Heimdal to Brae Alpha Condensate Pipeline PL301 - Decommissioning

Environmental Appraisal

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Terms and Abbreviations

Abbreviation	Explanation
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable'
AWMP	Active Waste Management Plans
BAT	Best Available Technique
BEIS	Department of Business, Energy and Industrial Strategy
BP	British Petroleum
CA	Comparative Assessment
CNS	Central North Sea
CO_2	Carbon Dioxide
COP	Cessation of Production
CSV	Construction Support Vessel
DECC	Department of Energy and Climate Change (now BEIS)
DOB	Depth of Burial
DP	Decommissioning Programme
EA	Environmental Appraisal
EMODnet	European Marine Observation and Data Network
EMS	Environmental Management System
EMT	Environmental Management Team (OPRED)
ENE	East North East
EPS	European Protected Species
ES	Environmental Statement
ESE	East South East
EU	European Union
EUNIS	European Nature Information System
FAO	Food and Agriculture Organization
FPSO	Floating Production Storage and Offloading
GJ	Gigajoule
HMP	Heimdal Main Platform
HRP	Heimdal Riser Platform
HSE	Health and Safety Executive
HSES	Health, Safety, Environment and Security
ICES	The International Council for the Exploration of the Sea
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometer
km^2	Kilometer Square
KP	Kilometer Point
KPI	Key Performance Indicators
m^2	Meters Square
m^3	Meters Cubed

MARPOL	The International Convention for the Prevention of Pollution from Ships
MCDA	Multi Criteria Decision Analysis
MCZ	Marine Conservation Zone
MDAC	Methane Derived Authigenic Carbonate
MMO	Marine Management Organization
MS	Marine Scotland
NCMPA	Nature Conservation Marine Protected Area
NCS	Norwegian Continental Shelf
NMPi	National Marine Plan interactive
NNE	North North East
NNS	Northern North Sea
NORM	Naturally occurring radioactive material
NMs	Notifications to Mariners
ODU	Offshore Decommissioning Unit
OGA	Oil and Gas Authority
OPEP	Oil Pollution Emergency Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo and Paris Conventions
PL	Pipeline
PMF	Priority Marine Feature
PMS	Pipeline Management System
P&A	Plug and Abandonment
PP&A	Permanent Plug and Abandonment
PWA	Pipeline Works Authorization
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SFF	Scottish Fisherman's Federation
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SOPEP	Shipboard Oil Pollution Emergency Plans
SOSI	Seabird Oil Sensitivity Index
SPA	Special Protection Area
SSS	Side Scan Sonar
TFSW	Trans-Frontier Shipment of Waste
THC	Total Hydrocarbon Content
µg/g	Microgram/Gram
UKBAP	United Kingdom Biodiversity Action Plan
UKCS	United Kingdom Continental Shelf
UNESCO	United Nations Educational, Scientific and Cultural Organization
VMS	Vessel Monitoring System
WNW	West North West
WON	Well Operations Notification

Figures and Tables

Executive summary

1 Introduction and Background

This section provides a non-technical summary of the Environmental Appraisal (EA) conducted by Equinor Energy A.S (henceforth Equinor) for the proposed Heimdal to Brae Alpha 8" Gas Condensate Cross Boundary Pipeline (PL301) decommissioning.

PL301 is a gas condensate export pipeline running from the Heimdal Platform in the Norwegian Sector of the Northern North Sea (NNS) to the Brae Alpha installation in the UK sector on the NNS. The water depth along the route of PL301 varies from 100 m to 123 m, respectively.

Installations/Facilities associated with PL301 and how they are covered in the Decommissioning Programme, and this Environmental Appraisal are:

Included:

- The PL301 running from the Norwegian/UK boundary to cut point KP 116.028 within Brae Alpha safety zone
- Cut and removal of 20-meter section of PL301 (KP 116.008 – KP 116.028)

Not included:

- The Heimdal installations on NCS
- The Norwegian section of PL301
- The PL301 section from cut point KP 116.028, onto the Brae Alpha topside
- The Brae Alpha installation on UKCS

2 Decommissioning Overview

The Heimdal license currently operate the PL301 in its entirety. PL301 is owned by the Heimdal license. Decommissioning of PL301 means operation in close proximity to the Brae Alpha installation and risk associated with removal activities on a live platform. It is therefore most safe and efficient to decommissioning the PL301 Brae end section at the same time as decommissioning of the Brae Alpha installation under management of one operator.

In addition, the decommissioning of PL301 in the UKCS is to be carried out as part of a greater campaign, decommissioning the whole length of PL301 and the Heimdal field on NCS. Alignment between Norwegian and UK governmental body is required for the decommissioning of PL301.

The decommissioning of PL301 will therefore be split into two Decommissioning Programmes as illustrated in Figure 0-1 below.

1. The trenched and/or buried length of PL301 running from the Norwegian/UK boundary to cut point KP 116.028 within Brae Alpha safety zone, including cut and removal of the 20-meter section of PL301 (KP 116.008 – KP 116.028)
2. The surface laid length of PL301, entirely within the Brae Alpha safety zone, running from cut point KP 116.028 to the Brae Alpha installation. OPRED will be advised of any agreement made for the decommissioning of this remaining section of PL301.

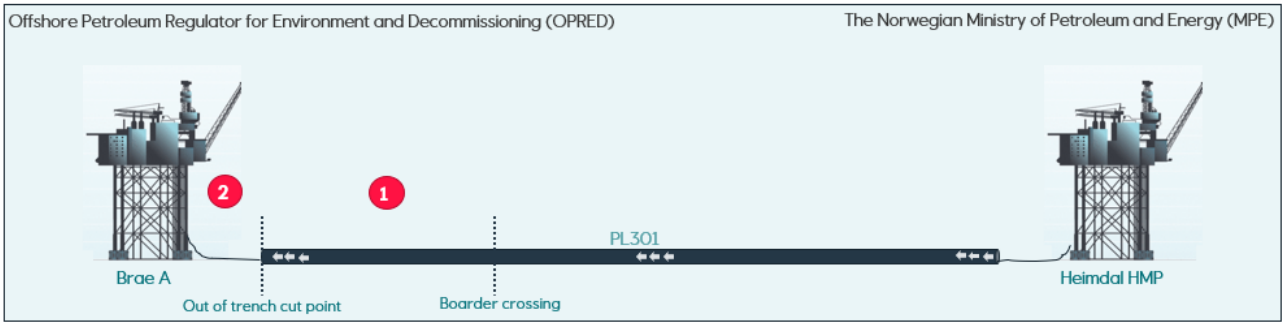


Figure 0-1 UK Decommissioning Programme concept for PL301

The section 2 of PL301 from cut point KP 116.028 to Brae Alpha topside will be decommissioned at a later date. Discussions are ongoing and agreement will be made with the Brae Alpha operator. The section of PL301 that is left exposed will not pose any risk to other users of the sea. The justification for leaving this section exposed is that by doing so the decommissioning options for the Brae Alpha facilities will not be influenced or limited by previous work. The removed section of PL301 is to ensure physical split between the two Decommissioning Programmes.

Within the scope of work, KP 78.620 to KP 116.028, PL301 is crossed by a total of seven pipeline assets. For all seven of the crossings PL301 is the pipeline that is crossed over and in six of the seven instances both PL301 and the other pipeline asset crossing over it are covered by protective material e.g. mattresses/ gravel, in the other instance both PL301 and the other product are covered in mattresses. Currently the seven crossings will remain intact, consideration of decommissioning will occur at a time when those assets overlaying the PL301 are decommissioned themselves and are the responsibility of their respective operators. The stabilisation features on the four crossings within the Brae Alpha safety zone will be considered with the Brae Alpha facilities. More detailed information regarding PL301 crossings are found in Appendix E.

A Norwegian decommissioning plan has been submitted by Equinor to the Norwegian Ministry of Petroleum and Energy (MPE) to allow decommissioning of the Norwegian section of PL301.

3 Proposed Schedule

The precise timing of decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements. The base case for planning the decommissioning of the Heimdal facilities is based on CoP scheduled for autumn 2021. If it is decided to end gas processing in autumn 2021, the preparatory phase will start in 2021 with main removal and disposal activities in 2022, 2023 and 2024. All removal and disposal activities related to this EA, are scheduled to be completed by the end of 2027. The Heimdal license partners are however still assessing the potential extended use of Heimdal beyond 2021. Alternative possible dates for Heimdal CoP are 2022 and 2023. If the later CoP dates are selected the schedule for removal and disposal above will be deferred accordingly. The high-level Gantt chart Table 1-1 provides the overall schedule for the programme of decommissioning activities proposed for the Heimdal installation and associated infrastructure.

Figure 0-2 A project schedule for decommissioning of the PL301 (Base Case)

PL 301 schedule (Base case)								
Activity	2020	2021	2022	2023	2024	2025	2026	2027
COP								
Cleaning and decomissioning								
Subsea Cut PL301 at Heimdal Main								
Subsea Cut PL301 UK at cut point KP 116.028 and recover pipe section								
Rock installation								
Post Decommissioning Surveys								
Close-out reports								

4 Options for Decommissioning

This EA is only concerned with PL301 between the Norway-UKCS boundary and the point approx. 20 m after the pipe exits its trench inside the Brae Alpha safety zone. PL301 was assessed against the Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines (BEIS, 2018) and the recommended CA process was applied. The initial screening stage of the CA involved the assessment of 10 decommissioning options, these were screened down to three options which were carried forward to the evaluation phase. These were:

- Option 2a - Full removal via de-burial and cut and lift pipeline sections using a construction support vessel (CSV);
- Option 4a - Leave in situ (Minor Intervention) Rock placement over areas of spans / exposure, rock placement to remediate snag risk from exposures / spans; and
- Option 4c - Leave in situ (Minor Intervention) Removal and recovery of surface sections out with existing trench, rock placement or trenching to remediate snag risk from cut ends. Removal of areas of spans and exposures using cut and lift techniques (including deburial where required).

The resulting recommended option following CA was, Option 4a - Leave in situ (Minor Intervention). This option forms the basis of the methodology and activities being assessed as part of this Environmental Appraisal (EA).

5 Environmental and Socio-Economic Baseline

The key environmental and social sensitivities for the PL301 area have been summarised in Table 0-1.

Table 0-1 Key environmental and social sensitivities in the Heimdal to Brae Alpha PL301 pipeline area

Environmental Receptor	Description
Key Conservation interests	
OSPAR (2008) List of Threatened and/or Declining Habitats and Species	
Ocean quahog	Ocean quahog (*Arctica islandica)* are one of the longest-living animals in the world. Ocean quahog are burrowing filter feeders, therefore are reliant on suitable sediment conditions – sand and gravel substrates are their preferred habitat. The sediment type surrounding the Brae Alpha platform is likely to be a suitable habitat for ocean quahog. However, according to the findings of the 2001 and 2006 surveys around the Brae Alpha platform, ocean quahog numbers were too low to be considered an aggregation (Oil and Gas UK, 2019).
Seapens and burrowing megafauna in circalittoral fine mud	This habitat was identified as having the potential to occur in the vicinity of the PL301 route. These habitats are heavily bioturbated by the burrowing fauna living within the sediment (Hughes *et al.*, 2010). Seapens are usually a distinctive feature of this habitat, however survey effort in the vicinity of the Brae Alpha (in both survey years) noted very few seapens. Other species, such as the burrowing crustaceans *Calocaris macandreae* or *Callianassa subterranea*, which are often distinctive of this habitat, were present in low numbers, if at all (Oil and Gas UK, 2019). Many of the species indicative of this OSPAR habitat are not found in high numbers at the Brae Alpha though this does not rule out their presence further along the route of PL301.

Conservation sites	
Special Areas of Conservation (SACs)	The nearest SAC to the Brae Alpha and PL301 is the Braemar Pockmark SAC, which is situated 8 km west north-west of the end of PL301 where it crosses the UK/Norway median line. This site is designated for the presence of 'submarine structures formed by leaking gases', which are found within seabed depressions referred to as "pockmarks" and support reef-like communities distinct from the surrounding soft sediments. The SAC is a singular large depression which contains Methane Derived Authigenic Carbonate (MDAC) blocks made by leaking gases, which support a fauna typical of rocky reefs, including anemones *Urticina feline* and *Metridium senile* and squat lobsters (*Galathea squamifera*) (JNCC, 2019a). The project is not located in an area likely to produce Annex I submarine structures. However, within the final 2 km of the PL301 before it reaches the Brae Alpha, pockmarks were observed (Deepocean, 2017), no evidence of associated MDAC structures were noted.
Nature Conservation Marine Protected Area (NCMPAs)	The nearest MPA to the project is the Norwegian Boundary Sediment NCMPA located 60 km south south-east of the Brae Alpha platform. This area constitutes a relatively shallow sandy plain which has been designated due to its importance to ocean quahog. The site lies adjacent to the UKCS/Norwegian median line (Scottish Government, 2014). Past surveys in the Brae Alpha area have not found evidence of substantial populations of ocean quahog (Oil and Gas UK, 2019).
Special Protected Areas (SPAs)	There are no SPAs in the vicinity of the project area.
Annex I Habitats	There is no evidence of the presence of other Annex I habitats.
Conservation Species	
Coastal and Offshore Annex II species most likely to be present in the project area	
Pinnipeds – Harbour and Grey Seals	Pinnipeds are not expected in significant numbers, with densities estimated at approximately 0-1 individuals per 25 km^2 for both harbour (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) (Seal Mammal Research Unit (SMRU), 2011). This is due to the proposed decommissioning project being approximately 190 km offshore.
European Protected Species most likely to be present in the project area	
Harbour porpoise	The harbour porpoise (*Phocoena phocoena*) is a small, highly mobile species of cetacean that is common to all UK waters. As such the harbour porpoise can also be found in the vicinity of the proposed decommissioning project in relative abundance. Based on observational data, higher numbers are present in January and July (Reid *et al*., 2003). The relative density of harbour porpoise is roughly estimated at 0.6 animals/km^2 in the project area (Hammond *et al*., 2017).
Minke whale	Minke whale (*Balaenoptera acutorostrata*) occur in water depths of 200 m or less throughout the NNS and Central North Sea (CNS). They are usually sighted in pairs or in solitude; however, groups of up to 15 individuals can be sighted feeding. It appears that animals return to the same seasonal feeding grounds. Sightings in relation to the project area are mainly and highest in spring and the summer months (Hammond *et al*., 2017). The relative density of minke whales is estimated at 0.03 animals/km^2 in the project area (Hammond *et al*., 2017).
White-beaked dolphin	The white-beaked dolphin (*Lagenorhynchus albirostrisis*) are found mostly in continental shelf waters with depths between 50 m and 100 m, and rarely out to the

	200 m isobath (Reid *et al*. 2003). Distribution of the species has been linked to sea surface temperature, local primary productivity and prey abundance. White-beaked dolphins are usually found in water depths of between 50 and 100 m in groups of around 10 individuals, although large groups of up to 500 animals have been observed. The species are roughly estimated to have a density of 0.2 animals/km^2 near the project area (Hammond *et al*., 2017). They are most prevalent in moderate densities in the project area from summer into the early winter months (Reid *et al*. 2003).
Benthic environment	
Seabed type	According to data by the British Geological Society, the Brae Alpha platform is situated in sand substrate. The majority of PL301 also passes through areas of sandy substrate. By the UKCS/Norway median line a stretch of the PL301 passes through muddy sand before crossing into Norwegian waters (NMPi, 2019). The EUNIS habitat complex in the immediate area surrounding the Brae Alpha is classified as A5.27 'Deep circalittoral sand' (EMODnet, 2019). Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts (European Environment Agency, 2019a). PL301 also passes through EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019). In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment (European Environment Agency, 2019b). Of the six stations sampled around the Brae Alpha platform in the 2006 survey (Oil and Gas UK, 2019), fines were greater than 30% in all but one sample, confirming that the sediment in the area around Brae Alpha has a substantial silt and clay component (Oil and Gas UK, 2019). According to the Priority Marine Feature (PMF) distribution maps provided in Tyler-Walters *et al*. (2016) and the NMPi (2019), the Brae Alpha platform and the majority of PL301 are found in an area designated as SNH Priority Marine Feature (PMF) 'Offshore subtidal sand and gravels'. The section of pipeline within the area of mud sediment is within the PMF 'Offshore deepsea muds' (SNH, 2014). Therefore, almost the whole extent of PL301, from the Brae Alpha to the median line, is found within PMF habitat.
Benthic Environment	The EUNIS habitat complex in the immediate area surrounding the Brae Alpha is classified as A5.27 'Deep circalittoral sand' (EMODnet, 2019). This habitat is likely to be characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms (European Environment Agency, 2019a). The PL301 pipeline also passes through EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019). Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira spp.*, echinoderms and foraminifera (European Environment Agency, 2019b). In context of the survey findings from both years, polychaete dominance was seen, and echinoderms were prevalent, though molluscs made up a lesser component of the benthos. Of the two surveys conducted at the Brae Alpha, the dominant taxa were echinoderms, annelids, molluscs and brittle stars. The polychaete *Paramphinome jeffreysii* was dominant in almost all surveys (see). The following PMF benthic features are also known to occur close to the Brae Alpha rig and PL301: 'Ocean quahog *Arctica islandica*' (an OSPAR 2008 listed species), 'Mud burrowing amphipod *Maera lovenii*', 'Seapens and burrowing megafauna in circalittoral fine mud' (an OSPAR 2008 listed habitat), and 'Burrowed mud'.

