vicinity of the wellheads is negligible. Dropped object procedures are industry-standard and will be employed. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. The post-decommissioning Clear Seabed Verification Survey will aid in the identification of in-field dropped objects. During transport the infrastructure will either be transported on deck with suitable sea fastening or held 'in the hook' securely for transport as per safe vessel operating procedures. As a result, there will be minimal risk from significant dropped objects during transport. Should such an event occur, the likely destination ports would mean transport over gas or condensate lines only which would result in a low-risk hydrocarbon release	

Table 5.1.1 Impact identification			
Impact	**Further assessment**	**Justification**	**Mitigation**
		which could be managed by offshore spill procedures with minimal environmental impact. As the methodology for platform removal to shore has not been defined, there exists the possibility that the platforms could be transported by a vessel using a crane. Where these would be suspended over the side of the vessel for the transfer, the possibility of dropping onto a live pipeline cannot be ruled out. However, dropped object procedures are industry standard and there is only a very remote probability of any interaction with any live infrastructure, when planning for such transport efforts will be made to minimise the transit over live infrastructure. In line with the mitigation measures in place, accidental events are not assessed further herein.	

5.2 Seabed disturbance

5.2.1 Introduction

This section discusses the potential environmental impacts associated with seabed interaction resulting from the proposed Solan infrastructure decommissioning activities. The measures planned by Premier to minimise these impacts are detailed in Section 5.2.4.

The decommissioning activities have the potential to impact the seabed in the following main ways:

- Direct impact through:
    - Removal of subsea infrastructure including the jacket, structures and stabilisation materials;
    - Removal of pipelines, umbilicals and flowlines;
    - Rock displacement for buried sections of pipelines; and
    - Rock placement to remediate depressions resulting from pile excavations.
- Indirect impact through:
    - Re-suspension and re-settling of sediment.

Direct disturbance the physical disturbance of seabed sediments and habitats and has the potential to cause temporary or permanent changes to the marine environment, depending upon the nature of the associated activity. Indirect disturbance occurs outside of the direct disturbance footprint. It may be caused by the suspension and re-settlement of natural seabed sediments disturbed during activities. Indirect disturbance is considered temporary in all instances.

Vessels utilising dynamic positioning will be deployed to carry out the decommissioning activities, therefore there are no additional seabed impacts associated with anchors and mooring lines. These activities fall out with the scope of EA and the appropriate permits will be applied for in support of works carried out via the DESNZ Portal Environmental Tracking System ('PETS'). An application to decommission the wells will be made via the online WONS on the North Sea Transition Authority ('NSTA') online portal.

5.2.2 Description and quantification of impact

5.2.2.1 Jacket

As the mass of the Solan jacket (excluding piles) is <10,000 tonnes, it falls within the OSPAR 98/3 category of steel structures for which derogation cannot be sought. Therefore, the only option available for these jackets is full removal, as presented in Section 3.6.

The Solan jacket is anchored to the seabed using 16 piles (4 per leg) of varying dimensions. Assuming there would be no technical issues, the piles will be cut internally 3 m below the mean seabed. Should internal severance not be available, alternative approaches, such as excavation techniques and external cutting, may require consideration and have been assessed here based on a conical excavation with a radius of 12.7 m. As it is not possible to estimate overlap of pile excavations, no such consideration has been made here and thus the disturbance figures presented in Table 5.2.1 reflect a precautionary approach. As a worst-case scenario, excavation of the seabed, including the removal of the mud mattresses placed around the legs to prevent scour (Figure 3.1.2), will be required to release the piles from the seabed. As the removal of the mattresses is required, the direct impact has been based on the total footprint of the piles, plus the mattresses to be removed from around the platform legs. This may impact any benthos living on or around the mattresses. Indirect impacts are considered to cover twice the area of the direct impact as a worst-case scenario, to account for any sediment disturbance and resettlement (Table 5.2.1).

Permanent direct disturbance will also likely be incurred due to the rock placement used to remediate the depressions resulting from the excavations around each pile. The area of permanent disturbance is assumed to be the same footprint of that of direct disturbance resulting from pile excavation and has been calculated using an excavation cone with a radius of 12.7 m on the seabed surface.

Table 5.2.1 Seabed footprint related to the removal of jacket

Activity	Quantity and dimensions	Expected duration of disturbance	Total		
			Direct disturbance area (km^2)	Indirect disturbance area (km^2)	Permanent direct disturbance area (km^2)
Excavation and removal of Solan Jacket piles	16 x 12.7 m excavation radius	Temporary	0.008107	0.016215	0.008107
Removal of mud mattresses around Solan	4 x mattresses (84.1 m^2)	Temporary	0.000336	0.000673	-
		Total	**0.008444**	**0.016888**	**0.008107**

NOTE:
1. Worst-case scenario is based on no overlap for conical excavation.

5.2.2.2 Subsea structures

As discussed in Section 3.6, the recommended option for decommissioning subsea structures is full removal. All subsea structures are not piled to the seabed, aside from the SOST, which is piled to the seabed using 8 piles, and the SAL, which is piled to the seabed by a single pile. The piles the SOST will be removed to approximately 3 m below the seabed and may be suitable for removal via internal cutting methods, however access to cut the pile will only be confirmed when internal inspections are completed, at which point OPRED will be consulted. It is possible that some degree of excavation will be required which has been assessed here based on a conical excavation with a radius of 12.7 m. The base case for the SAL pile is for it to be removed to approximately 3 m below the seabed by an internal cut, although the feasibility of this is still to be established. OPRED will be consulted if an internal cut is not feasible or if -3m cannot be achieved. An external cut would require a degree of preparatory excavation which has been assessed here based on a conical excavation with a radius of 12.4 m. As it is not possible to estimate overlap of pile excavations, no such consideration has been made here and thus the disturbance figures presented in Table 5.2.2 reflect a precautionary approach and as such should be considered a worst case. During excavation, sediment will likely be removed by using mass flow excavator ('MFE') and will be deposited down-current of the piles, where it will undergo natural dispersal which will be transient in nature. It is expected

that the displaced sediment will be rapidly incorporated into the local sediment transport regime. The area of indirect disturbance is assumed to be twice the direct disturbance area, as a worst case (Table 5.2.2).

Table 5.2.2 Seabed footprint related to the removal of subsea structures

Activity	Quantity and dimensions (m)	Expected duration of disturbance	Total		
			Direct disturbance area (km^2)	Indirect disturbance area (km^2)	Permanent direct disturbance area (km^2)
SOST	1 x (55x45x25)[1]	Temporary	0.003575	0.007150	-
Excavation and removal of SOST Piles	8 x 12.7 m excavation radius	Temporary	0.004054	0.008107	0.004054
SAL	1 x (12x5x4.2)[2]	Temporary	0.000098	0.000196	-
Excavation and removal of SAL Pile	1 x 12.4 m excavation radius	Temporary	0.000483	0.000966	0.000483
Well P1 WHPS	1 x (7.9x7.9x4.9)[2]	Temporary	0.000098	0.000196	-
Well P2 WHPS	1 x (9.3x8.8x6.9)[2]	Temporary	0.000122	0.000244	-
Well P3 WHPS	1 x (6.1x5.7x4.6)[2]	Temporary	0.000062	0.000125	-
WI well W1 WHPS	1 x (7.9x7.9x4.9)[2]	Temporary	0.000098	0.000196	-
WI well W2 WHPS	1 x (9.3x8.8x6.9)[2]	Temporary	0.000122	0.000244	-
Trash Cap W1	1x (4.4x4.4x4.2)[2]	Temporary	0.000041	0.000082	-
Trash Cap W2	1x (4.4x4.4x4.2)[2]	Temporary	0.000041	0.000082	-
		Total	**0.008794**	**0.017588**	**0.004537**

NOTES:

1. A 5 m buffer has been applied to each face of the structure to account for any minor dredging required to facilitate removal.
2. A 1 m buffer has been applied to each face of the structure to account for any minor dredging required to facilitate removal.

Remedial rock will be used to fill excavations following removal of the jacket and piled subsea structures. The volume of rock required to fill these excavations has been calculated on the basis that 100% rock will be used given the seabed in the Solan area is and natural backfill is unlikely. The area of indirect disturbance is assumed to be twice the direct disturbance area, as a worst case shown in Table 5.2.3.

Table 5.2.3 Seabed footprint related to the requirement for remedial rock placement

Item	Quantity and dimensions (m)	Expected duration of disturbance	Quantity of rock (Te)	Total		
				Direct disturbance area (km^2)	Indirect disturbance area (km^2)	Permanent direct disturbance area (km^2)
Jacket piles	16 x 12.7 m excavation radius	Temporary and permanent	8,392.20	0.008107	0.016215	0.008107
SOST piles	8 x 12.7 m excavation radius	Temporary and permanent	4,196.10	0.004054	0.008107	0.004054
SAL pile	1 x 12.4 m excavation radius	Temporary and permanent	485.36	0.000483	0.000966	0.000483
		Total	**13,073.66**	**0.012644**	**0.025288**	**0.012644**

NOTE:

1. Worst-case scenario based on no overlap for conical excavation.

5.2.2.3 Pipelines

All pipelines, umbilicals, flowlines and stabilisation materials will be fully removed. Table 5.2.4 presents the approximate footprint of seabed affected by the decommissioning this infrastructure. Where the pipeline will be partially removed, a 10 m corridor centred (5 m each side) around each pipeline/umbilical has been assumed.