Fish – spawning and nursery grounds	
Spawning grounds	The project area is located within the spawning grounds of cod *Gadus morhua*, mackerel *Scomber scombus*, Norway lobster *Nephrops norvegicus*, Norway pout *Trisopterus esmarkii* and saithe *Pollachius virens* (Coull *et al*., 1998; Ellis *et al*., 2012).
Nursery grounds	The following species have nursery grounds in the vicinity of the project: anglerfish *Lophius piscatorius*, blue whiting *Micromesistius poutassou*, cod, haddock *Melanogrammus aeglefinus*, European hake *Merluccius merluccius*, herring *Clupea harengus*, ling *Molva molva*, mackerel, Norway lobster, Norway pout, saithe, sandeel *Ammodytidae spp*., spotted ray *Raja montagui*, spurdog *Squalus acanthias*, and whiting *Merlangius merlangus* (Coull *et al*., 1998; Ellis *et al*., 2012).
Probability of 0 age group fish aggregation	Aires *et al*. (2014) provides modelled spatial representations of the predicted distribution of 0-year group (i.e. juvenile) fish. The probability of 0 group fish species occurring in the vicinity of the Brae Alpha and PL301 was low across all species.

Seabirds

According to the density maps provided in Kober *et al*. (2010), the following species have been recorded within the area of proposed operations: Manx shearwater *Puffinus puffinus*, northern gannet *Morus bassanus*, pomarine skua *Stercorarius pomarinus*, Arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua*, black-legged kittiwake, great black-backed gull *Larus marinus*, common gull *Larus canus*, lesser black-backed gull *Larus fuscus*, herring gull *Larus argentatus*, glaucous gull *Larus hyperboreus*, common tern *Sterna hirundo*, Arctic tern *Sterna paradisaea*, common guillemot, razorbill *Alca torda*, little auk *Alle alle* and Atlantic puffin *Fratercula arctica*.

In Blocks 16/3, 16/7 and 16/8 the sensitivity of seabirds to oil pollution, reflected by the SOSI (JNCC, 2015), is extremely high from April to June. It is low for all other months of the year, except in Block 16/3 for the months of January and February, although there is no data available between November and December (Webb *et al*., 2016).

Seabird Oil Sensitivity Index (SOSI)

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
16/3	**2***	**2**	**5**	**1***	**1**	**5**	**5**	**5**	**5**	**5***	**N**	**N**
16/7	**5***	**5**	**5**	**5***	**1***	**5***	**5**	**5**	**5**	**5***	**N**	**N**
16/8	**5***	**5**	**5**	**1***	**1**	**1***	**5**	**5**	**5**	**5***	**N**	**N**
Key	**1** = Extremely high			**2** = Very high		**3** = High		**4** = Medium		**5** = Low	**N** = No data	
	* in light of coverage gaps, an indirect assessment of SOSI has been made using the method provided by the Joint Nature Conservation Committee (JNCC) (Webb *et al*., 2016)											

Socio-economic Receptor	**Description**
Commercial fishing	
According to fishing data from the Scottish Government (2019a), fisheries in ICES rectangle 46F1 have predominantly targeted combinations of demersal and pelagic species as well as shellfish throughout the years 2014-2018. From 2014 to 2016 the catch, by weight, was predominantly pelagic. This has since	

dropped to less than 1 tonne per year as the focus has shifted to demersal species. In 2018, 619 tonnes of fish were landed overall, almost a third of the weight recorded in 2014, however the value of this catch was approximately the same. This is due to the contribution of high value shellfish to the 2018 total, namely *Nephrops* – on average shellfish was valued 2.7 times higher than demersal catch and 31.9 times higher than pelagic catch (Scottish Government, 2019a).

Fishing effort in 46F1 was compared to the effort expressed within Scottish waters (NMPi, 2019). Effort was low year-round, with no clear seasonal pattern. In 2018, the effort in 46F1 comprised 0.3% of the UK total of 126,863 days of fishing effort. The majority of this effort was conducted using trawl gear.

Amalgamated VMS data from 2007-2015 in Figure 3-6 shows trawling activity in this region from *Nephrops* and demersal trawling. Fishing intensity is generally low in the area, particularly with respect to demersal trawling. This corresponds to the relatively low fishing effort. *Nephrops* trawl intensity is much higher around the Brae Alpha platform, the spatial distribution of VMS data corresponds to the presence of EUNIS habitat complex A5.37 'Deep circalittoral mud' indicating this habitat supports *Nephrops*. Similarly, where PL301 passes through the mud habitat to the north of the Brae Alpha there is also an increase in the intensity of VMS data. The total number of trawls over PL301 is highest in the section just before the median line crossing (Figure 3-6). This corresponds to the presence of mud habitat and *Nephrops*. Between 2007 and 2015, the number of *Nephrops* trawls reached a maximum of 50-55 crosses over that section of pipeline.

Fishing Landings in ICES Rectangle 46F1

Species type	2018		2017		2016		2015		2014	
	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)
Demersal	847,867	481	1,528,970	834	837,895	562	397,479	275	284,941	210
Pelagic	124	<1	43	<1	1,417,757	1,952	201,599	531	462,981	1,689
Shellfish	509,275	137	236,408	57	156,764	34	320,771	75	615,924	142
Total	**1,357,266**	**619**	**1,765,421**	**890**	**2,412,415**	**2,548**	**919,850**	**882**	**1,363,845**	**2,041**

Fishing Effort in ICES Rectangle 46F1

ICES Rectangle	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
46F1	2014	55	9	57	2	D	-	D	26	52	15	D	55	**277**
	2015	61	D	9	D	3	9	D	D	D	D	65	34	**198**
	2016	D	100	34	D	15	D	10	17	D	8	9	D	**229**
	2017	14	16	46	4	14	7	12	29	13	42	7	12	**218**
	2018	10	40	D	19	139	D	7	D	34	57	16	10	**347**

Note: Monthly fishing effort by UK vessels landing into UK: green = 0 – 100 days fished, yellow = 101 – 200, orange = 201-300, red = ≥301, D = Disclosive data (indicating very low effort, specifically less than 5 over-10 m vessels undertook fishing activity in that month), - = no data

Other sea users

Shipping activity	Shipping activity is considered low in Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2016).

Oil and Gas	The Brae Alpha and PL301 are located in the NNS in an area of extensive oil development with a number of fields located nearby, see below[1]: Installation / Installation Type / Operator / Distance and direction Miller / Footings and subsea infrastructure / BP / 7.7 km ENE Brae B / Platform / RockRose Energy / 11.7 km NNE Brae East / Platform / RockRose Energy / 24.9 km NNE Gudrun Jacket / Platform / Equinor / 31.7 km ENE
Telecommunication	The closest telecommunication cables in the vicinity of the project area is the telecom Tampnet 3 cable (25.5 km ESE).
Military activities	There are no military restrictions on Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2019).
Renewables	There are no renewable sites near the project area.
Wrecks	There are ten wrecks within 20 km of the project area, nine are unknown (NMPi, 2019). Only one is named, the possible wreck of the Lundstoskjaer fishing vessel. There are no protect wrecks in the vicinity of the project area (Scottish Government, 2019b).

6 Impact Assessment Process

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

The environmental impact assessment has been informed by a number of different processes, including identification of potential environmental issues through project engineer and marine environmental specialist review in a screening workshop, and consultation with key stakeholders (as detailed in Section 4.1).

The impact assessment screening workshop discussed the proposed decommissioning activities and any potential impacts these may pose. This discussion identified ten potential impact areas based on the proposed removal and decommissioning *in situ* activities. Two of the ten potential impacts were screened in for further assessment based on the potential severity and/or likelihood of their respective environmental impact. The ten potential impacts are detailed in Table 1-3 below, together with justification statements for the screening decisions.

Table 0-2 Environmental impact screening summary for the decommissioning project

Potential impact	Further assessment?	Rationale
Emissions to air	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of the CoP. As

[1] Note: BP= British Petroleum,

		such, emissions generated by infrastructure, equipment and vessels associated with operation of the asset will be replaced by those from vessels and equipment required for decommissioning activities, as well as the recycling of any 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. 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. The majority of atmospheric emissions for the Decommissioning Project relate to vessel time or are associated with the structures decommissioned *in situ*. As the decommissioning activities proposed are of short duration, emissions are not anticipated to result in significant impacts. The estimated CO_2 emissions to be generated by the selected decommissioning options is 9,487.14 Te (over an estimated 53 days), this equates to 0.19% of the total UKCS vessel emissions (excluding fishing vessels) for the year 2017 (7,800,000 Te; BEIS, 2019). Considering the above, atmospheric emissions do not warrant further assessment.
Seabed disturbance	Yes	There is potential for decommissioning and legacy activities to generate disturbance to the seabed; these include activities associated with the *in situ* decommissioning of the trenched and buried PL301, as well as any associated remediation post-decommissioning. The end of PL301 will be removed by cut and lift. Exposed sections of the flowline will be remediated as appropriate. Seabed impacts may range in duration from short-term impacts, such as temporary sediment suspension or smothering, to permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire. Seabed disturbance from the decommissioning activities has the potential to modify the habitat in a way which might impact upon other sea users which utilise the seabed. The end section of the PL301 will be cut and lifted therefore reverse reeling will not occur. This eliminates potential to generate clay berms in the sediment. However, exposed sections of the PL301 will be remediated with rock placement minimising any residual snag hazard. Non-intrusive post-decommissioning surveys will occur to ensure that the PL301 has been left in an acceptable condition. Impacts to the seabed from project activities have been assessed further in Section 6.1, whilst impacts to commercial fisheries

		generated by seabed disturbance are assessed in Section 6.2 below.
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 PL301. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. 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. The PL301 Decommissioning Project is estimated to require five different vessel types. These would not all be on location at the same time. Vessel activities are expected to over over approximately 53 days; most of these days are attributed to rock placement activities. In consideration of the duration and location of vessel presence in conjunction with employment of standard practices, temporary presence of vessels does not require further assessment.
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	Yes	PL301 will be decommissioned *in situ*. PL301 will be cut at 20m out of trench at the Brae Alpha end this section will be lifted. Removal of the section of PL301 will cause short-term disturbance; meaning the impacts will last less than a year. The cut end of the PL301 and exposed sections are to be remediated during decommissioning. The placement of rock results in a change in substrate. While this will ultimately become covered by sediment deposition, the time scale associated with this process is such that remediation is defined as a permanent impact. Future monitoring work will ensure the integrity of the Depth of Burial (DoB) of these structures and ensure that snagging risks do not arise. Further consideration of the proposed activities was deemed necessary and therefore has been addressed within this EA. The frequency of this monitoring work and any subsequent maintenance regime will be established after consultation with OPRED. Stabilisation measures (mattresses and grout bags) associated with any crossings of the PL301 will be left and considered during the subsequent decommissioning of the respective pipelines. Further assessment related to potential snagging risks associated with the decommissioning of infrastructure *in situ* is provided in Section 6.2.
Water quality	No	PL301 will be both pigged and flushed prior to the commencement of decommissioning activities. All flushing products will be routed into the production stream via Brae Alpha. This should remove the majority of contaminated material. Any residual traces of produced water, hydrocarbons, scale, metal oxides and other trace elements from the formation fluids are therefore expected to be low, although precise quantification is difficult to specify. It should also be noted that PL301 has been regularly pigged during its operational life and

		therefore scale deposits should be minimal in the first instance. Pigging and flushing is a pre-decommissioning activity therefore will be permitted as appropriate and falls outside the scope of this EA. During the cutting of PL301 ends there may be a small release of any residual material held within the pipeline. As stated, the volume of any residual material is expected to be low across the entire PL301 and will have been flushed to an acceptable level of cleanliness prior to the commencement of the decommissioning activities. Therefore, as the pipeline cuts will only be at either end, any release will be equal to or less than typical licensed produced water discharges and will dissipate before it reaches the surface with no long-term persistence expected. The potential for discharges will be fully risk assessed and consented in the appropriate manner. PL301 left *in situ* will degrade overtime and contaminants contained within the pipeline material (e.g. coating) will be released. Releases are expected to occur in very small quantities and over a long period of time. Additionally, since PL301 coating is covered with a concrete coating and primarily buried, the pathway for contaminant releases will be limited. Given the small quantities of contaminants expected to be released and the long-term degradation of PL301 left *in situ*, no significant impacts are anticipated. Vessel discharges are managed through existing, International Convention for the Prevention of Pollution from Ships (MARPOL) compliant controls, including bilge management procedures and good operating practices. Post-flushing and/or water jetting, residual liquids present during the decommissioning of pipelines and substructures will be treated before being discharged to sea, such that the discharge will comprise treated water. Any residual remaining material will be in trace levels/volumes following the flushing and pigging regime and will not pose any significant risk to water quality.
Underwater noise emissions	No	Vessel presence will be limited in scale (i.e. the size and number of vessels) and duration and, therefore, does not constitute a significant or prolonged increase in noise emissions across the project area. To remove the PL301, the cutting of the flowline will likely be done with shears, thereby minimising produced underwater noise during this activity. All other noise generating activities associated with the decommissioning of the PL301 are considered negligible in the context of ambient noise levels and are likely to be masked by project related vessel activities. Multibeam echosounder survey equipment is likely to be used for imaging and identification of PL301 exposures. At present, there is no requirement for seismic activity relating to the decommissioning activities. Should there be a requirement of seismic survey in the future, the appropriate JNCC (2017)

		Guidelines will be adhered to for mitigation of noise impacts to marine mammals. None of the activities associated with the decommissioning of PL301 are considered to generate significant noise levels which may cause injury or significant disturbance to marine species or other users. The project is not located within a marine mammal protection area. On this basis, underwater noise does not require further assessment.
Resource use	No	Generally, the main source of resource use from the proposed activities will be fuel use. Any opportunities for increasing fuel efficiency and reducing use of resources will be identified and implemented where possible. The estimated total energy usage for the project is 32,199 GJ. This is considered very low, compared to the resources generated during the production phase of the project. Considering the above, resource use does not warrant further assessment.
Onshore activities	No	The OPRED Guidance states that onshore activities are not in scope of Decommissioning EAs, and this topic does not require further assessment. 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.
Waste	No	The recycling and disposal of wastes are covered by the Equinor's Waste Management Strategy, which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous and special waste, and TFSW. The Waste Management Strategy is also guided by Equinor's HSES Policy and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for each phase of the decommissioning activities in individual Active Waste Management Plans (AWMPs) and ongoing monitoring of waste procedures and performance review against target Key Performance Indicators (KPIs). Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned material. 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. However, the weight and/or volume of such material is not expected to result in

		substantial landfill use. On this basis, no further assessment of waste is necessary.
Unplanned events	No	There will be three vessel types on-site during the decommissioning process. The CSV, used for cutting and removing the end section of rigid pipeline, is expected to have the largest fuel inventory of the few vessels involved in the decommissioning activities. Therefore, a worst-case accidental diesel inventory release would be associated with the CSV. However, the inventory is expected to be less than the worst-case crude oil spill from loss of well containment modelled and assessed in the Brae Alpha Offshore Oil Pollution Emergency Plan (OPEP), which considers and immediate release of 1,823 m^3 of diesel (Marathon UK, 2017c). The vessel's fuel inventory 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 are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Equinor will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP. Consequently, any impact from vessel-based fuel inventory release will be less than that already assessed and mitigated against within the OPEP for the operational phase of PL301. Should an accidental release occur, the appropriate measures and permits will be sought and put in place to address the situation. In addition to the mitigation measures outlined in the OPEP, Equinor maintains manned bridges, navigational aids and monitoring of safety zones. Considering the above, the potential impacts from accidental chemical/ hydrocarbon releases during decommissioning activities do not warrant further assessment. As the proposed operations are to remove only the end section of the surface laid section of PL301. This section is the only lift procedure associated with the project, thus there should be minimal risk of any dropped objects. No diver operation will be required either so the process itself is of minimal risk. However, 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. Post-decommissioning debris clearance surveys will aid in the identification of any dropped objects should they occur. In line with the mitigation measures in place, unplanned loss of materials to the sea do not require further assessment.

7 Environmental Management

The project has limited activity associated with it beyond the main period of preparation for decommissioning and removal of PL301. The focus of environmental performance management for the project is therefore to ensure that the activities that will take place during the limited period of decommissioning happen in a safe, compliant and acceptable manner. The primary mechanism by which this will occur is through Equinor's accredited Environmental Management System (EMS) and Health, Safety, Environment and Security (HSES) Policy.

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

Equinor also operates a Waste Management Strategy specific to this Decommissioning Project and will develop an Active Waste Management Plan (AWMP) for the decommissioning project to detail the types of materials identified as decommissioning waste and to outline the processes and procedures necessary to support the Decommissioning Programme for PL301. The AWMP will detail the measures in place to ensure that the principles of the waste management hierarchy are followed during decommissioning.

In terms of activities in the northern North Sea, the National Marine Plan has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been developed in line with UK, European Union (EU) and OSPAR legislation, directives and guidance. With regards to decommissioning, the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. As part of the conclusions to this assessment (Section 3.6.4), Equinor has given due consideration to the Scottish National Marine Plan during Project decision making and the interactions between the Project and Plan. The proposed operations as described in this permit have been assessed against the Marine Plan objectives and policies, specifically GEN-1, 4, 5, 9, 12, 13, 21 and Oil and Gas 1, 2, 3, 5, and 6.

8 Conclusion

Given the remote offshore location of the PL301 and the highly localised impacts of the proposed decommissioning activities, there is no potential for decommissioning to impact any European or nationally designated protected sites.

This EA has considered the Scottish National Marine Plan, adopted by the Scottish Government to help ensure sustainable development of the marine area. Equinor considers that the proposed decommissioning activities are in alignment with its objectives and policies.

Based on the findings of this EA, including the identification and subsequent application of the proposed mitigation and control measures are appropriate that the proposed PL301 decommissioning activities do not pose any significant threat to environmental or societal receptors within the UKCS.

1 INTRODUCTION

1.1 Project Overview

The Heimdal Field is located in Block 25/4 on the Norwegian Continental Shelf in the northern North Sea, close to the border of the United Kingdom Continental Shelf (UKCS). PL301 is a 116 km cross border pipeline, 78 km within the Norwegian Sector and 38 km within the UK sector, owned by the Heimdal License and operated by Equinor Energy AS (henceforth Equinor). The water depth along the route of PL301 varies between 100 m and 123 m.

The field was developed in several phases and consists of two platforms and several pipeline systems. The Heimdal Main Platform (HMP) was installed in 1984 and production started in 1985. The Heimdal Riser Platform (HRP) was installed in 2002 and serves as a tie-in point for Vale, Byggve/Skrine, Atla and Valemon. Heimdal is also a hub in Gassled's dry gas transportation network.

The HMP and PL301 are owned by the Heimdal Group. The Heimdal (PL301) licensees are; Equinor Energy AS (29.443%), Total E&P Norge AS (16.759%), Spirit Energy Norway AS (28.798%), Petoro AS (20.0%) and LOTOS Exploration and Production Norge AS (5.0%).

1.1.1 Infrastructure Relevant to this Decommissioning Scope

The Heimdal license currently operate the PL301 in its entirety. PL301 is owned by the Heimdal license. Decommissioning of PL301 means operation in close proximity to the Brae Alpha installation and risk associated with removal activities on a live platform. It is therefore most safe and efficient to decommissioning the PL301 Brae end section at the same time as decommissioning of the Brae Alpha installation under management of one operator.

In addition, the decommissioning of PL301 in the UKCS is to be carried out as part of a greater campaign, decommissioning the whole length of PL301 and the Heimdal field on NCS. Alignment between Norwegian and UK governmental body is required for the decommissioning of PL301.

The decommissioning of PL301 will therefore be split into two Decommissioning Programmes as illustrated in Figure 0-1.

1. The trenched and/or buried length of PL301 running from the Norwegian/UK boundary to cut point KP 116.028 within Brae Alpha safety zone, including cut and removal of the 20-meter section of PL301 (KP 116.008 – KP 116.028)
2. The surface laid length of PL301, entirely within the Brae Alpha safety zone, running from cut point KP 116.028 to the Brae Alpha installation. OPRED will be advised of any agreement made for the decommissioning of this remaining section of PL301.

The section 2 of PL301 from cut point KP 116.028 to Brae Alpha topside will be decommissioned at a later date. Discussions are ongoing and agreement will be made with the Brae Alpha operator. The section of PL301 that is left exposed will not pose any risk to other users of the sea. The justification for leaving this section exposed is that by doing so the decommissioning options for the Brae Alpha facilities will not be influenced or limited by previous work. The removed section of PL301 is to ensure physical split between the two Decommissioning Programmes.

A Norwegian decommissioning plan has been submitted by Equinor to the Norwegian Ministry of Petroleum and Energy (MPE) to allow decommissioning of the Norwegian section of PL301.

The two DPs will be supported by separate Comparative Assessment (CA) and Environmental Appraisal (EA) processes. This EA assesses the project scope for the first DP only, the second DP will be considered at a later date and aligned with future decommissioning of Brae Alpha Platform. The extent of the infrastructure associated with the decommissioning scope is shown in Figure 1-1, Figure 1-2 and Figure 1-3.

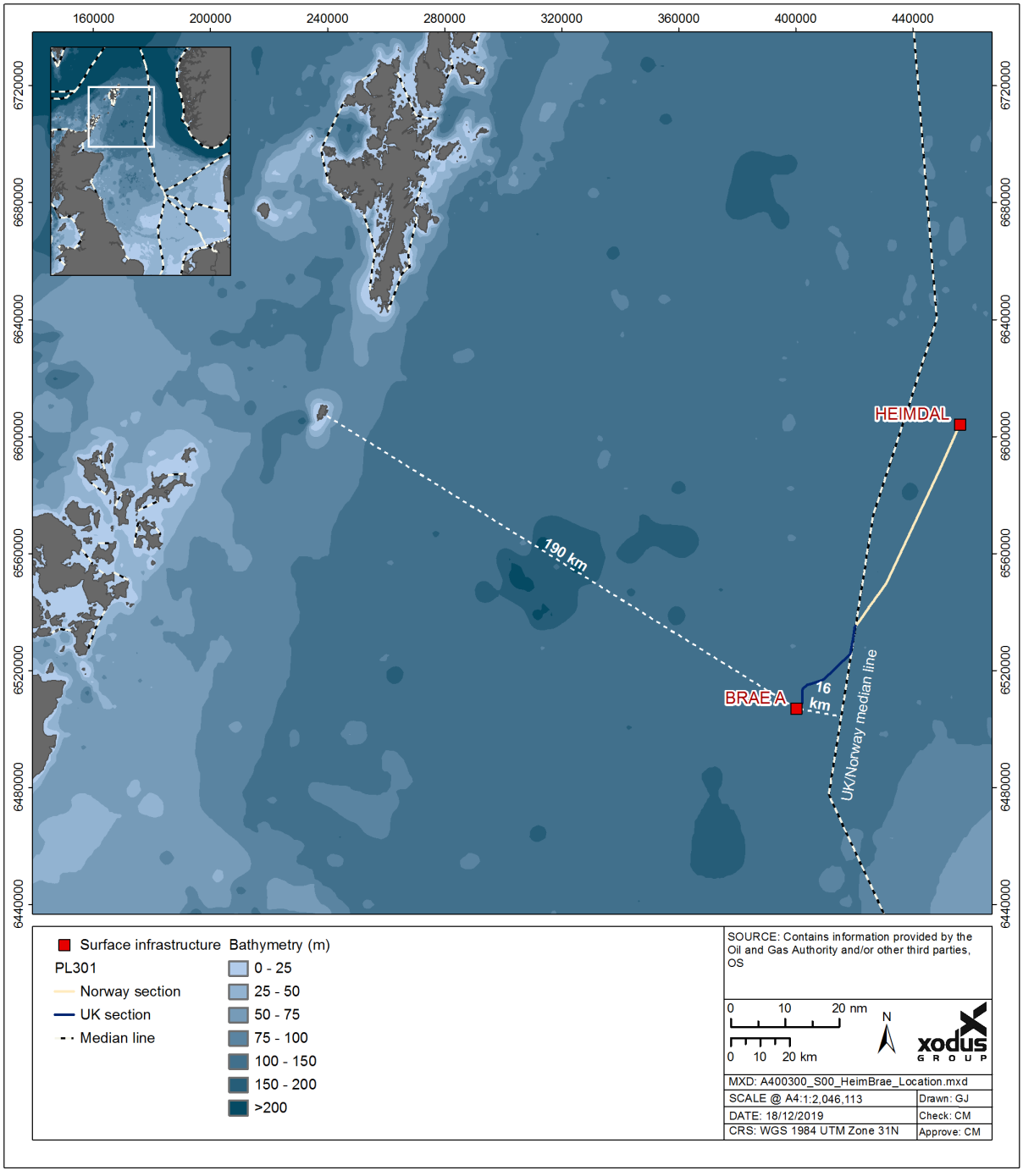


Figure 1-1 Location of the PL301

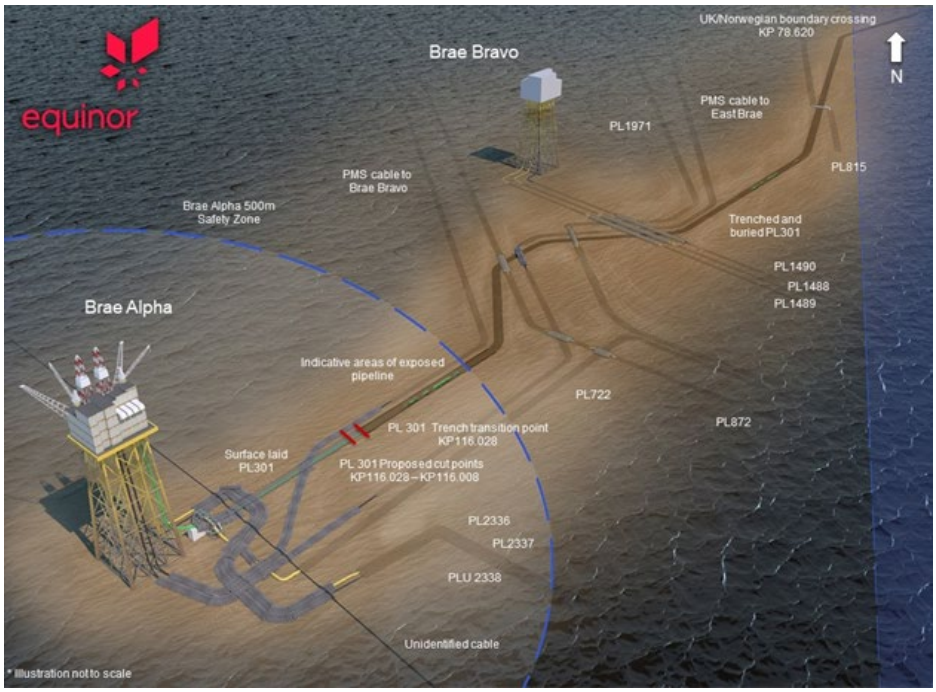


Figure 1-2 Wider overview of Brae Alpha platform location and PL301 route in relation to other infrastructure

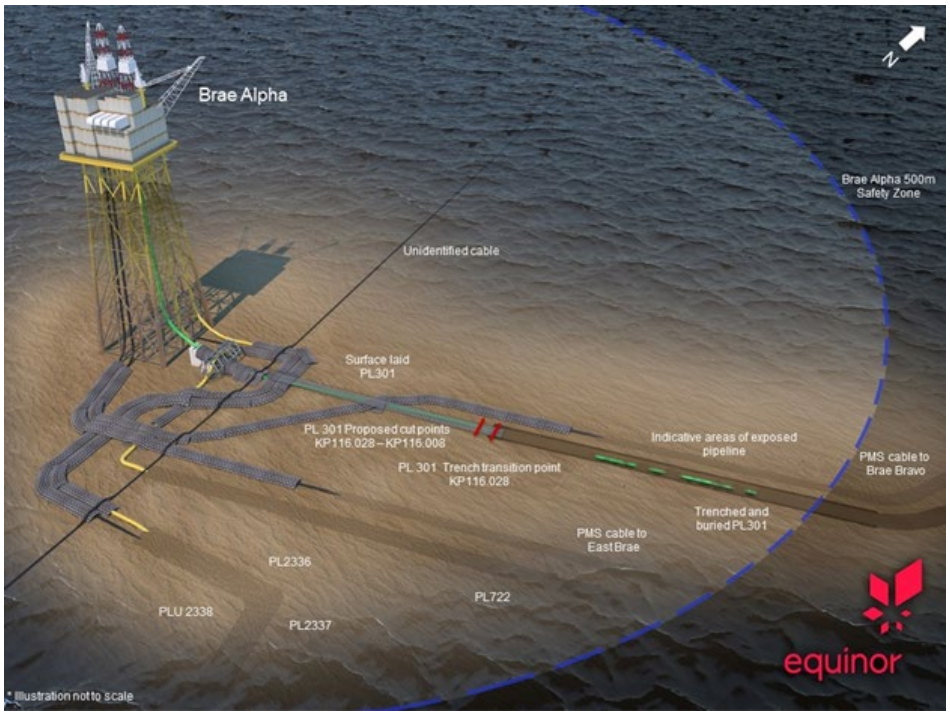


Figure 1-3 Overview of Brae Alpha platform safety zone and PL301 route

1.2 Purpose of the Environmental Appraisal Report

This EA assesses the potential environmental impacts associated with the proposed PL301 decommissioning activities. The impact identification and assessment process take into account stakeholder engagement, comparison of similar decommissioning projects undertaken in the UKCS, expert judgement, and the results of supporting studies which aim to refine the scope of the DP. This EA Report documents this process and details, in proportionate terms, the extent of any potential impacts and any necessary mitigation/control measures proposed.