Table 5.2.4 Seabed footprint related to the decommissioning of pipelines, umbilicals and flowlines

Field	Item	Total length (m)	Decommissioning Approach	Expected duration of disturbance	Total	
					Temporary Direct disturbance area (km^2)	Temporary Indirect disturbance area (km^2)
Solan	PL3094	546	Full removal	Temporary	0.008791	0.017581
	PL3095	1,521	Full removal	Temporary	0.024488	0.048976
	PL3578	602	Full removal	Temporary	0.006243	0.012485
	PL3579	613	Full removal	Temporary	0.006369	0.012738
	PL3580	538	Full removal	Temporary	0.005525	0.011051
	PL3581	596	Full removal	Temporary	0.006121	0.012242
	PL3582	612	Full removal	Temporary	0.006285	0.012570
	PL3583	577	Full removal	Temporary	0.005926	0.011852
	PLU3584	584	Full removal	Temporary	0.005928	0.011855
	PLU3585	538	Full removal	Temporary	0.005477	0.010954
	PLU3586	594	Full removal	Temporary	0.006047	0.012094
	PLU3585JW2	40	Full removal	Temporary	0.000407	0.000814
	PLU3586JW1	40	Full removal	Temporary	0.000407	0.000814
	PLU4204	233	Full removal	Temporary	0.002337	0.004674
	PLU4205	50	Full removal	Temporary	0.000502	0.001003

Table 5.2.4 Seabed footprint related to the decommissioning of pipelines, umbilicals and flowlines						
Field	Item	Total length (m)	Decommissioning Approach	Expected duration of disturbance	Total	
					Temporary Direct disturbance area (km^2)	Temporary Indirect disturbance area (km^2)
	PLU4206	50	Full removal	Temporary	0.000502	0.001003
	PLU4207	233	Full removal	Temporary	0.002337	0.004674
	PLU4208	50	Full removal	Temporary	0.000502	0.001003
	PLU4209	50	Full removal	Temporary	0.000502	0.001003
	PL4971	1,097	Full removal	Temporary	0.011244	0.022489
	PLU4972	1,463	Full removal	Temporary	0.014937	0.029874
	PL4973	15	Full removal	Temporary	0.000150	0.000301
	PL4974	20	Full removal	Temporary	0.000201	0.000401
	PL4975	20	Full removal	Temporary	0.000201	0.000402
	PLU4976	16	Full removal	Temporary	0.000163	0.000325
	PL4977	15	Full removal	Temporary	0.000150	0.000301
				Total	**0.121740**	**0.243480**

5.2.2.4 Pipeline stabilisation materials

All stabilisation materials will be fully removed. Table 5.2.5 presents the approximate footprint of seabed affected by the decommissioning these items along with the approximate footprint associated with the dispersing of rock cover over the buried sections of PL3095, PL3580 PL3583, PLU3585, PL3581, PL3582, PLU3586, PL4971 and PLU4972. As the dispersed rock is being left *in situ*, permanent direct disturbance has also been calculated for the new location of the dispersed rock cover on the seabed.

Table 5.2.5 Seabed footprint related to the pipeline stabilisation materials

Field	Location	Stabilisation type	No.	Dimensions (m)	Disposal route	Total		
						Temporary direct disturbance area (km^2)	Temporary indirect disturbance area (km^2)	Permanent direct disturbance area (km^2)
Solan	Flowline & Umbilical protection for DC1, DC2 & Well P3 Infrastructure at Solan Platform	Concrete Mattress	30	6 x 3	Remove	0.000540	0.001080	
		25kg sand or grout bags	273	0.5 x 0.5	Remove	0.000068	0.000137	
		1Te grout bags	26	1 x 1	Remove	0.000026	0.000052	
	Pipeline protection infield between Solan Platform, SOST and SAL	Concrete Mattress	140	6 x 3	Remove	0.002520	0.005040	
		Concrete Mattress	34	6 x 4	Remove	0.000816	0.001632	
		25kg sand or grout bags	280	0.5 x 0.5	Remove	0.000070	0.000140	
		1Te grout bags	32	1 x 1	Remove	0.000032	0.000064	
	Pipeline protection at DC1 (Well P1/P2), DC2 (Well P2/W1) and Well P3	Concrete mattresses	145	6 x 3	Remove	0.002610	0.005220	
		25kg sand or grout bags	1232	0.5 x 0.5	Remove	0.000308	0.000616	
	Between Solan SOST & SAL on PL3095.	Deposited rock	1	204 x 5	Disperse and leave *in situ*	0.001020	0.002040	0.001020

Table 5.2.5 Seabed footprint related to the pipeline stabilisation materials								
Field	Location	Stabilisation type	No.	Dimensions (m)	Disposal route	Total		
						Temporary direct disturbance area (km^2)	Temporary indirect disturbance area (km^2)	Permanent direct disturbance area (km^2)
	Between Solan platform and DC1 on PL3580, PL3583, PLU3585.	Deposited rock	1	300 x 5	Disperse and leave *in situ*	0.001500	0.00300	0.001500
	Between Solan platform and DC2 on PL3581, PL3582, PLU3586	Deposited rock	1	360 x 5	Disperse and leave *in situ*	0.001800	0.003600	0.001800
	Between well P2 and well P1 on PL4971	Deposited rock	1	916 x 5	Disperse and leave *in situ*	0.004580	0.009160	0.004580
	Between Solan platform and well P3 on PLU4972	Deposited rock	1	1,196 x 5	Disperse and leave *in situ*	0.005980	0.011960	0.005980
					Total	**0.021870**	**0.043741**	**0.014880**

5.2.2.5 Summary

Table 5.2.6 provides a summary of the estimated potential seabed disturbance associated with the various decommissioning activities outlined in Section 3.9.

The overall expected temporary area of disturbance associated with all the decommissioning activities is 0.483 km^2. A further 0.028 km^2 of permanent impact, exclusively attributed to rock placement is also expected.

Table 5.2.6 Seabed footprint summary

Activity	Temporary direct disturbance (km^2)	Temporary indirect disturbance (km^2)	Permanent direct disturbance (rock) (km^2)
Jacket	0.008444	0.016888	0.008107
Subsea structure removal	0.008794	0.017588	0.004537
Pipeline decommissioning	0.121740	0.243480	-
Pipeline stabilisation decommissioning	0.021870	0.043741	0.014880
Total	**0.160848**	**0.321697**	**0.027524**
Temporary total	**0.482545**		

5.2.3 Effects on sensitive receptors

Decommissioning activities are expected to lead to two types of physical disturbance. The first is temporary disturbance, which will result from the removal of the jacket, subsea structures, pipelines, umbilicals, flowlines and stabilisation materials from the seabed. The sediment will be disturbed by the action of retrieving equipment from the seabed, but once decommissioning is complete, the affected areas will be free of anthropogenic material. Temporary disturbance should allow recovery in line with natural processes such as sediment re-suspension and deposition, movement of animals into the disturbed area from the surrounding habitat, and recruitment of new individuals from the plankton.

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

5.2.3.1 Temporary disturbance

As noted in Table 5.2.6, approximately 0.483 km^2 of seabed would be affected by temporary direct disturbance. The scale of the disturbance is minimal when compared to other forms of disturbance that occur in the area, such as commercial trawling. A commercial trawler with a 12 m wide beam trawl trawling at its slowest rate of approximately 4.7 km/hr would cover an area of roughly 0.06 km^2 per hour so would therefore take around eight hours to cover the anticipated direct disturbance area [19].

Two main factors minimise the impacts of seabed disturbance:

- Biological communities are in a continual state of flux and can either adjust to disturbed conditions or rapidly re-colonise areas that have been disturbed.
- The moderate dynamic nature of much of the seabed environment will aid the recovery of disturbed areas.

The seabed is inhabited by numerous organisms, including mobile fauna (e.g., crustaceans) which may be able to vacate an area following a disturbance and less mobile, or sessile fauna. Past surveys of this area of the WoS indicate that it is typical of the wider area; characterised by various sessile benthic species associated with specific sediment types. For instance, finer areas are colonised by the heart urchin, common starfish, hermit crab and sea star, and coarser areas are inhabited by common brittlestars. Direct mortality of such limited mobility seabed organisms and direct loss of habitat would be expected.

The seabed type within the Solan area is primarily classified under the habitat complex EUNIS biotope complex A5.27 (Deep circalittoral sand) with smaller areas of EUNIS biotope complex A5.15 (Deep circalittoral coarse sediment) and the seabed energy is described as 'low' [18]. Spawn is usually deposited demersally, on marine vegetation or on a substrate with a high percentage of gravel and a low fine sediment component [48]. This habitat would therefore support the high intensity mackerel, anglerfish, blue whiting and spurdog nursery grounds which [15] identified in this area of the WoS. Seabed disturbance could therefore also present a risk to fish and shellfish species which use the seabed for spawning and/or nursery grounds.