1.3 Regulatory Context

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

The Petroleum Act 1998 (as amended) governs the decommissioning of offshore oil and gas infrastructure, including pipelines, on the UKCS. The Act requires the operator of an offshore installation or pipeline to submit a draft DP for statutory and public consultation, and to obtain approval of the DP from OPRED, part of BEIS, before initiating decommissioning work. The DP must outline in detail the infrastructure being decommissioned and the method by which the decommissioning will take place.

The primary guidance for offshore decommissioning from the regulator (BEIS, 2018), details the need for an EA to be submitted in support of the DP. The guidance sets out a framework for the required environmental inputs and deliverables throughout the approval process. It now describes a proportionate EA process that culminates in a streamlined EA report rather than a lengthy Environmental Statement (ES). The OPRED guidance is supported by Decom North Sea's (Decom North Sea, 2017) Environmental Appraisal Guidelines for Offshore Oil and Gas Decommissioning, which provide further definition on the requirements of the EA report.

In terms of activities in the NNS, the Scottish National Marine Plan has been adopted by the Scottish Government to help ensure sustainable development of the marine area. This Plan has been developed in line with UK, EU and OSPAR legislation, directives and guidance. With regards to decommissioning the Plan states that 'where re-use of oil and gas infrastructure is not practicable, either as part of oil and gas activity or by other sectors such as carbon capture and storage, decommissioning must take place in line with standard practice, and as allowed by international obligations. Re-use or removal of decommissioned assets from the seabed will be fully supported where practicable and adhering to relevant regulatory process. As part of the conclusions to this assessment (Section 3.6.4), Equinor has given due consideration to the National Marine Plan during Project decision making and the interactions between the Project and Plan.

1.4 Scope and Structure of this Environmental Appraisal Report

This EA report sets out to describe, in a proportionate manner, the potential environmental impacts of the proposed activities associated with the PL301 decommissioning and to demonstrate the extent to which these can be mitigated and controlled to an acceptable level. This is achieved in the following Sections, which cover:

- The process by which Equinor has arrived at the selected decommissioning strategy (Section 2)
- A description of the proposed decommissioning activities (Section 2)
- A review of the potential impacts from the proposed decommissioning activities and justification for the assessments that support this EA (Section 5)
- A summary of the baseline sensitivities and receptors relevant to the assessment area that support this EA (Section 3)
- Assessment of key issues (Section 6)
- Conclusions (Section 7)

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

2 PROJECT SCOPE

2.1 Consideration of Alternatives and Selected Approach

2.1.1 Decision Making Context

The latest guidance (BEIS, 2018) states that subsea installations (e.g. drilling template, wellheads, production manifold and risers) must, where practicable, be completely removed for reuse or recycling or final disposal on land. Any piles used to secure such structures in place should be cut below natural seabed level at such a depth as 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 and are not relevant to this EA/DP.

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 could be considered as candidates for *in situ* decommissioning. Where an Operator is considering decommissioning pipelines *in situ*, the decision-making process must be informed by a 'Comparative Assessment' of the feasible decommissioning options. This Comparative Assessment takes account of safety, environmental, technical, societal and economic factors to arrive at a preferred decommissioning solution.

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

2.1.2 Alternatives to Decommissioning

Options to re-use PL301 *in situ* for future hydrocarbon or alternative developments have been considered, but to date none have yielded a viable commercial opportunity. As no alternatives for re-use or an alternative use have been identified there is no reason to delay decommissioning activity of PL301.

2.1.3 Subsea Comparative Assessment

PL301 was assessed for decommissioning against the Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines (BEIS, 2018). The recommended Comparative Assessment (CA) process was applied.

All possible decommissioning options for the group were coarsely screened against the primary criteria as specified within the BEIS (2018) Guidance: Safety; Environment; Technical; Societal; and Economic. The options were scored against each criterion either green, amber or red, pertaining to attractive, acceptable or unattractive respectively. This process eliminated the least favourable options from each equipment group in preparation for detailed evaluation of the remaining options. Those remaining options were then investigated in detail to develop quantitative and qualitative data for each option pertaining to the primary criteria and sub-criteria (e.g. safety data; environmental impact data; technical considerations; societal impacts; and costs). Once this data had been prepared, a detailed evaluation was conducted to determine the final recommended decommissioning option for each item of equipment. This was facilitated by comparing the data for each sub-

criterion across the options using a Multi Criteria Decision Analysis (MCDA) tool which employs pairwise comparisons of quantitative and qualitative data to produce a relative score for each sub-criterion that can be summed to produce an overall relative score for each option, enabling identification of the emerging recommendation for the group. This assessment was then presented to key Stakeholders for their consideration and comment.

The only infrastructure that was carried through to the evaluation phase of the CA was the main PL301 as all other infrastructure associated with PL301 was either outside the scope of this project or has to be fully removed. The decommissioning options considered carried through to the evaluation phase of the CA are listed below in Table 2-1.

Table 2-1 Decommissioning options for PL301

Subsea Infrastructure Description	Decommissioning Options Considered
PL301	• Option 2a - Full removal via de-burial and cut and lift pipeline sections using a construction support vessel (CSV). • Option 4a - Leave *in situ* (Minor Intervention) Rock placement over areas of spans / exposure, rock placement to remediate snag risk from exposures / spans. • Option 4c - Leave *in situ* (Minor Intervention) Removal and recovery of surface sections out with existing trench, rock placement to remediate snag risk from cut ends. Removal of areas of spans and exposures using cut and lift techniques (including deburial where required)

Note: Further information on the options considered can be found in the DP and CA reports noted in Table 8-1.

After careful consideration through the CA process it was concluded that the preferred decommissioning option was option 4a - to leave PL301 in situ and place rock cover over spans and exposure to remediate snagging risk.

2.2 Scope of Proposed Decommissioning Operations

2.2.1 Description of the Infrastructure Being Decommissioned

The infrastructure being considered for decommissioning within the scope of this document is PL301 and its associated stabilisation feature between the UK-Norway boundary and the point which the PL301 leaves the trench within the Brae Alpha safety zone. PL301 is a 116 km cross border pipeline (Norway78 km / 38 km UK) owned by the Heimdal Licensees (Equinor Energy AS (29.443%), Total E&P Norge AS (16.759%), Spirit Energy Norway AS (28.798%), Petoro AS (20.0%) and LOTOS Exploration and Production Norge AS (5.0%)) and operated by Equinor Energy.

PL301 was laid in a trench and was initially left unburied however, long sections the trench have since naturally backfilled (circa 95% of its length). For the section of PL301 that is within the scope of this piece of work there are seven crossings. For all seven of the crossings PL301 is the pipeline that is crossed over and in six of the seven instances both PL301 and the other product crossing over it are covered by protective material e.g. mattresses/ gravel, in the other instance both PL301 and the other product are covered in mattresses (Appendix E).

2.3 General Assumptions

All pipework will be pigged and flushed to an 'As Low As Reasonably Practicable' (ALARP) level of cleanliness prior to decommissioning activities commencing reflecting current guidance from OPRED and the HSE. The section of PL301 on the NCS is outside the scope of this report, the section of PL301 from the point it exits the trench in the Brae Alpha safety zone to its termination point is also outside of the scope of this report.

2.4 Method Statements

An appropriately licensed waste management company will be identified through a selection process which ensures that the selected facility demonstrates a proven record of:

1. waste stream management throughout the deconstruction process;
2. the ability to deliver innovative re-use/recycling options; and
3. ensures the aims of the waste hierarchy are achieved.

Geographic locations of potential disposal yard options may require the consideration of Trans-Frontier Shipment of Waste (TFSW), including hazardous materials. Early engagement with the relevant waste regulatory authorities will ensure that any issues with TFSW are addressed. Equinor will engage with other companies and industries to identify potential reuse opportunities.

2.4.1 PL301

The boundary of infrastructure covered within the scope of this report are from the UK/Norway boundary to inside the Brae Alpha safety zone. The proposed decommissioning strategy as a result of the CA evaluation for PL301 is for Leave *in situ* (Minor Intervention) - Rock placement over areas of Spans / Exposure. This decommissioning strategy will be achieved through deploying a rock dumping vessel and placing rock at all sections that pose a potential snag risk (spans and exposures) (see Appendix D).

PL301 shall be cut using hydraulic shears within the Brae Alpha safety zone to disconnect the pipeline to separate the end pipeline section. The end section is to be removed and the end of the pipeline that is the transboundary end will be rock dumped or trenched, the end of the pipeline that is connected to Brae Alpha is to be left exposed to ensure further decommissioning options are not compromised and is not within the scope of this decommissioning scope of work. The section of PL301 that is left exposed will not pose any risk to other users of the sea. The justification for leaving this section exposed is that by doing so the decommissioning options for the Brae Alpha facilities will not be limited by previous work.

2.4.2 Stabilisation Features

The guidelines state that all mattresses and grout bags installed to protect pipelines should, where their condition allows, be removed. The mattresses located along PL301 that fall within the scope of this report, KP 78.046 to KP 116.028, are associated with pipeline crossings. As such all mattresses shall be left undisturbed and decommissioning strategies for these mattresses shall be reviewed when the pipelines that cross PL301 are decommissioned. If during decommissioning activity any stabilisation features are found that are in a condition that means they are not able to be recovered Equinor shall open dialogue with OPRED as to potential solutions.

2.4.3 Clean Seabed Verification

Following the decommissioning of all infrastructure, it is necessary to identify any potential residual snagging hazards associated with any changes to the seabed. The proposed method for clear seabed validation is through non-intrusive methodologies, if however, it is deemed necessary a post decommissioning overtrawl sweep may be performed on areas of potential snag risk. The methods used will be discussed and finalised with OPRED.

Results of this survey will be available once the work is complete, with a copy forwarded to OPRED.

This will be conducted to ensure the seabed is left in a unrestricted condition for future fishing effort, in line with the current Decommissioning Guidance (BEIS, 2018).

Pre- and post-decommissioning surveys shall be conducted, and any debris identified shall be recovered and recycled / disposed of accordingly.

2.5 Summary of Material Inventory

This section summarises the inventory of materials associated with the subsea infrastructure to be decommissioned. Comprehensive information about the materials present within PL301 is provided in Table 2-2.

Table 2-2 Inventory of material associated with PL301

Item	Description	Weight (Te)
Metals	Ferrous (steel - all grades)	2,162.3
	Non-Ferrous (copper, aluminium	0
Concrete	Aggregates (Concrete coating)	3,441.1
Plastic	Rubbers, polymers	0
Hazardous	Bitumen coating	174.9
	Residual fluids (hydrocarbons, chemicals)	0
	NORM scale	0
Other	(Glass filament, Silica)	0
	Total (Tonnes)	5,778.29

2.6 Waste Management

The management of waste during decommissioning is a highly regulated activity, which potentially requires compliance with both national and international legislation, depending on the destinations identified for disposal and treating any wastes generated.

The Equinor Waste Management Strategy specifies the requirements for the contractor waste management plan. The waste management plan will be developed once the contract has been awarded during the project execution phase. The plans shall adhere to the waste stream licensee conditions and controlled accordingly. Discussion with the regulator will ensure that all relevant permits and consents are in place. Due to the transboundary nature of PL301 it is possible that waste may be transported over international boundaries, requiring the consideration of TFSW, including hazardous materials. Early engagement with the required regulatory authorities will ensure that any issues with TFSW are addressed.

2.7 Environmental Management Strategy and Sustainability

The Equinor Environmental Management Strategy (EMS) provides the basis for enabling cost effective environmental and social performance that protects and creates value for Equinor and communities, enabling them to effectively address the climate change challenge and to respect human rights and that secures their license to operate.

The scope of sustainability is to ensure responsible environmental, social and economic performance enabling business resilience.

2.8 Proposed Schedule

The precise timing of the decommissioning activities is not yet confirmed and will be subject to market availability of cost-effective removal services and contractual agreements. The base case for planning the decommissioning of the Heimdal facilities is based on CoP scheduled for autumn 2021. If it is decided to end gas processing in autumn 2021, the preparatory phase will start in 2021 with main removal and disposal activities in 2022, 2023 and 2024. All removal and disposal activities related to this EA, are scheduled to be completed by the end of 2027. The Heimdal license partners are however still assessing the potential extended use of Heimdal beyond 2021. Alternative possible dates for Heimdal CoP are 2022 and 2023. If the later CoP dates are selected the schedule for removal and disposal above will be deferred accordingly. The high-level Gantt chart featured in Figure 2-1 provides the overall schedule for the programme of decommissioning activities for the Heimdal installation operated by Equinor Energy AS.