Given the very localised area of decommissioning activities and the transient nature of the disturbance to benthic sediments in this moderately energetic area with good recovery potential, disturbance to fish and shellfish is not expected to be significant. Fish are highly mobile organisms and are likely to avoid areas of re-suspended sediments and turbulence during the activities and these spawning and nursery grounds will be 'recolonised' over time [9]. Therefore, the proposed activities are unlikely to have an impact on fish and shellfish species populations or their long-term survival.

Post-disturbance recovery of the seabed is dependent both on the strength of the seabed soils and the ability of the hydrological regime to rework disrupted sediments and return the seabed to its original contours. It has been reported that offshore circalittoral mixed sediments have a high recoverability following disturbance [67][5].

Indirect disturbance (being twice the area of direct disturbance) is projected to have an area of temporary impact of 0.322 km^2 with no permanent impacts anticipated and very quick recovery expected. Sediments that are redistributed and mobilised as a result of the proposed decommissioning activities will be transported by the seabed currents before settling out over adjacent seabed areas. The natural settling of the suspended sediments is such that the coarser material (sands) will quickly fall out of suspension with the finer material being the last to settle. This natural process will ensure that all the suspended sediment is not deposited in one location. With the majority of the area being classified as EUNIS biotope complex A5.27 (Deep circalittoral sand), it is likely that much of this sediment will fall out of suspension in a matter of minutes.

There is the potential for a number of depressions and berms to be left on the seabed following removal of the subsea structures. As a worst-case scenario (presented in Section 5.2.2) it is assumed as a worse case, that excavation will be required to remove the subsea structures in order to facilitate removal. Based on the relatively low dynamic nature of the environment in the vicinity of the Solan, it is anticipated that these depressions will backfill naturally over time. It is estimated that it can take between 1 and 5 years for natural recovery of similar depressions [66][46][27].

The re-settlement of sediments may result in the smothering of epifaunal species [23] with the degree of impact related to their ability to clear particles from their feeding and respiratory surfaces [62]. Infaunal communities are naturally habituated to sediment transport processes and are therefore less susceptible to the direct impact of temporarily increased sedimentation rates. Depending on the sedimentation rates, infaunal species and

communities can also work their way back to the seabed surface through blanket smothering. Defra (2010) states that impacts arising from sediment re-suspension are short-term (generally over a period of a few days to a few weeks) [12].

Following completion of the proposed activities, the natural physical processes of sediment transportation and natural backfilling are therefore expected to restore the seabed habitat to its equilibrium state within a year. This will be qualified by post-decommissioning surveys.

5.2.3.2 Permanent disturbance

Permanent direct disturbance will occur due to placing further rock cover on the seabed in perpetuity. Approximately 0.028 km^2 of seabed will be subject to permanent (yet localised) direct disturbance due to the dispersion of rock protection material and placement of rock within the depressions resulting from the excavation surrounding each pile, as detailed in Table 5.2.6.

The proposed decommissioning activities will cause a direct impact to fauna living on and in the sediments. Mortality is more likely in non-mobile benthic organisms, whereas mobile benthic organisms are more sparsely distributed and may be able to move away from the area of disturbance. Whilst the introduction of a new substratum into the area may be influenced by scour from tides and mobile sediments and it may even become partially buried in places from time to time, it is likely that parts of it will eventually support a low diversity epifaunal community similar to that present on naturally occurring stones and boulders in the area. This will occur as a result of natural settlement by larvae and plankton and through the migration of animals from adjacent undisturbed benthic communities.

While the introduction of rock cover clearly results in a change in the habitat type and associated fauna present, the scale of the impact is negligible considering the very large extent of seabed of a similar composition available in the WoS. Rock dispersion will be extremely localised.

5.2.3.3 Impact on protected habitats

The Solan infrastructure is not located in and does not pass through any designated sites of conservational importance. The closest conservational sites are those of the Faroe-Shetland Sponge Belt MPA (26 km), West Shetland Shelf MPA (28 km) and Seas off Foula SPA (38 km).

The closest protected site with a seabed habitat as a qualifying feature is the Faroe-Shetland Sponge Belt MPA located approximately 26 km from Solan. Due to the distance, this site (which is protected, in part, for “iceberg scars”) is not expected to be impacted by the proposed operations.

5.2.3.4 Blue Carbon

Marine sediments are the primary store of biologically derived carbon (mostly inorganic carbon). Biogenic marine habitats are highly productive places, with a very high rate of assimilation of carbon into plant material (662 $gC/m^2/yr$), mostly in coastal areas. However, their overall contribution to the carbon budget is relatively small compared to sediments [6][7]. Carbon stored in organisms can be broadly defined as either ‘transient’, such as the carbon stored in seagrass beds, kelp and macroalgae; or ‘long term’, such as biogenic structures (e.g. coral reefs, serpulid reefs, mussel beds).

Carbon may be sequestrated in marine sediments as precipitated carbonates (‘PCO’) or as particulate organic carbon (‘POC’). While it is known that sediment accumulation rates tend to be faster nearer to land (e.g. in sea lochs), it is unclear what processes maintain the accumulation basins on the shelf, or whether any of the rich supply of organic material from phytoplankton in productive shelf waters becomes refractory and remains there [6]. The principal threat to long term carbon burial in sediments is any process that stirs up the sediment, particularly the top few millimetres of sediment. Resuspension of sediment allows rapid consumption of buried carbon by organisms and its subsequent release as carbon dioxide. This effectively reduces the carbon burial rate significantly and reduces the blue carbon inventory.

Patterns of standing stocks and sequestration capacity of organic carbon follow the distribution of mud and mud-sand-gravel combinations. Most organic carbon and the largest capacity for sequestration of organic carbon appears to be in deep mud off the continental shelf [6]. A review of sediment accumulation rates in the North Sea showed that the burial rates for organic carbon are strongly dependent on sediment type. The seabed type within the Solan area is primarily classified under the habitat complex EUNIS biotope complex A5.27 (Deep circalittoral sand) with areas of EUNIS biotope complex A5.15 (Deep circalittoral coarse sediments) [18].

The average percentage carbonate in the top 10 cm of superficial sediments in the offshore WoS area (BGS, 2022), is <10% which is below average for the UKCS more generally [6][53]. The impact on any blue carbon stores is therefore expected to be negligible.

5.2.4 Mitigation measures

Mitigation measures to minimise seabed impacts within the Solan area are detailed below:

- Cutting and lifting operations will be controlled by ROV to ensure accurate placement of cutting and lifting equipment and minimise any impact on seabed sediment;
- Lifting operations will be conducted around high tide and slack water to minimise the distribution of mobilised sediments;
- The requirements for further excavation will be assessed on a case-by-case basis and will be minimised to provide access only where necessary. Internal cutting will be used preferentially where access is available;
- Vessels are most likely to be equipped with dynamic positioning rather than relying on anchors to remain in position which interact with the seabed.
- The rock mass will be carefully displaced over the designated areas of seabed in order to ensure rock is only placed within close proximity to the original location, minimising seabed disturbance;
- Data collected in the area will be reviewed for potential sensitive seabed habitats prior to the commencement of operations; and
- Post-decommissioning debris clearance, surveys and monitoring shall be carried out using non-intrusive methodologies such as MBES, side scan sonar, using ROVs etc.

5.2.5 Cumulative assessment

The decommissioning activities taking place within the Solan area are unlikely to be occurring concurrently with the decommissioning of any other installation or field within close proximity (Figure 5.2.1). However, it is most likely that all of the surrounding WoS oil and gas assets will be subject to decommissioning in the coming years. The anticipated seabed footprint of these activities is currently unknown. There is no anticipated cumulative seabed impact with the Solan decommissioning activities. Therefore, cumulative impacts to the seabed caused by decommissioning activities are considered to be negligible.

The Solan infrastructure is located approximately 56 km from the UK/Faroes EEZ limit (closest point). Given this distance, and the area of indirect temporary disturbance being 0.322 km^2, there is no potential for sediment to travel beyond the immediate vicinity of the decommissioning area and into neighbouring territorial waters. The potential for transboundary impacts is highly unlikely.

Another major source of seabed disturbance in the local area is fishing activity, however, it is difficult to quantify the area impacted by fishing gear. Information presented in Section 4.4, suggests that fishing activity is moderate near Solan and moderate to high in the south and southeast of the project area (Figure 4.4.2).