Figure 2-1 Overall project schedule of decommissioning of Heimdal on the NCS (Base Case)

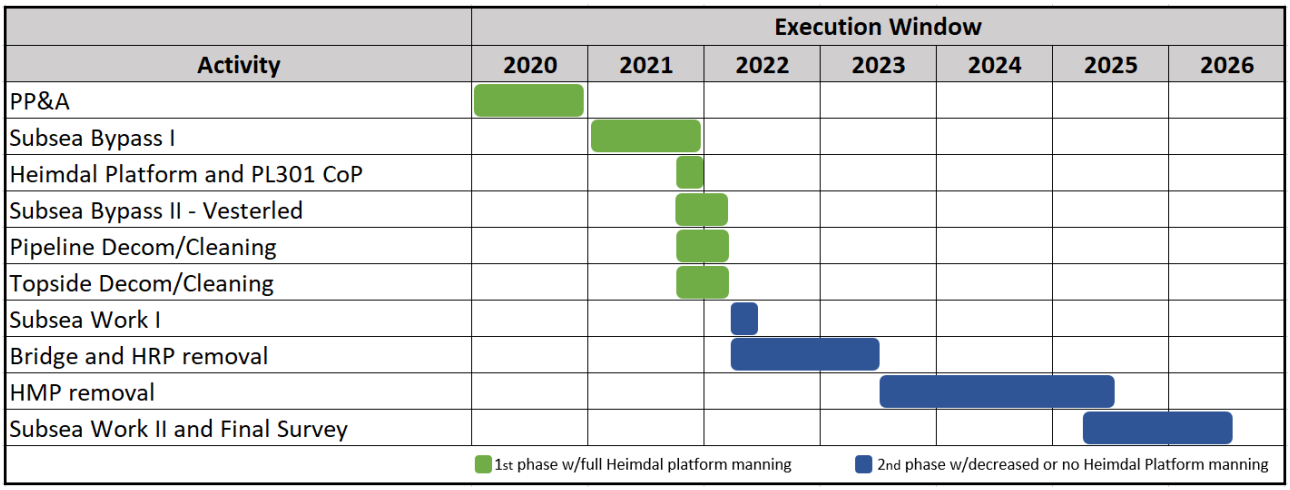
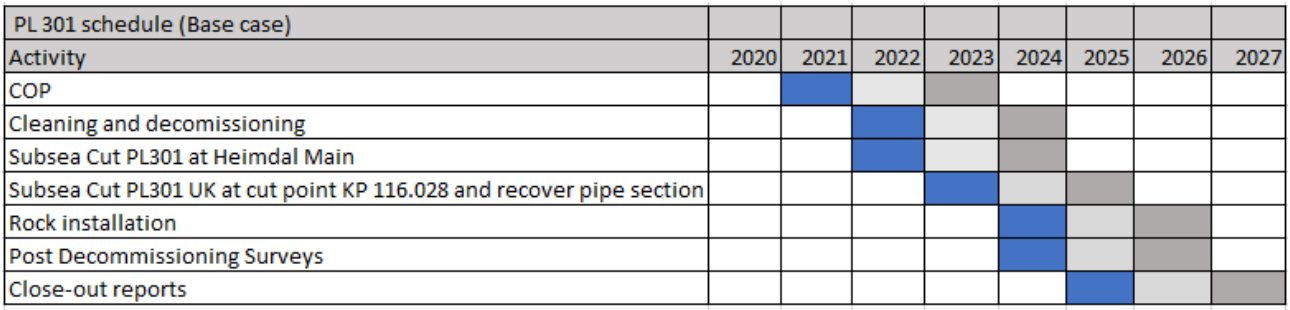


Figure 2-2 A project schedule for decommissioning of the PL301 (Base Case)



3 ENVIRONMENTAL AND SOCIETAL BASELINE

3.1 Background

Information is provided here on the environmental baseline characteristics around the Brae Alpha platform and along PL301 to help inform an assessment of the features that may be affected by the proposed decommissioning operations or may have a bearing on the nature and extent of relevant impacts. The potential interactions between project activities and environmental receptors are detailed and assessed in Section 6. As the activities associated with the DP will form an ongoing presence over six years, environmental features and any relevant changes in their characteristics and sensitivities are described across as long a period of time as possible.

The project scope (Section 2) and initial screening (Section 5) suggests that the majority of potentially significant environmental impacts would be felt within relatively close proximity of the proposed development location. Therefore, environmental sensitivities are described on a local scale, with broader scale data only used where appropriate to certain ecological characteristics, such as broadscale habitat classification. Certain activities or events, such as water quality impacts, could potentially have more spatially extensive environmental impacts. In these instances, those environmental sensitivities that may be affected are described on a greater spatial scale.

In this regard, Table 3-2 provides an overview of all the environmental and societal sensitivities in the area. Details have been provided on the receptors most likely to be impacted by the proposed activities in the sections below. This baseline characterisation describes the current conditions of the receiving environment comprising the Heimdal infrastructure and is considered sufficient to enable effective evaluation of the potential environmental interactions from proposed decommissioning activities at this stage. A pre-decommissioning survey will be conducted, this will primarily be a visual based survey with video and pipe tracker equipment.

3.2 Summary of Environmental Data

The available environmental data covers the Brae Alpha area and certain points along the route of the PL301. Additional survey work will be carried out prior to decommissioning activities commencing. However, the existing survey data is sufficient to broadly characterise the benthic community surrounding the Brae Alpha and along the PL301 and highlight the potential for presence of protected species/habitats (of which none have been identified to date). It is expected that the existing coverage will be acceptable to support the approval of a Decommissioning Environmental Appraisal for the PL301, prior to any offshore works being undertaken. Existing data, either taken directly from environmental surveys, or from Environmental reports which are relevant to the Project area, are listed in Table 3-1. This data has been used to inform the baseline environmental conditions at the Brae Alpha and along PL301.

After reviewing surveys listed in Sections 3.2.1 to 3.2.6, it was noted that the habitats and species recorded are typical of those found in EUNIS habiats A5.27 ‘Deep circalittoral sand’ and A.53 ‘Deep circalittoral mud’ and the species and habitats located adjacent to PL301 are expected to be consistent with the NNS as a whole.

Table 3-1 Existing environmental data

Data Source (Survey or Report)	Distance to Project	Date	Contractor/Author
Brae Alpha Environmental Survey	0 km	Aug 2001	Gardline
Brae Alpha Environmental Survey	0 km	Aug 2006	Hartley Anderson
Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Environmental Statement Report	0 km	Jul 2017	Marathon Oil
East Brae and Braemar Environmental Statement Report	~4 km	Jun 2017	Marathon Oil
Miller Environmental Survey	~5 km	2000	ERT
Devenick Environmental Survey	~24 km	Jul 2001	ERT
Devenick Environmental Survey	~24 km	Aug 2009	Gardline
Harding Environmental Survey	~36 km	2006	Gardline

3.2.1 Brae Alpha Environmental Surveys (2001 and 2006)

Several surveys of the area around the Brae Alpha platform have been conducted in the past. These were mostly carried out when the Brae Alpha and PL301 became recently operative/were in the early stages of productive life. There are no known environmental surveys of the PL301 pipeline. The most recent two surveys at the Brae Alpha occurred in 2001 and 2006 (as detailed in Table 3-1). The 2001 survey used Day grabs to sample both the biological and chemical environment at six stations around the Brae Alpha.

The 2006 survey sampled six locations at different distances from the Brae Alpha platform, starting at 250 m from the platform, 500 m, 1000 m, 1200 m, 2000 m, and 5000 m from the Brae Alpha. A Van Veen grab was used to collect the samples. The data gathered was both biological and chemical in nature. These two Brae Alpha surveys are the basis for the baseline environmental composition as described in the following sections.

The dominant taxa in both years were: polychaetes, echinoderms, annelids, molluscs and brittle stars. The polychaete *Paramphinome jeffreysii* was most numerous in both surveys (Oil and Gas UK, 2019). Other common polychaetes in the Brae Alpha area in 2001 were: *Paradoneis eliasoni*, *Apistobranchus tullbergi*, *Galathowenia oculata*. In 2006, the prevalent polychaete species were: *Chaetozone setosa*, *Pectinariidae spp*., and *Sthenelais limicola*. Most echinoderms were juveniles therefore not identifiable to species level. *Amphiura filiformis* was the most common brittle star species in the area; its numbers were much higher in the 2006 survey (Oil and Gas UK, 2019).

The 2006 survey covered a range of sampling locations up to 2 km from the platform. At the closest sampling location (250 m from the platform), the species composition was similar to that found in the 2001 survey, which was exclusively conducted around the Brae Alpha platform (Oil and Gas UK, 2019).

3.2.2 Brae Alpha, Brae Bravo, Central Brae, West Brae and Sedgwick Environmental Statement (2017)

This Environmental Statement (ES) consolidated data from the 2001 and 2006 surveys of the Brae Alpha area. The ES determined that the sampling pattern was cruciform, with samples taken along due north, east, south and west axes at the distances defined within Section 3.2.1 above.

Similar species as found at the Brae Alpha were identified at the Brae Bravo. The community was dominated by polychaete species, including species like *P. jeffreysii* (68% of polychaetes), *Spiophanes bombyx*, *Galathowenia oculata*, *Tharyx killariensis*, and *Pholoe assimilis*. This community composition is typical of the central and northern North Sea (Marathon, 2017a). The species composition was the same at West Brae (including Sedgwick) and Central Brae. *A. islandica* were found in low abundance across the survey area.

3.2.3 East Brae and Braemar Environmental Statement (2017)

16 samples were collected within 125 m of the East Brae platform during a pre-decommissioning survey in 2015. The results were used to characterise the area surrounding the drill cuttings pile and surroundings. These samples were taken in a random array within the 125 m radius of the platform (Marathon, 2017b).

20 sediment samples were taken around the Braemar wells, at distances of between 500 m and 1000 m from the wells; the samples were taken in a cruciform pattern, along due north, east, south and west axes. Five video locations were recorded, three were north of Braemar and the remaining two were of a location between Braemar and East Brae, and southeast of East Brae (Marathon, 2017b).

The community across the wider East Brae area was dominated by the polychaetes *P. jeffreysii*, *Pterolysippe vanelli*, *P. assimilis*, *Spiophanes kroyeri*, *Lumbrineris cingulata/aniara* and *Notomastus spp*., and the bivalves *Adontorhina similis* and *Axinulus croulinensis*. *A. islandica* accounted for 0.5% of all taxa in the surveys – the majority of which were juvenile.

3.2.4 Miller Environmental Survey (2000)

The 2000 survey of the Miller site was conducted using a Van Veen grab. 15 locations were sampled at distances of: 140 m, 181 m, 202 m, 500 m, 550 m, 1000 m, 1414 m, 2500 m, 5000 m, and 10000 m. Both biological and chemical data was sampled (Oil and Gas UK, 2019).

The benthic species composition was comprised of annelids (49.3%), arthropods (23%), molluscs (17.6%), echinoderms (3.1%) and minor phyla (6.2%) (BP, 2011). Common taxa included the polychaetes *P. jeffreysii*, *P. assimilis*, *Aphelochaeta spp*, *Exogone veruger*, *S. kroyeri* and *Jasmineira caudata*. Opisthobranch molluscs (including *Cylichna cylindracea*, *Philine quadrata*, *P. scabra* and *Refusa umbilicata*), and the bivalve mollusc *Thyasira pygmaea* were also common across the samples. *A. islandica* was only found in very low numbers at sampled sites (a maximum of ten individuals were counted at one site), if it was found at all.

3.2.5 Devenick Environmental Surveys (2001 and 2009)

The 2001 survey of the Devenick area were conducted using a Van Veen grab. 19 stations were sampled, at 100 m, 500 m, 707 m, 1000 m, 2500 m, 5000 m, and 10000 m from the Devenick wellhead. This survey was of both the chemical and biological environment at the oil field (Oil and Gas UK, 2019).

The most common polychaete species in 2001 were *Oweniidae spp*., *P. jeffreysii*, and *Pectinariidae spp.* Juvenile echinoderms (*Echinoidea spp*.) also formed a significant part of the benthic community. A total of 29 juvenile *A. islandica* were found at one site sampled.

The 2009 survey of the Devenick oil field was conducted using Day grab samples. The samples were taken from five locations at the wellhead location or 500 m away. Both chemical and biological samples were taken (Oil and Gas UK, 2019).

In 2009, the benthic community was different. Species belonging to the genus *Oweniidae* were much less common and instead the prevalent polychaete species were *P. jeffreysii* and *S. bombyx*. Brittle stars (*Amphiuridae spp*.) were also common across all five sampled sites.

3.2.6 Harding Site Survey (2006)

This survey was conducted using Day grab gear, and both chemical and biological data was collected. 11 sites were sampled at distances from 160 m, 202 m, 401 m, 500 m, 1000 m (Oil and Gas UK, 2019).

Juvenile (therefore unidentifiable to species) echinoderms of the genus *Echinoidea* were the most abundant taxon at eight of the eleven sites sampled. *P. jeffreysii*, juvenile *Pectinariidae spp*., and *S. bombyx* were amongst the most common polychaete species. The tube dwelling anemone *Cerianthus lloydii* and juvenile brittle stars (*Ophuroidea spp*.) were also found in high numbers at some of the sites sampled.

3.3 Summary of Receptors

The baseline environment in the project area is summarised in Table 3-2. For most receptors, the information provided in Table 3-2 is considered sufficient to inform the environmental assessment of potential impacts within this EA. Specific receptors identified during the ENVID and consultation meetings as potentially of specific interest to stakeholders included commercial fisheries, seabed and benthic environment and water quality. These receptors are discussed in more detail in the following Sections.

Table 3-2 Key environmental and social sensitivities in the PL301 area

Environmental Receptor	Description
Key Conservation interests	
OSPAR (2008) List of Threatened and/or Declining Habitats and Species	
Ocean quahog	Ocean quahog are one of the longest-living animals in the world. Ocean quahog are burrowing filter feeders, therefore are reliant on suitable sediment conditions – sand and gravel substrates are their preferred habitat. The sediment type surrounding the Brae Alpha platform is likely to be a suitable habitat for ocean quahog (*A. islandica*). However, according to the findings of the 2001 and 2006 surveys around the Brae Alpha platform, ocean quahog numbers were too low to be considered an aggregation (Oil and Gas UK, 2019).
Seapens and burrowing megafauna in circalittoral fine mud	This habitat was identified as being close to the PL301 route. These habitats are heavily bioturbated by the burrowing fauna living within the sediment (Hughes *et al.*, 2010). Seapens are usually a distinctive feature of this habitat, however survey effort in the vicinity of the Brae Alpha (in both survey years) noted very few seapens. Other species, such as the burrowing crustaceans *Calocaris macandreae* or *Callianassa subterranea*, which are often distinctive of this habitat, were present in low numbers, if at all (Oil and Gas UK, 2019). Many of the species indicative of this OSPAR habitat are not found in high numbers at the Brae Alpha though this does not rule out their presence further along PL301.
Conservation sites	
Special Areas of Conservation (SACs)	The nearest SAC to the Brae Alpha and PL301 is the Braemar Pockmark SAC, which is situated 8 km west north-west of the end of PL301 where it crosses the UK/Norway median line. This site is designated for the presence of submarine structures formed by leaking gases, which are found within seabed depressions referred to as “pockmarks” and support reef-like communities distinct from the surrounding soft sediments. The SAC is a singular large depression which contains Methane Derived Authigenic Carbonate (MDAC) blocks made by leaking gases, which support a fauna typical of rocky reefs, including anemones *Urticina feline* and *Metridium senile* and squat lobsters (JNCC, 2019a). The project is not located in an area likely to produce Annex I submarine structures. However, within the final 2 km of the PL301 before it reaches the Brae Alpha, pockmarks were observed (Deepocean, 2017). However, there was no evidence of associated MDAC structures.
Marine Protected Area (MPAs)	The nearest MPA to the project is the Norwegian Boundary Sediment NCMPA located 60 km south south-east of the Brae Alpha platform. This area constitutes a relatively shallow sandy plain which has been designated due to its importance to ocean quahog. The site lies adjacent to the UKCS/Norwegian median line (Scottish Government, 2014). Past surveys in the Brae Alpha area have not found evidence of substantial populations of ocean quahog (Oil and Gas UK, 2019).
Special Protected Areas (SPAs)	There are no SPAs in the vicinity of the project area.
Annex I Habitats	There is no evidence of the presence of other Annex I habitats.