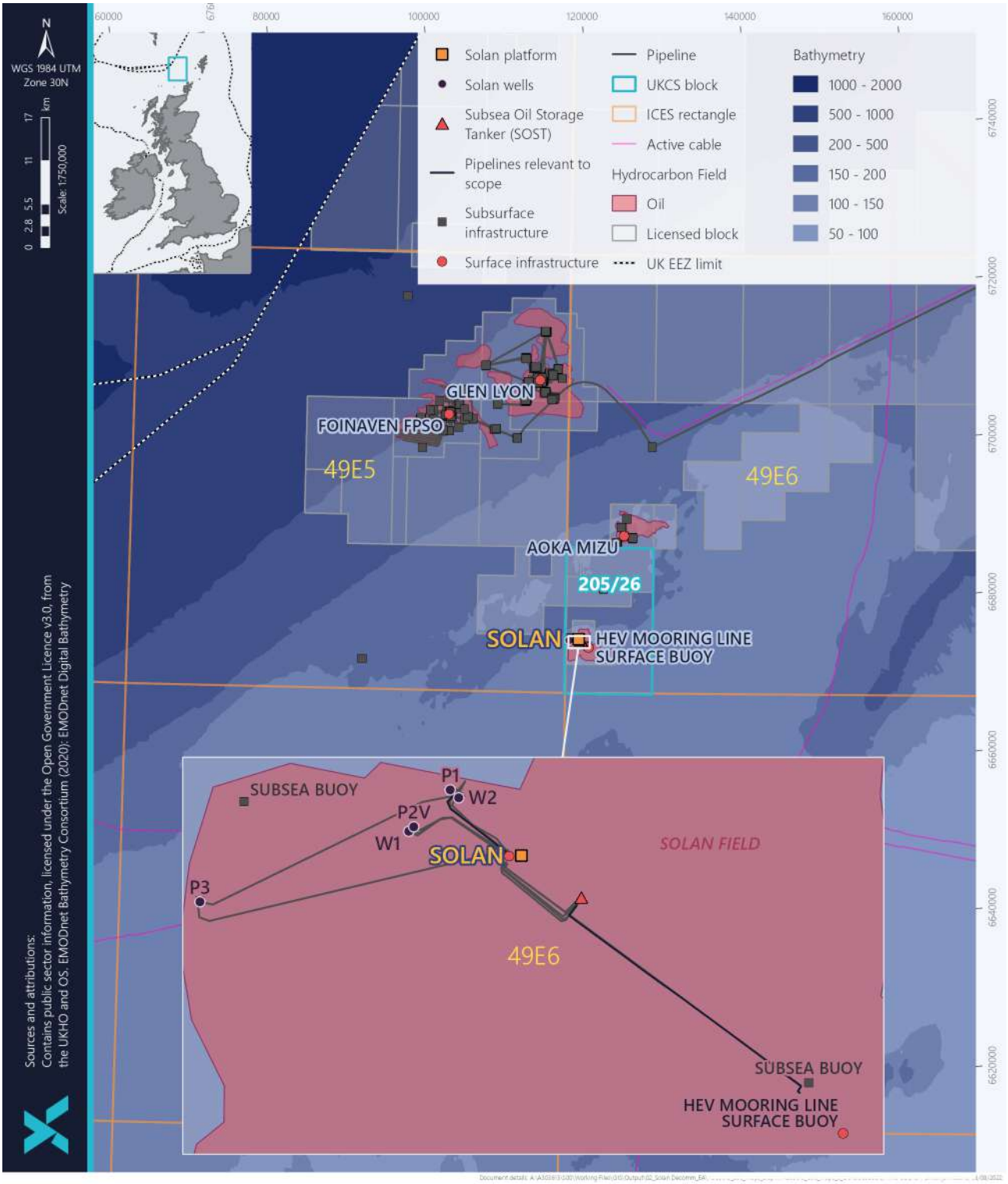

Figure 5.2.1 Location of Oil and Gas infrastructure within 40 km of the Solan Field

5.2.6 Residual Impact

Receptor	Consequence	Likelihood
Seabed habitats and benthos	Low	Frequent
Protected areas	Negligible	Rare

Rationale
Decommissioning of the Solan infrastructure will cause physical disturbance to the local seabed environment. Activities will result in an expected area of temporary direct disturbance equalling 0.161 km^2. When accounting for temporary indirect disturbance, which arises secondarily due to sediment suspension and resettlement, the total area of impact is approximately 0.483 km^2. Permanent disturbance due to rock displacement will affect approximately 0.028 km^2. An evaluation of threats and Impacts to circalittoral sand and slightly mixed sediment (in line with that in the WoS area), suggested that the threat from infrastructure installation offshore is low. Direct loss of habitat and direct mortality of sessile seabed organisms that cannot move away from the contact area would be expected. Impacts arising from sediment re-suspension are expected to be short-term and mobile species will be able to avoid the area during the course of activities and 'recolonise' it in the future. Although substratum loss may cause a decline of species in the area of direct footprint, species that inhabit this type of benthic habitat are deemed to be highly recoverable. While demersal fish species using the area as a nursery ground may coincide with the decommissioning activities, given the very localised nature of decommissioning activities and the transient nature of the disturbance to benthic sediments, disturbance to fish and shellfish nursery and spawning grounds is not expected to be significant. The displacement of rock is also unlikely to disturb the natural physical processes of the area. While the movement of rock will change a new area of local substrate, the footprint will cover the same size area of seabed as previously occupied. It will still remain a small area in proportion to the area of available natural habitat. There is potential that the colonisation of hard substrate may result in a habitat moderately comparable to that of a typical rocky reef. For these reasons, the impact consequence is considered low across all receptors. Owing to the nature of the proposed decommissioning impacts on the seabed are unavoidable and, for the duration of the activities, the likelihood of disturbance to the seabed is considered frequent the general seabed habitats and benthos and the likelihood of an impact on nearby protected areas, rare. Combining the consequence and likelihood rankings, the risk significance is low seabed and benthos and negligible for any nearby protected areas. Overall, the impact of seabed disturbance due to the proposed decommissioning activities, in combination with consideration of mitigation measures, is not significant.

Risk significance	Impact significance
Minor	Not significant

5.3 Disturbance to nesting seabirds

As oil and gas infrastructure in the North Sea ages out, the role these structures occupy in seabird ecology, and the subsequent impact of their decommissioning on seabirds, is coming under increasing scrutiny. In recent years, there has been an increase in the number of seabirds utilising offshore installations for nesting. Opportunistic species such as kittiwake and herring gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Although for most offshore platforms, the number of breeding birds remains very low.

Prior to the commencement of decommissioning activities, assurances must be made that any potential adverse impacts associated with the activities will be minimised with respect to protected species such as nesting seabirds.

5.3.1 Legislative Context

Premier is fully aware of their responsibilities under the following legislative expectations and requirements. The Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) transpose the European Union ('EU') Wild Birds Directive and secure protection of wild birds, their eggs and nests in the offshore marine area, including offshore marine installations. It is an offence under Regulation 40 to deliberately injure, kill or disturb any wild bird or take, damage or destroy the nest whilst in use or being built or take or destroy an egg.

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 amend the 2017 Regulations to ensure that the transposition of the Wild Birds Directive (and Habitats Directive) continues to be operable upon the UK's exit from the EU. The transposition note for the 2017 Regulations indicates that it was intended that Regulation 40 would transpose Article 5 of the Wild Birds Directive so despite deliberate disturbance not being specified it is intended it should be included [42].

5.3.2 Guidance Recommendations

Recent decommissioning operations in the UKCS have reported significant numbers of kittiwake nests on the cardinal faces and undersides of certain platforms. They are colonial nesters and readily utilise offshore platforms as an artificial cliff habitat.

Current advice from JNCC requests that all platforms that will have significant decommissioning operations planned within the following years breeding period, should have a survey undertaken to assess the extent of kittiwakes nesting on the platform. The survey methodology however is applicable to all potential nesting seabirds offshore.

An awareness of the birds utilising the platform will allow the operator the opportunity to implement a deterrence strategy, and/or apply for a licence to disturb if operations will lead to disturbance of nests that cannot be mitigated against. The survey data can be used to inform the planning and scheduling of works in order to avoid the risk of an offence and/or to determine whether a disturbance licence needs to be sought from OPRED.

5.3.3 Description and quantification of impact

The WoS is an important foraging ground for a number of seabird species. Table 5.3.1 shows a list of more common species typically recorded in the WoS area. Of these species only three have been recorded nesting on offshore platforms on the UKCS: kittiwake, lesser black-backed gull and herring gull.

Table 5.3.1 List of common seabird species recorded WoS	
Species common name	**Scientific name**
Arctic skua	*Stercorarius parasiticus*
Atlantic puffin	*Fratercula arctica*
Black-legged kittiwake	*Rissa tridactyla*
Common guillemot	*Uria aalge*
European storm-petrel	*Hydrobates pelagicus*
Glaucous gull	*Larus hyperboreus*
Great black-backed gull	*Larus marinus*
Great skua	*Stercorarius skua*
Herring gull	*Larus smithsonianus*
Iceland gull	*Larus glaucoides*
Lesser black-backed gull	*Larus fuscus*
Northern fulmar	*Fulmarus glacialis*
Northern gannet	*Morus bassanus*
Razorbill	*Alca torda*

5.3.4 Mitigation measures

Premier have implemented an internal team to discuss all aspects of bird management applicable to decommissioning operations. The remit of this team's work is to:

- Plan and arrange seasonal surveys;
- Explore technological opportunities for evidence gathering; and
- Develop Seabird management plans.