Conservation Species	
Coastal and Offshore Annex II species most likely to be present in the project area	
Pinnipeds – Harbour and Grey Seals	Pinnipeds not expected in significant numbers, with densities estimated at approximately 0-1 individuals per 25 km^2 for both harbour (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) (Seal Mammal Research Unit (SMRU), 2011). This is due to the site being approximately 190 km offshore.
European Protected Species most likely to be present in the project area	
Harbour porpoise	The harbour porpoise (*Phocoena phocoena*) is a small, highly mobile species of cetacean that is common to all UK waters. As such the harbour porpoise can also be found in the vicinity of the proposed decommissioning area in relative abundance. Based on observational data, higher numbers are present in January and July (Reid *et al*., 2003). The relative density of harbour porpoise is roughly estimated at 0.6 animals/km^2 in the project area (Hammond *et al*., 2017).
Minke whale	Minke whale (*Balaenoptera acutorostrata*) occur in water depths of 200 m or less throughout the northern North Sea and CNS. They are usually sighted in pairs or in solitude; however, groups of up to 15 individuals can be sighted feeding. It appears that animals return to the same seasonal feeding grounds. Sightings in relation to the project area are mainly and largest in spring and the summer months (Hammond *et al*., 2017). The relative density of minke whales is roughly estimated at 0.03 animals/km^2 in the project area (Hammond *et al*., 2017).
White-beaked dolphin	The white-beaked dolphin (*Lagenorhynchus albirostrisis*) are found mostly in continental shelf waters with depths between 50 m and 100 m, and rarely out to the 200 m isobath (Reid *et al*. 2003). Distribution of the species has been linked to sea surface temperature, local primary productivity and prey abundance. White-beaked dolphins are usually found in water depths of between 50 and 100 m in groups of around 10 individuals, although large groups of up to 500 animals have been seen. The species are roughly estimated to have a density of 0.2 animals/km^2 near the project area (Hammond *et al*., 2017). They are most prevalent in moderate densities in the project area from summer into the early winter months (Reid *et al*. 2003).
Benthic environment	
Seabed type	According to data by the British Geological Society, the Brae Alpha platform is situated in sand substrate. The majority of PL301 also passes through areas of sandy substrate. By the UKCS/Norway median line a stretch of PL301 passes through muddy sand before crossing into Norwegian waters (NMPi, 2019). The EUNIS habitat complex in the immediate area surrounding the Brae Alpha is classified as A5.27 'Deep circalittoral sand' (EMODnet, 2019). Very little data is available on these habitats however they are likely to be more stable than their shallower counterparts (European Environment Agency, 2019a). PL301 also passes through EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019). In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment (European Environment Agency, 2019b). Of the six stations sampled around the Brae Alpha platform in the 2006 survey (Oil and Gas UK, 2019), fines were greater than 30% in all but one sample, confirming that the sediment in the area around Brae Alpha has a substantial silt and clay component (Oil and Gas UK, 2019). According to the Priority Marine Feature (PMF) distribution maps provided in Tyler-Walters *et al*. (2016) and the NMPi (2019), the Brae Alpha platform and the majority of PL301 are found in an area designated as SNH Priority Marine Feature (PMF) 'Offshore subtidal sand

	and gravels'. The section of pipeline within the area of mud sediment is within the PMF 'Offshore deep sea muds' (SNH, 2014). Therefore, almost the whole extent of PL301, from the Brae Alpha to the median line, is found within PMF habitat.
Benthic Environment	The EUNIS habitat complex in the immediate area surrounding the Brae Alpha is classified as A5.27 'Deep circalittoral sand' (EMODnet, 2019). This habitat is likely to be characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms (European Environment Agency, 2019a). PL301 also passes through EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019). Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira spp.*, echinoderms and foraminifera (European Environment Agency, 2019b). In context of the survey findings from both years, polychaete dominance was seen, and echinoderms were prevalent, though molluscs made up a lesser component of the benthos. Of the two surveys conducted at the Brae Alpha, the dominant taxa were echinoderms, annelids, molluscs and brittle stars. The polychaete *Paramphinome jeffreysii* was dominant in almost all surveys (see Table 3-1). The following PMF benthic features are also known to occur close to the Brae Alpha rig and PL301: 'Ocean quahog *A. islandica*' (an OSPAR 2008 listed species), 'Mud burrowing amphipod *Maera lovenii*', 'Seapens and burrowing megafauna in circalittoral fine mud' (an OSPAR 2008 listed habitat), and 'Burrowed mud'.
Fish – spawning and nursery grounds	
Spawning grounds	The project area is located within the spawning grounds of cod *Gadus morhua*, mackerel *Scomber scombus*, Norway lobster *Nephrops norvegicus*, Norway pout *Trisopterus esmarkii* and saithe *Pollachius virens* (Coull *et al*., 1998; Ellis *et al*., 2012).
Nursery grounds	The following species have nursery grounds in the vicinity of the project: anglerfish *Lophius piscatorius*, blue whiting *Micromesistius poutassou*, cod, haddock *Melanogrammus aeglefinus*, European hake *Merluccius merluccius*, herring *Clupea harengus*, ling *Molva molva*, mackerel, Norway lobster, Norway pout, saithe, sandeel *Ammodytidae spp.*, spotted ray *Raja montagui*, spurdog *Squalus acanthias*, and whiting *Merlangius merlangus* (Coull *et al*., 1998; Ellis *et al*., 2012).
Probability of 0 age group fish aggregation	Aires *et al*. (2014) provides modelled spatial representations of the predicted distribution of 0-year group (i.e. juvenile) fish. The probability of 0 group fish species occurring in the vicinity of the Brae Alpha and PL301 was low across all species.
Seabirds	
According to the density maps provided in Kober *et al*. (2010), the following species have been recorded within the area of proposed operations: Manx shearwater *Puffinus puffinus*, northern gannet *Morus bassanus*, pomarine skua *Stercorarius pomarinus*, Arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua*, black-legged kittiwake, great black-backed gull *Larus marinus*, common gull *Larus canus*, lesser black-backed gull *Larus fuscus*, herring gull *Larus argentatus*, glaucous gull *Larus hyperboreus*, common tern *Sterna hirundo*, Arctic tern *Sterna paradisaea*, common guillemot, razorbill *Alca torda*, little auk *Alle alle* and Atlantic puffin *Fratercula arctica*. In Blocks 16/3, 16/7 and 16/8 the sensitivity of seabirds to oil pollution, reflected by the SOSI (JNCC, 2015), is extremely high from April to June. It is low for all other months of the year, except in Block 16/3 for the months of January and February, although there is no data available between November and December (Webb *et al*., 2016).	

Seabird Oil Sensitivity Index (SOSI)												
Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
16/3	2*	2	5	1*	1	5	5	5	5	5*	N	N
16/7	5*	5	5	5*	1*	5*	5	5	5	5*	N	N
16/8	5*	5	5	1*	1	1*	5	5	5	5*	N	N
Key	1 = Extremely high			2 = Very high		3 = High		4 = Medium		5 = Low	N = No data	
	* in light of coverage gaps, an indirect assessment of SOSI has been made using the method provided by the Joint Nature Conservation Committee (JNCC) (Webb *et al*., 2016)											

Socio-economic Receptor	Description
Commercial fishing	

According to fishing data from the Scottish Government (2019a), fisheries in ICES rectangle 46F1 have predominantly targeted combinations of demersal and pelagic species as well as shellfish throughout the years 2014-2018. From 2014 to 2016 the catch, by weight, was predominantly pelagic. This has since dropped to less than 1 tonne per year as the focus has shifted to demersal species. In 2018, 619 tonnes of fish were landed overall, almost a third of the weight recorded in 2014, however the value of this catch was approximately the same. This is due to the contribution of high value shellfish to the 2018 total, namely *Nephrops* – on average shellfish was valued 2.7 times higher than demersal catch and 31.9 times higher than pelagic catch (Scottish Government, 2019a).

Fishing effort in 46F1 was compared to the effort expressed within Scottish waters (NMPi, 2019). Effort was low year-round, with no clear seasonal pattern. In 2018, the effort in 46F1 comprised 0.3% of the UK total of 126,863 days of fishing effort. The majority of this effort was conducted using trawl gear.

Amalgamated VMS data from 2007-2015 in Figure 3-6 shows trawling activity in this region from *Nephrops* and demersal trawling. Fishing intensity is generally low in the area, particularly with respect to demersal trawling. This corresponds to the relatively low fishing effort. *Nephrops* trawl intensity is much higher around the Brae Alpha platform, the spatial distribution of VMS data corresponds to the presence of EUNIS habitat complex A5.37 'Deep circalittoral mud' indicating this habitat supports *Nephrops*. Similarly, where the PL301 pipeline passes through the mud habitat to the north of the Brae Alpha there is also an increase in the intensity of VMS data. The total number of trawls over PL301 is highest in the section just before the median line crossing (Figure 3-6). This corresponds to the presence of mud habitat and *Nephrops*. Between 2007 and 2015, the number of *Nephrops* trawls reached a maximum of 50-55 crosses over that section of pipeline.

Fishing Landings in ICES Rectangle 46F1										
Species type	2018		2017		2016		2015		2014	
	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)	Live weight (Te)	Value (£)
Demersal	847,867	481	1,528,970	834	837,895	562	397,479	275	284,941	210
Pelagic	124	<1	43	<1	1,417,757	1,952	201,599	531	462,981	1,689
Shellfish	509,275	137	236,408	57	156,764	34	320,771	75	615,924	142
Total	1,357,266	619	1,765,421	890	2,412,415	2,548	919,850	882	1,363,845	2,041

Fishing Effort in ICES Rectangle 46F1														
ICES Rectangle	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
46F1	2014	55	9	57	2	D	-	D	26	52	15	D	55	277
	2015	61	D	9	D	3	9	D	D	D	D	65	34	198
	2016	D	100	34	D	15	D	10	17	D	8	9	D	229
	2017	14	16	46	4	14	7	12	29	13	42	7	12	218
	2018	10	40	D	19	139	D	7	D	34	57	16	10	347
Note: Monthly fishing effort by UK vessels landing into UK: green = 0 – 100 days fished, yellow = 101 – 200, orange = 201-300, red = ≥301, D = Disclosive data (indicating very low effort, specifically less than 5 over-10 m vessels undertook fishing activity in that month), - = no data														

Other sea users	
Shipping activity	Shipping activity is considered low in Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2016).
Oil and Gas	The Brae Alpha and PL301 are located in the NNS in an area of extensive oil development with a number of fields located nearby, see below[2]: Installation — Installation Type — Operator — Distance and direction Miller — Footings and subsea infrastructure — BP — 7.7 km ENE Brae B — Platform — RockRose Energy — 11.7 km NNE Brae East — Platform — RockRose Energy — 24.9 km NNE Gudrun Jacket — Platform — Equinor — 31.7 km ENE
Telecommunication	The closest telecommunication cables in the vicinity of the project area is the telecom Tampnet 3 cable (25.5 km ESE).
Military activities	There are no military restrictions on Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2019).
Renewables	There are no renewable sites near the project area.
Wrecks	There are ten wrecks within 20 km of the project area, nine are unknown (NMPi, 2019). Only one is named, the possible wreck of the Lundstoskjaer fishing vessel. There are no protect wrecks in the vicinity of the project area (Scottish Government, 2019b).

3.4 Seabed Habitats and Benthos

According to data by the British Geological Society, the Brae Alpha platform is situated in sandy substrate. The majority of PL301 also passes through areas of sand. By the UKCS/Norway median line a stretch of PL301 passes through muddy sand before crossing into Norwegian waters (NMPi, 2019). The EUNIS seabed habitat surrounding the Brae Alpha rig is classed as A5.27 'Deep circalittoral sand', shown in Figure 3-1. The section of PL301 that follows the UK/Norway median line passes through an area of EUNIS habitat A.53 'Deep circalittoral mud'. Of the six stations sampled in the 2006 survey, fines were greater than 30% in all but one

[2] Note: BP= British Petroleum

sample, suggesting that the sediment in the area around Brae Alpha has a substantial silt and clay component (Oil and Gas UK, 2019).

Little data is available on EUNIS habitat complex A5.27 'Deep circalittoral sand'. However, such habitats are likely to be more stable than their shallower counterparts and characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms (European Environment Agency, 2019a). PL301 also passes through EUNIS habitat A5.37 'Deep circalittoral mud'. In mud and cohesive sandy mud in the offshore circalittoral zone, typically below 50-70 m, a variety of faunal communities may develop, depending upon the level of silt/clay and organic matter in the sediment. Communities are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira spp.*, echinoderms and foraminifera (European Environment Agency, 2019b).

In context of the survey findings, the dominant taxa at the Brae Alpha platform in both survey years were: polychaetes, echinoderms, annelids, molluscs and brittle stars. The polychaete *P. jeffreysii* was most numerous in 2001 and 2006 (Oil and Gas UK, 2019). *P. jeffreysii* accounted for over 50% of species in the wider Brae area; this species is thought to be a hydrocarbon tolerant scavenger (Marathon, 2017a). Other common polychaetes in the Brae Alpha area in 2001 were: *Paradoneis eliasoni*, *Apistobranchus tullbergi*, *Galathowenia oculata*. In 2006, the prevalent polychaete species were: *Chaetozone setosa*, *Pectinariidae spp.*, and *Sthenelais limicola*. Species commonly identified in the wider Brae complex were consistent with previous findings for that area of the North Sea (Marathon, 2017a).

Benthic community composition was similar across other surveys in the area (listed in Table 3-1). *P. jeffreysii* was amongst the dominant polychaete species at Miller (~5 km away), Devenick (~24 km) and Harding (~36 km). Other common polychaetes were: *Capitella capitata*, *Oweniidae spp* (juvenile), *G. oculata* and *S. bombyx*. Juvenile urchins (unidentifiable to species) were the most common fauna across all sites sampled at Harding.

A total of 29 juvenile *A. islandica* were found at one site sampled during the 2001 Devenick survey. This is still relatively low and does not indicate the presence of an aggregation. In 2009 at Devenick *A. islandica* numbers were much lower. This is consistent with the findings of all other surveys across the different oil fields; only a few individual *A. islandica* juveniles are present in the area. Devenick is also ~24 km from the PL301 therefore the survey results for this area are not as representative of the PL301 area as some of the closer surveys (Table 3-1).

According to the Scottish Priority Marine Feature (PMF) distribution maps provided in Tyler-Walters *et al*. (2016) and the NMPi (2019), the Brae Alpha platform and the majority of PL301 are found in an area designated as SNH Priority Marine Feature (PMF) 'Offshore subtidal sand and gravels'. The section of PL301 within the area of mud sediment is within the PMF 'Offshore deep-sea muds' (SNH, 2014). Therefore, almost the whole extent of PL301, from the Brae Alpha to the median line, is found within PMF habitat.

Within the vicinity of the Braemar development, MDAC structures were observed (Marathon, 2017b). This is indicative of protected Annex I habitat 'Submarine structures made by leaking gases'. The same polychaetes were dominant in this habitat, however there was an increased prevalence of *Sipuncula spp* (Marathon, 2017b). Pockmarks were observed during a pipeline survey along the latter part of the PL301 route (Deepocean, 2017), a section of PL301 and pockmarks is shown in Figure 3-2. There was no evidence of MDAC features associated with the observed pockmarks.

Total hydrocarbon concentration within samples taken during the Brae Alpha 2006 survey, ranged from 3.9 µg/g to 8.1 µg/g, and averaging a concentration of 5.4 µg/g (Oil and Gas UK, 2019). This is below the hydrocarbon concentrations for the wider area, DECC (2016) reported that the concentration of Total Hydrocarbon Content (THC) within the Fladen Ground in 2001 was 19.3 µg/g.