Premier will liaise with OPRED and JNCC to confirm expectations and licensing requirements based on the nest status and scheduling, as appropriate.

5.3.5 Cumulative impact

There are no clear cumulative impacts associated with the disturbance or abandonment of nests on the Solan facility.

5.3.6 Transboundary impact

There are no transboundary impacts associated with the disturbance or abandonment of nests on the Solan facility.

5.3.7 Residual impact

Receptor	Consequence	Likelihood
Seabirds nesting on the Solan	Negligible	Rare
Rationale		
Should nesting birds be found on the installation, decommissioning activities within the Solan project area may result in the disturbance/abandonment of nests if works or removal operations coincide with breeding periods of seabird species in UK waters. The main receptor for this disturbance will most likely be kittiwakes, lesser black-backed gull and herring gulls, although other species cannot be discounted. During all operations, disturbance or forced nest abandonment would be reduced to As Low as Reasonably Practicable ('ALARP'). The risk of either loss of nesting habitat or abandonment of eggs/fledglings is sufficiently low and localised that the impact to the local population is considered temporary, highly localised and largely undetectable against natural variation. The consequence on seabird populations is ranked as negligible. However, the results of future nesting surveys will also be taken into consideration. Following considered remedial strategies and scheduling to avoid bird breeding periods where applicable (i.e. should nesting birds be found to reside on the installation), the likelihood of occurrence is rare. This impact can only happen should any potential deterrence strategies fail.		
Risk significance	**Impact significance**	
Minor	Not significant	

6 Conclusions

The Solan field is located to the West of Shetland. This EA addresses the environmental impacts associated with the activities associated with the decommissioning of the Solan facility and associated infrastructure.

A CA was completed to determine the appropriate decommissioning methods for all items associated with the asset. Full removal of all Solan associated surface installations, subsea installations, pipelines, flowlines, umbilicals and associated protection materials will be undertaken, in line with the BEIS Guidance [3]. With regards to various sections of buried pipelines, umbilicals and flowlines, the preferred option is to disperse the overlaying rock placement and remove all infrastructure to shore, leaving the dispersed rock *in situ*.

Following detailed review of the proposed project activities, the environmental sensitivities characteristic of the project area, industry experience with decommissioning activities and of stakeholder concerns, it was determined that assessment of the following issues was required in order to properly define the potential impacts associated with the Solan decommissioning activities:

- Seabed disturbance (Section 5.2);
- Disturbance to nesting seabirds (Section 5.3).

A review of each of these potentially significant environmental interactions has been completed and the results have been summarised below.

Seabed disturbance was assessed due to the nature of the proposed activities and the location of the Solan to multiple designated sites of conservational importance. The proposed decommissioning activities may impact a temporary (direct and indirect) area of 0.483 km^2 of seabed habitat, with an additional area of 0.028 km^2 of permanent impact associated with rock dispersion. While the activities may result in the mortality of some individuals, many of the taxa within the Solan area are relatively resilient; sandy communities are comparatively quick to recover from disturbance. No decommissioning activity will be taking place in a protected area, therefore it is highly unlikely that and habitat or species of conservation interest will be directly or indirectly affected. With regards to the sediment and benthic features within area, the Solan activities are unlikely to affect the natural physical processes of the area. Overall, due to the duration and highly localised spatial scale on which the impacts will be occurring in the context of the wider available sandy habitat, the impact is considered **not significant**.

Decommissioning activities within the Solan area may result in **disturbance to nesting seabirds**, assuming nesting occurs at the installation, if works or removal operations coincide with breeding periods of seabird species in UK waters. However, following Premier's bird management plan, any potential disturbance or forced nest abandonment will be reduced to ALARP. The consequence on seabird populations will be highly localised and generate a low impact to the local population through the relatively low predicted loss of nesting habitat. Furthermore, impacts may only occur if any potential deterrence strategies are unsuccessful. The overall impact of decommissioning activities on nesting seabirds is currently considered **not significant** and should this outcome change in the wake of future survey effort, this will be communicated to OPRED.

Finally, this EA has considered the Scottish NMP, adopted by the Scottish Government to help ensure sustainable development of the marine area. Premier considers that the proposed decommissioning activities are in alignment with its objectives and policies.

In summary, the proposed operations have been rigorously assessed through the CA and EA, resulting in a set of selected decommissioning options which are thought to present the least risk of environmental impact whilst satisfying safety risk, technical feasibility, societal impacts and economic requirements. Having reviewed the project activities within the wider regional context and taking into consideration the mitigation measures to limit any potential impacts, the findings of this EA conclude that the activities do not pose any significant threat to environmental or societal receptors within the UKCS.

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Appendix A: EA Method

Appendix A.1 Impact identification

An EA in support of a DP should be focused on the key issues related to the specific activities proposed; the impact assessment write-up should be proportionate to the scale of the project and to the environmental sensitivities of the project area. This does not mean, however, that the impact assessment process should be any less robust than for a statutory EIA or consider any fewer impact mechanisms. To this end, an ENVID exercise (Appendix D: ENVID) was undertaken early in the EA process. This exercise identified the key environmental sensitivities, discussed the sources of potential impact and identified those aspects which required further assessment and those which could be scoped out. The decision on which issues required further assessment was based on:

- Specific proposed activities and sensitive environmental receptors;
- A review of industry experience of decommissioning impact assessment; and
- An assessment of wider stakeholder interest

Appendix A.2 Environmental significance

For the potential sources of impact that were assessed in this EA, it is important that a conclusion is reached regarding whether the impact is likely to result in a substantive change to environmental and societal conditions. During EA, there are many ways this can be done; a common approach is to define 'significance', and this approach is taken here. However, it is equally appropriate to employ some other method; the key is that the methods used for identifying and assessing significance are transparent and verifiable.

The first step is to assign a prediction of likelihood is assigned as per Table A.3.1, this indicates the frequency of the impact mechanism occurring during the project activities (as opposed to the likelihood of a subsequent impact occurring). The next step is to assign a prediction of consequence of environmental and societal impact, based on the criteria presented in Table A.3.2. These criteria recognise the likely effectiveness of planned mitigation measures to minimise or eliminate potential impact; as such, they represent an impact where mitigation has been taken into account. The consequence and likelihood criteria are then combined as per Table A.3.3 to give an overall risk score. This risk score is compared against the criteria presented in Table A.3.4 to give a conclusion regarding significance. In cases where the impact is considered significant, further measures to remove, reduce or manage the impact to a point where the resulting residual significance is at an acceptable level must be adopted and the steps above repeated.

Appendix A.3 Significance determination method

Table A.3.1 Definition of likelihood			
Category	**One-word descriptor**	**Description**	**Quantitative range per year**
5	Frequent	• - Likely to occur several times a year; • - Very high likelihood or level of uncertainty	$<10^{-1}$
4	Probable	• - Expected to occur at least once in 10 years; • - High likelihood or level of uncertainty	10^{-3} to 10^{-1}
3	Rare	• - Occurrence considered rare; • - Moderate likelihood or level of uncertainty.	10^{-4} to 10^{-3}
2	Remote	• - Not expected nor anticipated to occur; • - Low likelihood or level of uncertainty.	10^{-6} to 10^{-4}
1	Improbable	• - Virtually impossible and unrealistic; • - Very low likelihood or level of uncertainty	$<10^{-6}$

Table A.3.2 Definition of Consequence				
Category	**Socio-cultural economic impact**	**Biodiversity impact**	**Remediation cost**	**Negative public image exposure**
5	- Permanent loss of access or use of area with permanent reduction in associated community; - Major economic impact to surrounding community; Irrevocable loss of culture resources; - Irrevocable loss of culture resources; - Scale typically widespread (national or greater level).	Very High: - Catastrophic loss of natural resources or biodiversity typically over a widespread area, with permanent or long-term consequences; and/or - Irrevocable loss of regionally unique habitat, legally designated conservation site or intact ecosystems; - No mitigation possible	<$10,000,000	International Coverage
4	- Permanent partial restriction on access or use, or total restriction >10 years in duration; - Temporary reduction in quality of life >10 years durations; -Harm to cultural resources requiring major mitigation;	High: - Persistent environmental degradation within and beyond the project area, typically with prospects of short-to-medium term recovery if the cause of the impact is removed or by natural abatement process and/or; - Serious loss (>50%) of unique habitat or legally designated	$1,000,000 to $10,000,000	National Coverage