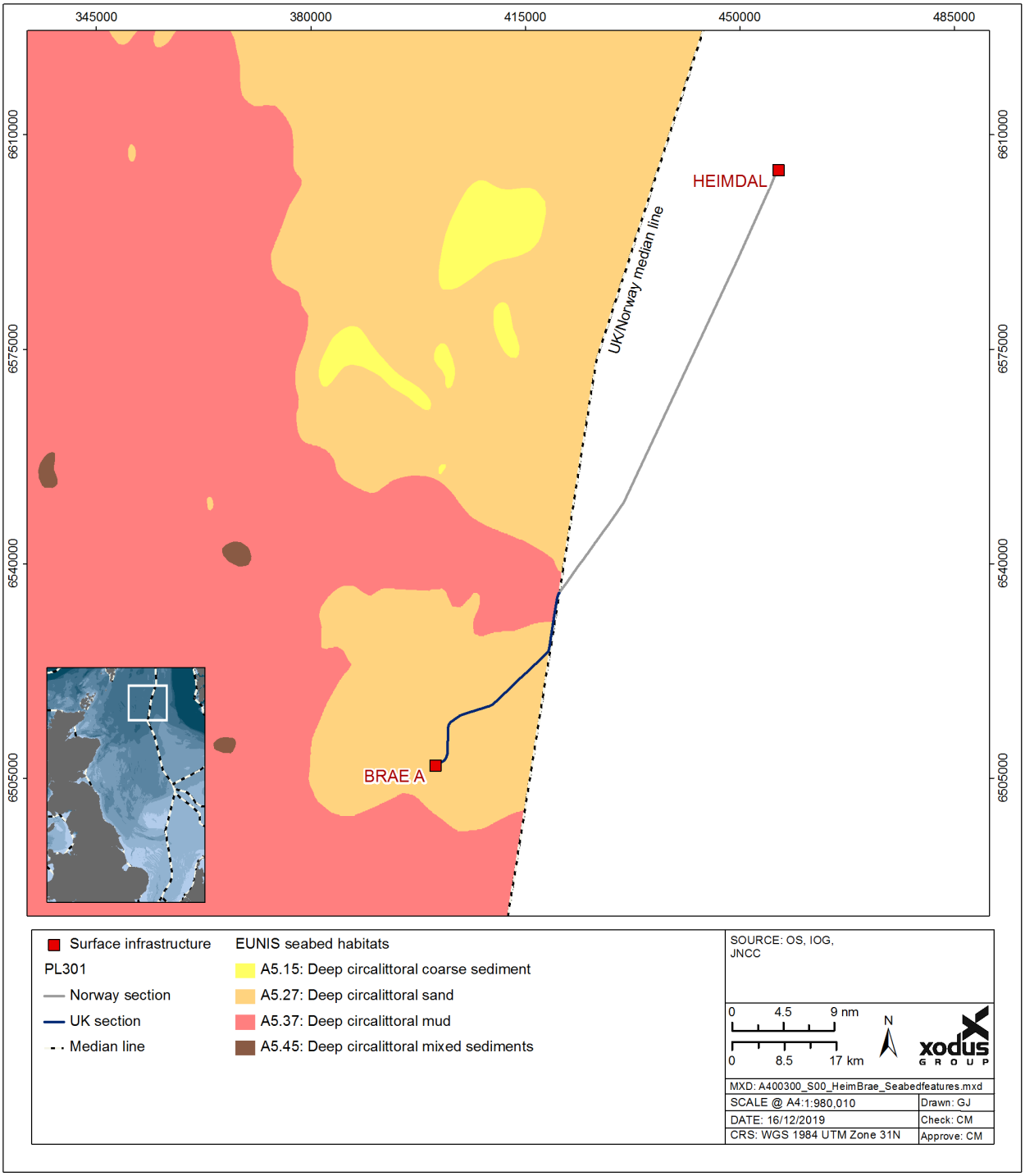


Figure 3-1 EUNIS seabed habitats in the vicinity of the Brae Alpha and PL301

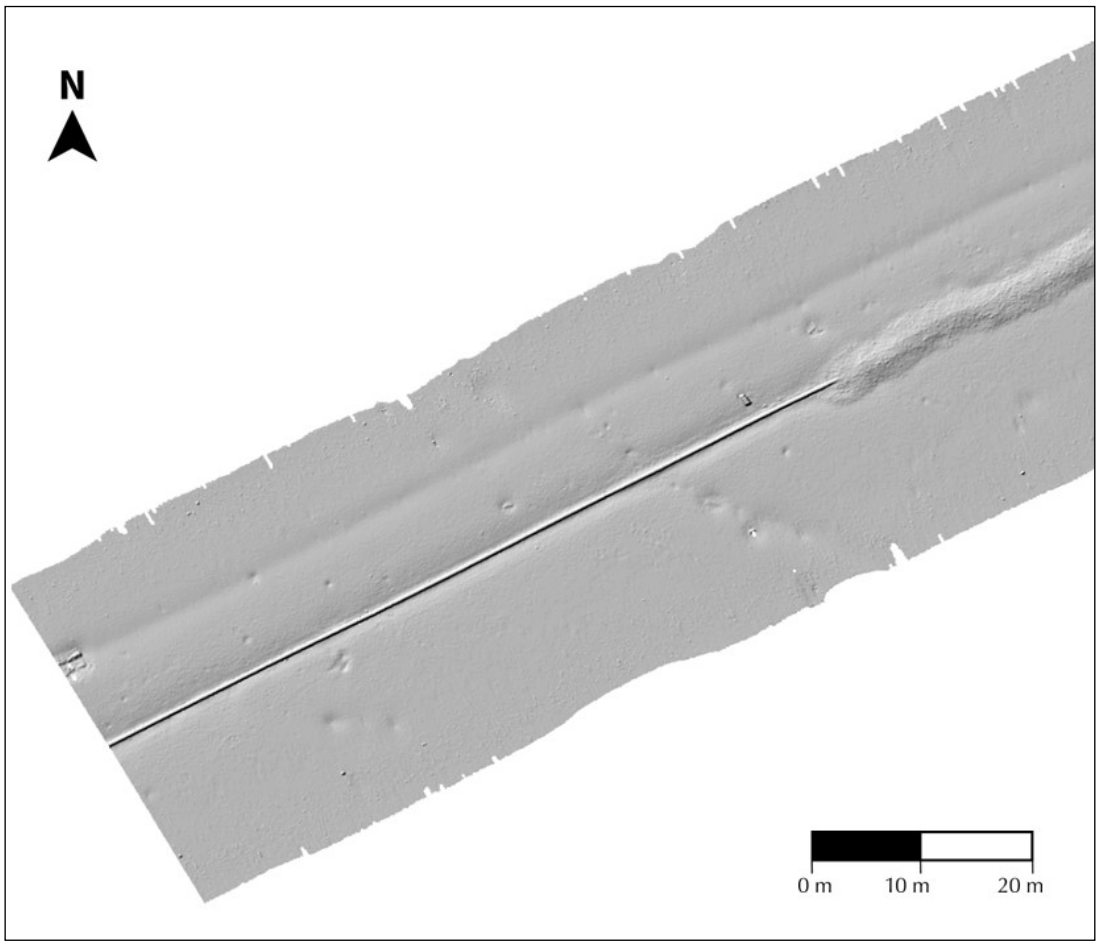


Figure 3-2 Image of seabed surrounding PL301 with evidence of pockmarks (between KP 115.791 and KP 116.090 close to the Brae Alpha)

3.5 Other Sea Users

3.5.1 Maritime Activities

The North Sea contains some of the world's busiest shipping routes, with significant traffic generated by vessels trading between ports at either side of the North Sea and the Baltic. North Sea oil and gas fields also generate moderate vessel traffic in the form of support vessels principally operating from Peterhead, Aberdeen, Montrose and Dundee in the north and Great Yarmouth and Lowestoft in the south (DECC, 2016). Figure 3-3 below, a composite of Automatic Identification System (AIS) vessel tracks, illustrates the relative vessel activity surrounding the Brae Alpha and along the route of PL301. The presence of support vessels is observed in the immediate vicinity of the Brae Alpha platform.

PL301 is found in UKCS Blocks 16/3, 16/7 and 16/8 where shipping activity is assessed to be low (DECC, 2016; Oil and Gas Authority, 2016). Cargo vessels and tankers appear to constitute the majority of vessels around the Brae Alpha and along the end of PL301, as shown in Figure 3-3. Passenger vessels and service craft are also present in the area. There appears to be less vessel activity along the central stretch of PL301.

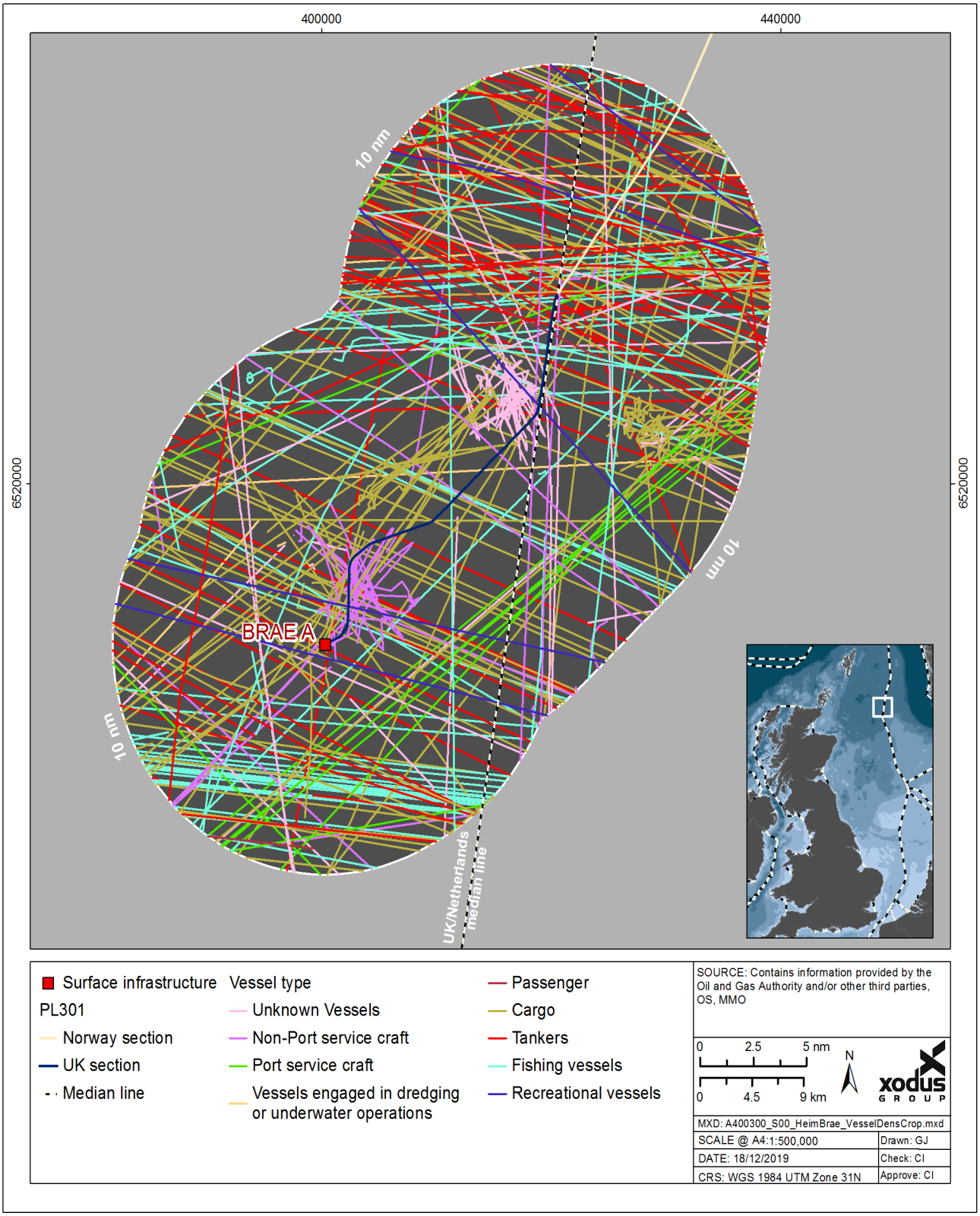


Figure 3-3 Vessel activity around the Brae Alpha and PL301

There are no renewable energy sites within 40 km of Brae Alpha or PL301. The closest site is the Offshore Wind Plan Option area approximately 150 km north west of PL301.

There are no military restrictions on Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2019).

3.5.2 Commercial Fisheries

The Brae Alpha and PL301 sit within ICES rectangle 46F1. The associated landings and effort trends for 46F1 have been provided for the most recent fishing years (2014-2018 inclusive; Table 3-3 and Table 3-4).

According to fishing data from the Scottish Government (2019a), fisheries in ICES rectangle 46F1 have predominantly targeted combinations of demersal and pelagic species as well as shellfish throughout the years 2014-2018 (Table 3-3). With regards to demersal catch by weight, compared to surrounding rectangles, 46F1 is of moderate catch (NMPi, 2019). Pelagic and shellfish landings by weight are comparatively low in 46F1 and the immediate surrounding rectangles when compared with other regions of the Scottish North Sea (NMPi, 2019). From 2014 to 2016 the catch, by weight, was predominantly pelagic. This has since dropped to less than 1 tonne per year as the focus has shifted to demersal species. In 2018, 619 tonnes were landed, almost a third of the weight recorded in 2014, however the value of this catch was approximately the same. This is due to the contribution of high value shellfish to the 2018 total, namely *Nephrops* – on average shellfish was valued 2.7 times higher than demersal catch and 31.9 times higher than pelagic catch (Table 3-3). The total annual landings for rectangle 46F1 in 2018 was 0.1% of the UK total of 563,712 tonnes. The value of catch in the rectangle was 0.2% of the 2018 UK catch value of £717,531,114. Monkfish/anglerfish and *Nephrops* were the highest value catch throughout 2018 (UK Government, 2019).

Average annual fishing effort, as a measure of total fishing days per annum, was low in ICES rectangle 46F1 compared to the effort expressed within Scottish waters (NMPi, 2019). Effort was low year-round, with no clear seasonal pattern (Table 3-4). Within a few months the fishing effort was recorded as disclosive or, in June 2014, as no data. This indicates low levels of fishing activity during those months, in particular it means less than 5 over-10m vessels undertook fishing activity. Effort remained relatively consistent between 2014 and 2017, most recently in 2018 there was an increase in effort, which can be attributed to month of May; only in this month did the number of effort days exceed 100. In 2018, the effort in 46F1 comprised 0.3% of the UK total of 126,863 days of fishing effort. Trawls were the most utilised gear within rectangle 46F1 across all years. Seine nets were also used although the effort for these was recorded as disclosive.

AIS recordings of fishing vessel movements from 2015 indicate vessel movement is dominated by transiting vessels (Figure 3-4). Fishing vessel activity was generally low within the decommissioning project area other than two busy transiting passages due south of the Brae Alpha platform and across the very northern end of PL301 within the UKCS – where PL301 crosses the median line. The circular AIS tracks south west of Brae Alpha appear to indicate pelagic fishing activity. To the south east of the Brae Alpha, on the Norwegian side of the North Sea, the clusters of back and forth vessel movement are indicative of *Nephrops* trawl fishing (Figure 3-4). Similarly, the sweeping curved AIS tracks to the west of Brae Alpha can also indicate *Nephrops* trawling which is known to occur based on landings (Table 3-3) and the known mud habitat in the area, as described in Section 3.4.