	-Scale typically regional to national level.	conservation site or intact ecosystems within area of study; - Mitigation only possible through prolonged and resource intensive effort (>50 years).		
3	- Temporary restriction <10 years in duration with a moderate reduction in usage levels or quality of life; - Harm to cultural resources recoverable through moderate mitigation efforts; - Scale typically local to regional level.	Medium: - Persistent environmental degradation within and close to the project area, localised within defined areas, typically with prospects of rapid recovery if cause of the impact is removed or by natural abatement processes and/or; - Temporary, but reversible loss (>25% to 50%) of unique habitat or legally designated conservation site or intact ecosystems within area of study; - Moderate mitigation efforts required (>1 to 50 years).	$100,000 to $10,000,000	Regional Coverage
2	- Best restriction <5 years in duration with a minor reduction in usage levels or quality of life; - Minor harm to cultural resources that is recoverable through minor mitigation efforts; - Scale typically localised.	Low: - Temporary environmental degradation, typically within and close to project area, with good prospects of short-term recovery; and/or - Brief, but reversible loss (>10% to 25%) of unique habitat or legally designated conservation site or intact ecosystems within area of study; - Minor mitigation efforts required (<1 year).	$10,000 to $100,000	Local Coverage
1	- Restrictions on access without loss of resources; Temporary but fully reversible impacts on quality of life; - Minor impact on cultural resources; - Typically transient and highly localised.	Negligible: - Highly transitory or highly localised environmental degradation typically contained within the project area and noticeable/measurable against background only within or in very close proximity to the project area; and/or - Some minor loss (<10%) of unique habitat or legally designated conservation site or intact ecosystems within area of study; - Naturally and completely reversible.	$0 to $10,000	No Outside Coverage

*Risk mat*Table A.3.3 Risk Matrix						
Likelihood	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		Consequence Category Note: Biodiversity and/or socioeconomic considerations take precedence: for all other factors, worst case score is assumed from severity descriptions				

Table A.3.4 Definition of significance		
Score	**Risk category**	**Significance**
IV: 17-25	High Risk. Manage risk utilising prevention and/or mitigation with highest priority. Promote issues to appropriate management level with commensurate risk assessment detail.	Significant
III: 12-16	Medium Risk. Manage risk utilising prevention and/or mitigation with priority. Promote issue to appropriate management level with commensurate risk assessment detail.	Significant
II: 5-10	Minor Risk with controls verified. No mitigation required where controls can be verified as functional.	Not significant
I: 1-4	Low Risk. No mitigation required.	Not significant

Appendix A.4 Impact identification outcome

Having used the method outlined throughout Appendix A: EA Method, each possible impact associated with the decommissioning is considered against the understanding of the environmental and societal baseline conditions for the area (Section 4). Each impact is scoped in or out of further assessment. A justification is provided for each impact scoped out. Section 5 of this EA contains the Impact Assessment for the Solan decommissioning, with Section 5.1 providing a justification for aspects scoped out.

Appendix B: Pipeline Crossing and Well Information

Solan well information			
Well ID	Designation	Status	Category of Well
205/26a-7y	Water Injection (W1)	Operating	SS 3-0-1
205/26a-8v	Development well	Decommissioned, AB2	SS 0-0-1
205/26a-9y	Oil Production (P2)	Operating	SS 3-0-1
205/26a-10z	Oil Production (P1)	Operating	SS 3-0-1
205/26a-11	Water Injection (W2)	Operating	SS 3-0-1
205/26a-15z	Oil Production (P3)	Operating	SS 3-0-1
NOTES: For details of well categorisation please refer the latest version of the Oil and Gas UK[1] Well Decommissioning Guidelines.			

Solan pipeline crossings			
ID	Pipeline description	Location	Protection / comment
SOLAN 500M SAFETY ZONE			
1-2	PL4971 over PLU4204 & PLU4207	Inside Solan combined 500m safety zone	Concrete mattresses, grout bags.
3-8	PLU4972 over PL3580, PL3581, PL3582, PL3583, PLU3585 & PLU3586	Inside Solan combined 500m safety zone	Concrete mattresses, grout bags.

[1] Oil and Gas UK changed its name to Offshore Energies UK in early 2022.

Appendix C: HSES Policy

Harbour Energy

Health, Safety, Environment and Security

Policy

Harbour Energy is committed to operating responsibly and securely, never compromising our Health, Safety, Environmental or Security (HSES) standards. Harbour Energy will do all that is reasonably practicable to reduce HSES risks, ensure the safety and security of everyone affected by our operations, protect the environment by minimising our environmental impacts, and protect our assets and business data.

To achieve this Harbour Energy will:

- Provide strong, visible leadership and commitment at all levels of the business
- Effectively identify hazards, threats and vulnerabilities to assess and manage risks
- Meet or surpass our legal and other requirements (e.g., compliance obligations)
- Set objectives and targets to drive improvement
- Support and train our people and assure their competence
- Provide appropriate resources
- Encourage open and honest communication
- Effectively manage the HSES risks associated with contracted work
- Maintain safe, clean, healthy and secure workplaces to protect our people, environment, assets and data
- Maintain protected high quality documented systems and processes
- Plan and prepare for potential emergencies
- Report, investigate and learn from any incidents and near misses
- Routinely inspect the workplace and audit systems and processes
- Seek opportunities to continually improve our performance

It is the responsibility of everyone in Harbour Energy to conform to our Policies and Standards and to assist the business in their implementation.

Linda Z Cook
CEO Harbour Energy plc
01 April 2021

HAE-GLO-HSE-POL-0001

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Appendix D: ENVID

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Preparatory activities	**Engineering down and cleaning**	**Discharges to Sea** Flushing / cleaning operations for topsides, installations and pipelines- discharge targeted 30ppm Discharge of chemicals / residual oil to sea - Water quality in immediate vicinity of discharge will be reduced slightly, but effects are usually minimised by rapid dilution in massive receiving body of water; planktonic organisms most vulnerable receptor. Potential NORM impacts.	- Controls will be in place, as relevant, through the Offshore Chemical Regulations and the Oil Pollution Prevention and Control Regulations - Work will be undertaken within permitted consent limits. - Compliance with RSA / EASR authorisation	1	5	5	- Procedural cleaning and/or containment process. - Maintenance procedures. - Bulk handling procedures and personnel training. - Vessels will be selected which comply with IMO/MCA codes for prevention of oil pollution. - Preferred operational procedures to be in place onboard vessels including use of drip trays under valves, use of pumps to decant lubricating oils, use of lockable valves on storage tanks and drums. - Chemical storage areas contained to prevent accidental release of chemicals. - Pre-mobilisation audits will be carried out including a comprehensive review of spill prevention procedures - Arrangements in place to track spills. -Residuals at cut ends released into the marine environment (post-flushing - should be low).	1	5	5	-These are routine operations and will be conducted within the agreed permit conditions and using Premier's procedural cleaning and containment processes. -Any residual material will be in trace levels/volumes following the DFPV regime and will not pose any significant risk to water quality. -Well cleaning is outwith the scope of this EA and will be covered by its own permitting regime.	**NO**
Power Generation	**Project Emissions**	**Gaseous emissions to atmosphere and energy use** Increased degradation of local/regional air quality (NOx and particulates). Transboundary air pollution. Contributing to global warming (CO2).	Emissions during decommissioning activities will occur in the context of the cessation of production. As such, almost all future emissions (from Project operations and vessels) will cease. - MARPOL compliance. - UKAPP compliance for vessels. - Minimal number of vessels deployed.	1	5	5	- Low sulphur diesel. '- Contractor selection - maintenance programmes and audits. '- Campaign, logistics, sharing vessels optimising vessels to minimise use where possible.	1	5	5	Emissions values will be included but will very likely represent a negligible proportion of all operational O&G UKCS emissions over the year.	**NO**

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				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Vessel Use	**Project Energy Use**	**Resource Use** Impact on climate change and reduction of resources of hydrocarbons. Some materials decommissioned *in situ* and some materials available for recycling.	-Energy use during decommissioning activities will occur in the context of the cessation of production. As such, almost all resource use (from Project operations, vessels and materials) will cease. - Minimal number of vessels deployed.	1	5	5	- Campaign, logistics, sharing vessels, optimising vessels to minimise use where possible. Observing the Waste Hierarchy	1	5	5	Energy value likely to be small. Replacement of materials decommissioned *in situ* is a theoretical value to replace the amount which would otherwise be recycled.	**NO**
	Vessel Engine Noise	**Underwater Noise** Physiological harm, behavioural modifications to marine mammals and potentially fish. Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location. Dynamically positioned vessels may be used. Thruster noise when initially deploying anchors and if dynamic positioning used.	-Comparable with operational background vessel noise.	1	5	5	- Campaign, logistics, sharing vessels optimising vessels to minimise use where possible - Main potential impact likely to be from disturbance rather than injury - Contractor selection - Minimising the duration, disturbance and risk of requiring the activity to be repeated.	1	5	5	Not deemed to be significant in relation to current vessel activity already being moderate, activities are far from shore and not in the vicinity of key areas for receptors and that the planned activities will be short in duration. The project area is located approximately 26 km to the nearest conservation zone (Faroe Shetland Sponge Belt MPA). The expected noise generated from the proposed decommissioning activities is not deemed to have any significant impact on any designated conservation zones due to the low estimated volume of noise and also the distance to the sites. Vessel activity within the vicinity of them project area is considered 'Very low' and it unlikely that the vessel use during operation will significantly alter that already produced	**NO**
	Vessel Discharges	**Discharges to Sea** (e.g. grey water, blackwater, ballast)	Routine discharges from vessels are typically well-controlled activities that are managed on an ongoing basis under MARPOL Annex IV.	1	5	5	'- Procedural cleaning and/or containment process - Maintenance procedures - Bulk handling procedures and personnel training	1	5	5	These are routine operations and will be conducted within the agreed permit conditions and using the vessel procedural cleaning and containment processes.	**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Topside, Jacket, Risers and Subsea Infrastructure (SOST, WHPS and SAL) Decommissioning	**Vessel Physical Presence**	**Other Users** e.g. Fisheries, Recreational users	- Limited duration. - Stakeholder engagement. - Existing controls through the Consent to Locate process. - UKHO standard communication channels including Kingfisher, Notice to Mariners and radio navigation warnings. -Safety zones will be in place - Use of Automatic Identification Systems (AIS) and other navigational controls	1	5	5	Campaign logistics and sharing vessels where possible Collision risk assessment. Stakeholder consultation. Logistics plan.	1	5	5	Not expected to be significant over normal vessel traffic and implementation of notifications etc.	**NO**
	Cutting and Removal	**Underwater Noise** Physiological harm, behavioural modifications to marine mammals and potentially fish.Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	- Intermittent and single source noise that is limited in duration - Most noise associated with these activities will be temporary and generated very close to the seabed, where absorption rates are highest.	1	5	5	- Main potential impact likely to be from disturbance rather than injury - Suitable technology for cutting will be selected to ensure the effectiveness of the cutting (likely to use diamond wire or similar mechanical form of cutting) - Minimising the duration, disturbance and risk of requiring the activity to be repeated.- Use of internal cutting where possible and external cutting methods as a contingency.	1	5	5	Planned activities will be short in duration and carried out in isolation. External cutting represents a worst-case scenario. There is low density of harbour porpoise in the project area (estimated to be 0.152 animals/km^2).	**NO**
		Seabed disturbance Disturbance to the seabed, including to features of conservation importance during removal Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	- Pre-decommissioning seabed surveys - Stakeholder consultation	3	5	15	- Review of survey data for potential sensitive habitats of seabed. - Cutting and lifting operations controlled by ROV. - Internal cutting will be used preferentially where access is available. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	3	5	15	No evidence of *S. spinulosa* or *A. islandica* aggregations within the area however, NMPi (2022) shows that the PMF 'Offshore subtidal sands and gravel' was identified in Block 205/26 which could give rise to the presence of ocean quahog. The project area is located within a wide area delineated as potentially featuring the Annex I habitat 'stony and/or bedrock reef', as listed under the EU habitats Directive (92/409/EEC). However, it should be noted that the 2008 survey recorded no indication for the presence of any potential Annex I habitats.	**YES**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking								Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
											Deemed to be a minor risk and therefore insignificant. However, due to the volume of disturbance from removal of all infrastructure, including the SOST and Jacket/Jacket footings, and the current uncertainty of seabed conditions (due to a latest survey information being 2008) this impact will be taken forward for further assessment. Potential stakeholder concern due to proximity to designated areas of conservational importance and impact on features of conservation importance including sessile and mobile organisms is also a factor in scoping this impact in.	
		Blue Carbon (linked to seabed disturbance) Disturbance to top layers of sediment during removal activities, leading to the release of a potential carbon store.	- Pre-decommissioning seabed surveys -Stakeholder consultation	1	5	5	- Cutting and lifting operations controlled by ROV. - Internal cutting will be used preferentially where access is available. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	1	5	5	Area of disturbance will be minimal – but due to emerging stakeholder and regulatory interest it will be cumulatively assed under seabed disturbance.	**YES (within Seabed Disturbance)**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
		Bird Disturbance All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to: 1. Take, damage or destroy the nest of any wild bird while that nest is in use or being built, or 2. Take or destroy an egg of any wild bird.	-Preferred approach is to avoid activity during breeding season which is not always practicable -Licensing requirements	3	3	9	- Premier are committed to deterring birds from their installations out with the breeding season to mitigate against nesting birds on the platform. Premier are in the process of surveying their installations to identify the presence of any wild birds and if discovered, may employ a range of non-invasive/ non-lethal deterrents to prevent birds nesting. These methods will continue throughout the duration of decommissioning. -Should these measures not prove successful, Premier will engage with OPRED to agree any further licensing requirements, as appropriate.	3	1	3	Opportunistic species such as Kittiwake and Herring Gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Due to stakeholder interest and proximity to Conservation sites designated to Seabirds this has been scoped in. The SPA Seas of Foula is situated 36 km to the northwest of the Solan infrastructure and is designated for high bird presence.	**YES**
		Physical presence of infrastructure being left *in situ* - Other Users Risk over time due to nearshore users as pipeline degrades. Safety risk to near shore users.	Continued monitoring for an agreed period and remediation if required, accurate mapping of decommissioned *in situ* location and state. The pipelines will be flushed clean of hydrocarbons and toxic materials, then disconnected and sealed.	5	2	10	Same as existing controls with additional subsidence monitoring where access allows.	5	1	5	Not scoped in due to all infrastructure being removed to shore for recycling/disposal.	**NO**
	Cutting and Removal Physical presence of infrastructure being left *in situ*	**Underwater Noise** Physiological harm, behavioural modifications to marine mammals and potentially fish.Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	- Intermittent and single source noise that is limited in duration	1	5	5	- Main potential impact likely to be from disturbance rather than injury - Suitable technology for cutting will be selected to ensure the effectiveness of the cutting (likely to use diamond wire or similar mechanical form of cutting) - Minimising the duration, disturbance and risk of requiring the activity to be repeated. - Use of internal cutting where possible and external cutting methods as a contingency.	1	5	5	Planned activities will be short in duration and carried out in isolation. External cutting represents a worst-case scenario.	**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Pipelines, Flowlines and umbilicals Decommissioning		**Seabed disturbance** Disturbance to the seabed, including to features of conservation importance during removal Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	- Pre-decommissioning seabed surveys -Stakeholder consultation	2	5	10	- Review of survey data for potential sensitive habitats of seabed. - Cutting and lifting operations controlled by ROV. - Internal cutting will be used preferentially where access is available. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	2	5	10	No evidence of *S. spinulosa* or *A. islandica* aggregations within the area however, NMPi (2022) shows that the PMF 'Offshore subtidal sands and gravel' was identified in Block 205/26 which could give rise to the presence of ocean quahog. The project area is located within a wide area delineated as potentially featuring the Annex I habitat 'stony and/or bedrock reef', as listed under the EU habitats Directive (92/409/EEC). However, it should be noted that the 2008 survey recorded no indication for the presence of any potential Annex I habitats. Deemed to be a minor risk and therefore insignificant. Potential stakeholder concern due to proximity to designated areas of conservational importance and impact on features of conservation importance including sessile and mobile organisms, therefore scoped into further assessment.	**YES**
		Blue Carbon (linked to seabed disturbance) Disturbance to top layers of sediment during removal activities, leading to the release of a potential carbon store	- Pre-decommissioning seabed surveys -Stakeholder consultation	1	5	5	- Review of survey data for potential sensitive habitats of seabed. - Cutting and lifting operations controlled by ROV. - Internal cutting will be used preferentially where access is available. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	1	5	5	Area of disturbance will be minimal – but due to emerging stakeholder and regulatory interest it will be cumulatively assed under seabed disturbance.	**YES (within Seabed Disturbance)**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
		Bird Disturbance All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to: 1. Take, damage or destroy the nest of any wild bird while that nest is in use or being built, or 2. Take or destroy an egg of any wild bird.	-Preferred approach is to avoid activity during breeding season which is not always practicable -Licensing requirements	1	5	5	- Premier are committed to deterring birds from their installations out with the breeding season to mitigate against nesting birds on the platform. Premier are in the process of surveying their installations to identify the presence of any wild birds and if discovered, may employ a range of non-invasive/ non-lethal deterrents to prevent birds nesting. These methods will continue throughout the duration of decommissioning. Should these measures not prove successful, Premier will engage with OPRED to agree any further licensing requirements, as appropriate.	1	5	5	Opportunistic species such as Kittiwake and Herring Gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Due to stakeholder interest and proximity to Conservation sites designated to Seabirds this has been scoped in. The SPA Seas of Foula is situated 36 km to the northwest of the Solan infrastructure and is designated for high bird presence.	**YES**
		Physical presence of infrastructure being left *in situ* - Other Users Risk over time due to nearshore users as pipeline degrades. Safety risk to near shore users.	Continued monitoring for an agreed period and remediation if required, accurate mapping of decommissioned *in situ* location and state. The pipelines will be flushed clean of hydrocarbons and toxic materials, then disconnected and sealed	5	2	10	Same as existing controls with additional subsidence monitoring where access allows.	5	1	5	Not scoped in due to all infrastructure being removed to shore for recycling/disposal.	**NO**
Stabilisation Features (Concrete Mattresses, grout bags and rock over)	**Removal**	**Physical presence of rock placement left *in-situ* -Other Users** Risk over time due to physical presence of rock. Safety risk to near other users of the sea.	Post decommissioning surveys / seabed clearance certificate to determine overtrawlability of material left in-situ and minimise potential snagging risk. Number of surveys will be agreed with OPRED.	1	5	5	Same as existing controls.	1	5	5	Very Low commercial fishing and shipping activity in the area.	**NO**

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			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
		Underwater Noise Physiological harm, behavioural modifications to marine mammals and potentially fish.Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	- Intermittent and single source noise that is limited in duration	1	5	5	- Main potential impact likely to be from disturbance - Minimising the duration, disturbance and risk of requiring the activity to be repeated.	1	5	5	Planned activities will be short in duration and carried out in isolation.	**NO**
		Seabed disturbance Disturbance to the seabed, including to features of conservation importance during removal. Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA. Lethal/sub-lethal effects on benthic and epibenthic fauna from physical abrasion; Smothering of organisms following settlement of resuspended particles.	- Pre-decommissioning seabed surveys - Stakeholder consultation	2	5	10	- Review of survey data for potential sensitive habitats of seabed. - Lifting operations controlled by ROV. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	2	5	10	No evidence of *S. spinulosa* or *A. islandica* aggregations within the area however, NMPi (2022) shows that the PMF 'Offshore subtidal sands and gravel' was identified in Block 205/26 which could give rise to the presence of ocean quahog. The project area is located within a wide area delineated as potentially featuring the Annex I habitat 'stony and/or bedrock reef', as listed under the EU habitats Directive (92/409/EEC). However, it should be noted that the 2008 survey recorded no indication for the presence of any potential Annex I habitats. Deemed to be a minor risk and therefore insignificant. Potential stakeholder concern due to proximity to designated areas of conservational importance and impact on features of conservation importance including sessile and mobile organisms, therefore scoped into further assessment.	**YES**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
		Blue Carbon (linked to seabed disturbance) Disturbance to top layers of sediment during removal activities, leading to the release of a potential carbon store.	- Pre-decommissioning seabed surveys - Stakeholder consultation	1	5	5	- Review of survey data for potential sensitive habitats of seabed. - Lifting operations controlled by ROV. - Heavy lift vessels are likely to be equipped with dynamic positioning rather than relying on anchors to remain in position.	1	5	5	Area of disturbance will be minimal – but due to emerging stakeholder and regulatory interest it will be cumulatively assed under seabed disturbance.	**YES (within Seabed Disturbance)**
		Bird Disturbance All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to: 1. Take, damage or destroy the nest of any wild bird while that nest is in use or being built, or 2. Take or destroy an egg of any wild bird.	-Preferred approach is to avoid activity during breeding season which is not always practicable -Licensing requirements	1	5	5	- Premier are committed to deterring birds from their installations out with the breeding season to mitigate against nesting birds on the platform. Premier are in the process of surveying their installations to identify the presence of any wild birds and if discovered, may employ a range of non-invasive/ non-lethal deterrents to prevent birds nesting. These methods will continue throughout the duration of decommissioning. -Should these measures not prove successful, Premier will engage with OPRED to agree any further licensing requirements, as appropriate.	1	5	5	Opportunistic species such as Kittiwake and Herring Gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Due to stakeholder interest and proximity to Conservation sites designated to Seabirds this has been scoped in. The SPA Seas of Foula is situated 36 km to the northwest of the Solan infrastructure and is designated for high bird presence.	**YES**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Waste Management	**Decommissioning**	**Waste** Resource use Energy consumption Use of landfill space	- Use of appropriately authorised waste management contractor(s) and facilities - Compliance with Waste Hierarchy.	1	5	5	- Detailed inventories (including IHM) - Project Waste Management Targets - Active Waste Management Plan	1	5	5	Additional controls will ensure that risks are adequately identified, assessed, managed and controlled.	**NO**
	Decommissioning and Transport	**Waste** Waste, including non-hazardous, hazardous, radioactive and marine growth.	-In accordance with the BEIS Guidance Notes under the Petroleum Act 1998, the disposal of such installations should be governed by the precautionary principle. -Waste Hierarchy -As per the Landfill Directive, pre-treatment will be necessary for most hazardous wastes which are destined to be disposed of to landfill site.	1	5	5	- Detailed inventories (including IHM) - Project Waste Management Targets - Active Waste Management Plan	1	5	5		**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking						Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
	Dismantling	**Waste** Onshore dismantling yard activities including airborne noise, odour, light, dust and aesthetics	-In accordance with the BEIS Guidance Notes under the Petroleum Act 1998, the disposal of such installations should be governed by the precautionary principle. -Waste Hierarchy -Onshore yards already deal with potential environmental issues as part of their existing site management plans.	1	5	5	- Detailed inventories (including IHM) - Project Waste Management Targets - Active Waste Management Plan	1	5	5		**NO**

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			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Unplanned Events	**Loss of containment**	**Accidental Events** Pollution of the marine ecosystem with hydrocarbons Project will introduce new diesel inventory to the site with additional inherent spill / pollution risk e.g., from heavy lift vessel.	- OPEP/SOPEP, including modelling and appropriate response planning - Collision risk assessment - Communication Interface Plan - Navaids used where appropriate	5	2	10	- Vessel diesel inventory expected to be within quantity modelled in OPEP - Maintenance procedures - Bulk handling procedures and personnel training - Vessels will be selected which comply with IMO/MCA codes for prevention of oil pollution - Maintenance procedures - Pre-mobilisation audits will be carried out including a comprehensive review of spill prevention procedures - Arrangements in place to track spills - Adverse weather working procedures - Use of existing 500 m safety exclusion zone at platforms during lifting operations. -Navigation aids, lighting in line with HSE and MCA requirements. -500 m safety exclusion zone to remain in operation.	5	1	5	-Well P&A is outside of the scope of this specific impact assessment, since it not dependent on approval of the DP. The possibility of a well blowout therefore does not require consideration here. -Reduced to 'as low as reasonably practicable'	**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking						Actions	
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				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
	Dropped objects	**Seabed Disturbance** Localised physical seabed disturbance resulting in community change. Recovery time and extent dependent on type of seabed and species present and location specific estimate within EA.	- Industry-standard procedures in place to make sure that the location of any lost material is recorded and that significant objects are recovered where practicable.	2	2	4	- Premier 's Environmental Management System. - Procedures will be in place to reduce the potential for dropped objects. - Training and awareness of contractors will be required. - Lift planning will be undertaken to manage risks during lifting activities, including the consideration of prevailing environmental conditions and the use of specialist equipment where appropriate. - All lifting equipment will be tested and certified. - Dropped objects would be recovered where practicable.	1	2	2	Premier procedures will reduce the potential for dropped objects.	**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking						Actions	
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				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
Legacy	**Surveys for post-decommissioned infrastructure left in-situ**	**Seabed disturbance** minor, localised physical seabed disturbance resulting in community change.	- Assessment undertaken for Survey SAT / notification - Use of dynamically positioned vessel (no anchors)	1	5	5	- Pre-determined survey / sampling regime aligned with industry best practise	1	5	5	Additional control will have no bearing on Residual Ranking.	**NO**

Project Activity	Detailed Activity	Summary of Environmental Impact/ Location-Specific Sensitive Habitats and Species	Controls, Mitigations and Ranking							Actions	
			Existing controls - Industry Standard, Legislative or Prescriptive	Initial Ranking taking into account existing controls and mitigation			Project Specific and Premier Best Practice	Final Ranking taking into account project-specific controls and mitigation			Comments	Taken Forward for Further Assessment?
				Consequence	Likelihood	Initial Risk / Impact Ranking		Consequence	Likelihood	Final Risk / Impact Ranking		
		Underwater noise Physiological harm, behavioural modifications to marine mammals and potentially fish. - Population impacts due to cumulative impact or impacting a reproductively significant number of individuals or location.	- Assessment undertaken for Survey SAT / notification - Minimal number of vessel days - JNCC (2017) Guidelines will be employed for mitigation of noise impacts to marine mammals for future survey work involving seismic survey equipment.	1	2	2	- Pre-determined survey / sampling regime aligned with industry best practise	1	2	2	Additional control will have no bearing on Residual Ranking.	**NO**

Appendix E: Energy and Emissions Summary

Appendix A.5 Project Activity

Table E.1.1 Energy and emissions by project activity		
Planned activity	**Operations energy (GJ)**	**Operations CO_2e (Te)**
Offshore transportation	**171,754**	**12,782**
Onshore deconstruction	**14,771.88**	**-***
Onshore transportation	**154.02**	**11.13**
Recycling of materials	**261,766.85**	**27,590**
New manufacture to replace recyclable materials	**318,725.35**	**16,335**
Total	**767,171.60**	**56,718**

ND: No conversion factor available

Appendix A.6 Offshore Transport

Table E.2.1 Offshore transport energy and emissions			
Vessel type	**Total duration (days)**	**Operations energy (GJ)**	**Operational CO_2 e(Te)**
HLV	**39.2**	**171,754**	**12,782**
CSV	**140**		
Anchor Handler	**15.6**		
Survey Vessel	**20**		