Smaller vessels are less likely to have AIS systems however they should be captured within Vessel Monitoring System (VMS) data, although it is altogether unlikely that smaller fishing vessels would be present so far offshore. Amalgamated VMS data from 2007-2015 in Figure 3-5 shows trawling activity in this region from *Nephrops* and demersal trawling. Fishing intensity is generally low in the area, particularly with respect to trawling for crustaceans. This corresponds to Table 3-4 of relatively low fishing effort. *Nephrops* and crustacean trawl intensity is much higher in the area around the Brae Alpha platform, spatially corresponding to the presence of EUNIS habitat complex A5.37 ‘Deep circalittoral mud’ indicating this habitat supports *Nephrops*. Similarly, where PL301 passes through the mud habitat to the north of the Brae Alpha there is also an increase in the intensity of VMS data (Figure 3-5).

The total number of trawls over the PL301 pipeline is highest in the section just before the median line crossing (Figure 3-6). This corresponds to the presence of mud habitat and *Nephrops*. Between 2007 and 2015, the

number of *Nephrops* trawls reached a maximum of 50-55 crosses over that section of pipeline per year. This is similar to the number of passes by a demersal trawl across the same years; the greatest number of demersal trawl passes was 41-60 in a year. Compared to the trawl intensity on the Norwegian side of the median line, there is relatively little demersal trawling activity in the vicinity of the Brae Alpha and PL301. The rest of PL301 running from the median line to Brae Alpha experienced much less trawl activity at < 5 VMS tracks on average between 2007-2015 – this is comparable to other pipelines within UK waters (NMPi, 2019). Where *Nephrops* trawling appears to stop across the median line in Norwegian waters this is due to a lack of data (Figure 3-6).

Table 3-3 Live weight and value for species types landed in ICES Rectangle 46F1 (Scottish Government, 2019a)

ICES Rectangle	Species type	2018		2017		2016		2015		2014	
		Value (£)	Live weight (t)	Value (£)	Live weight (t)	Value (£)	Live weight (t)	Value (£)	Live weight (t)	Value (£)	Live weight (t)
46F1	Demersal	847,867	481	1,528,970	834	837,895	562	397,479	275	284,941	210
	Pelagic	124	<1	43	<1	1,417,757	1,952	201,599	531	462,981	1,689
	Shellfish	509,275	137	236,408	57	156,764	34	320,771	75	615,924	142
	Total	**1,357,266**	**619**	**1,765,421**	**890**	**2,412,415**	**2,548**	**919,850**	**882**	**1,363,845**	**2,041**

Table 3-4 Days of fishing effort in ICES Rectangle 46F1 (Scottish Government, 2019a)

ICES Rectangle	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
46F1	2014	55	9	57	2	D	-	D	26	52	15	D	55	**277**
	2015	61	D	9	D	3	9	D	D	D	D	65	34	**198**
	2016	D	100	34	D	15	D	10	17	D	8	9	D	**229**
	2017	14	16	46	4	14	7	12	29	13	42	7	12	**218**
	2018	10	40	D	19	139	D	7	D	34	57	16	10	**347**

Note: Monthly fishing effort by UK vessels landing into UK: green = 0 – 100 days fished, yellow = 101 – 200, orange = 201-300, red = ≥301, D = Disclosive data (indicating very low effort, specifically less than 5 over-10 m vessels undertook fishing activity in that month), - = no data

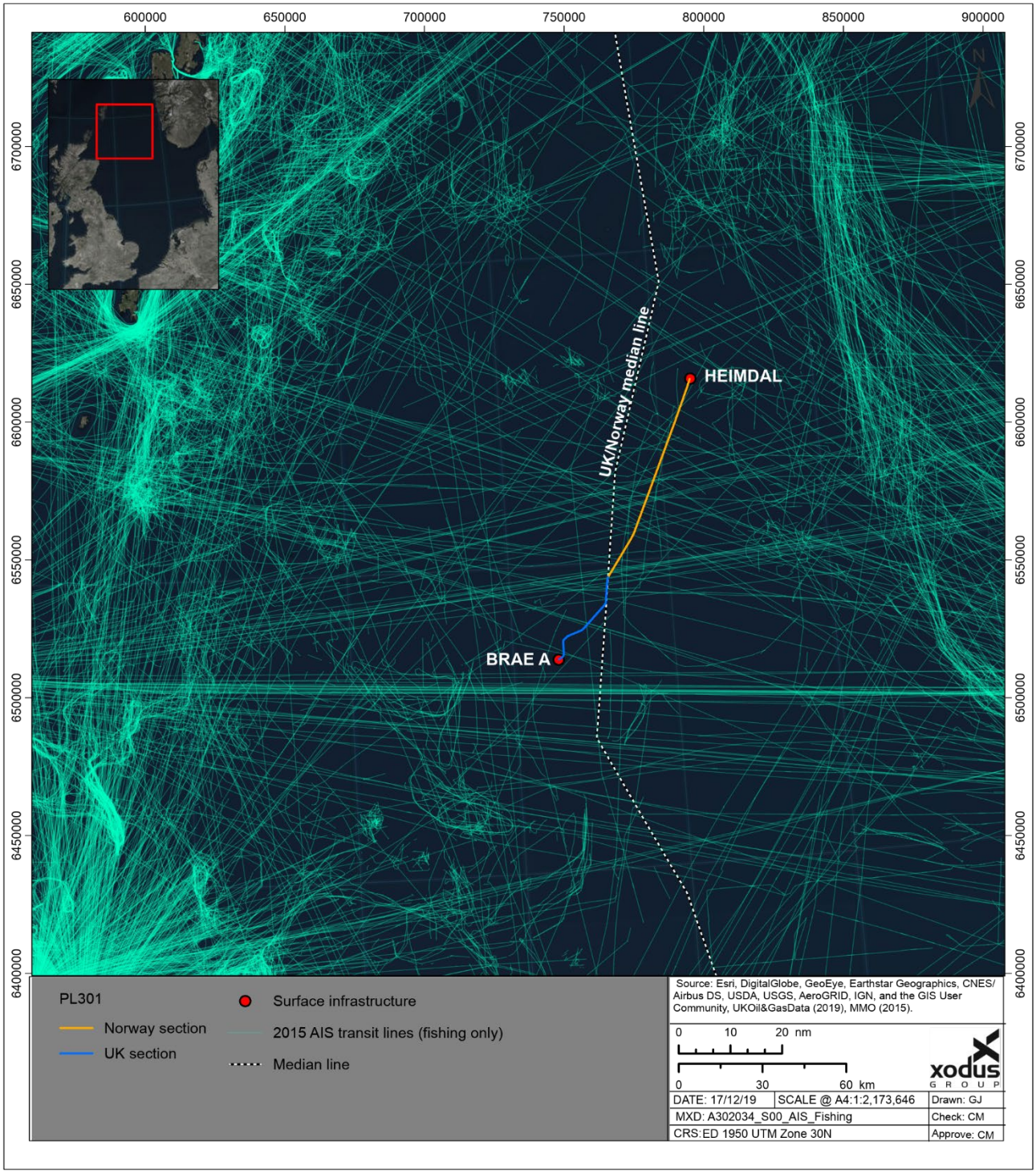


Figure 3-4 AIS data from commercial fishing vessels for the year 2015 (MMO, 2016)

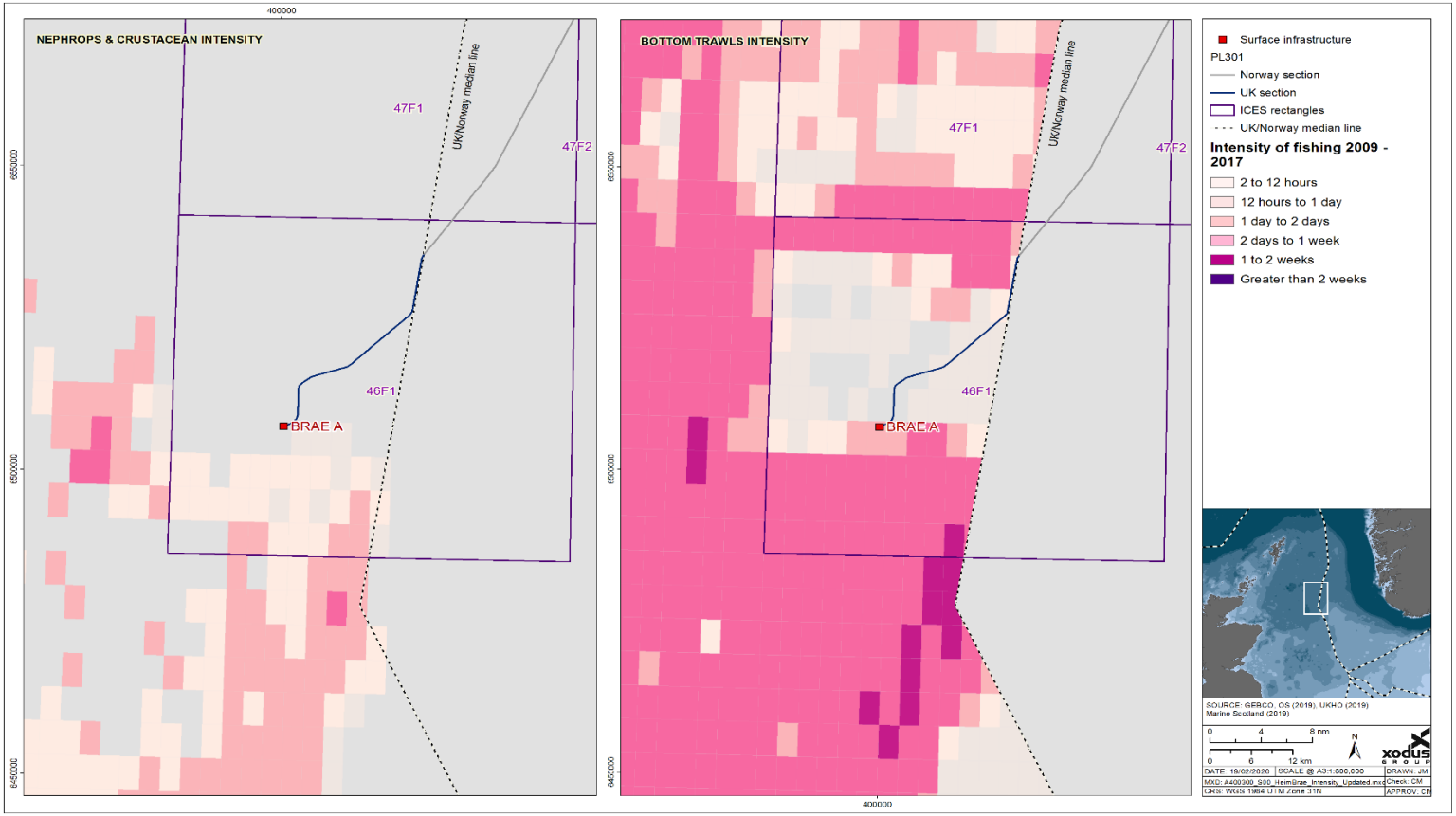


Figure 3-5 Vessel Monitoring System intensity for *Nephrops* and crustacean and bottom trawl fisheries in ICES Rectangles 46F1 and 47F1

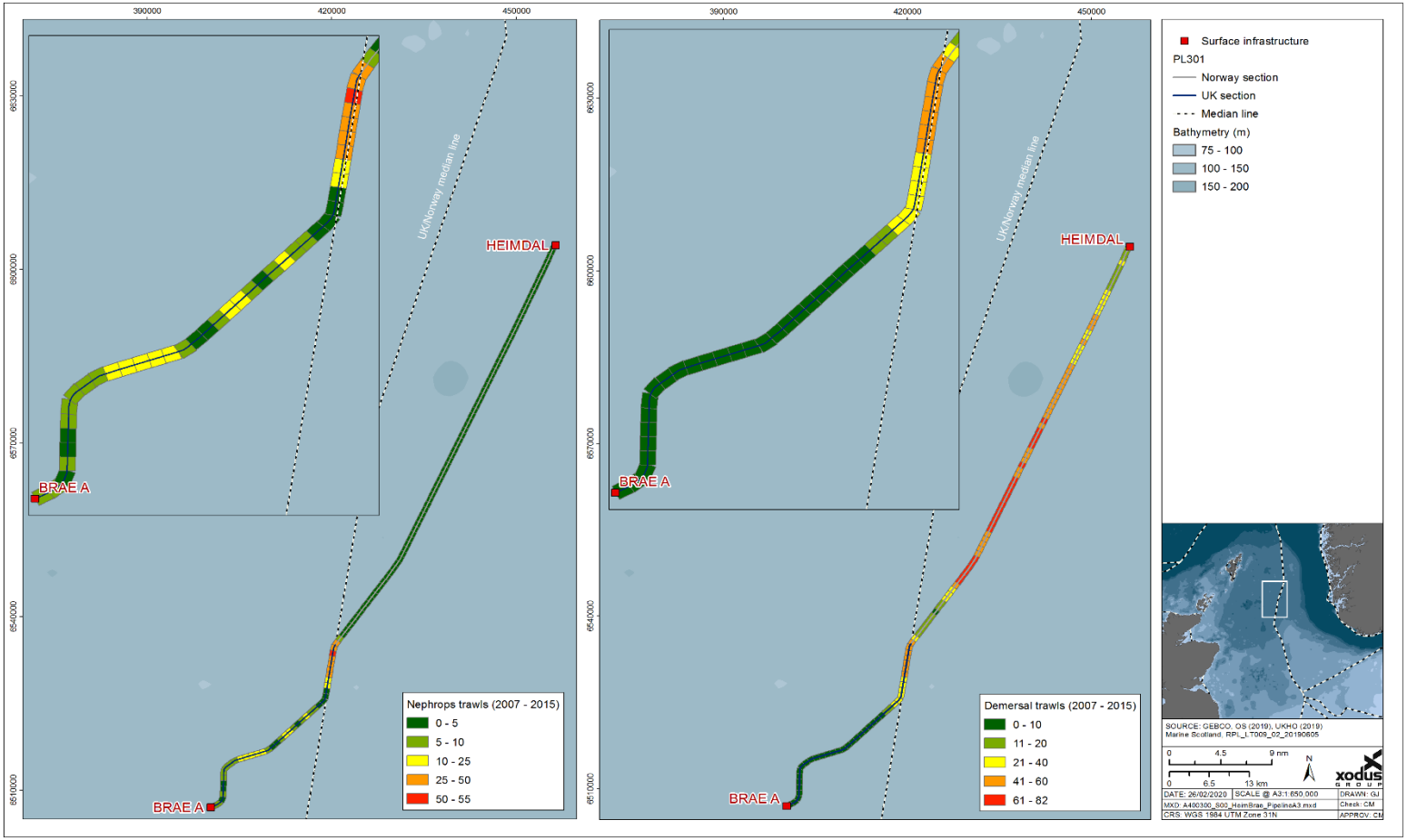


Figure 3-6 Relative trawling activity associated with PL301

3.6 Conservation Sites and Species

3.6.1 Offshore Conservation

The North Sea hosts a number of habitats and species of conservation interest, and numerous sites have been designated to protect these interests. Figure 3-7 shows the closest conservation areas to PL301 and the presence of substrate which is likely to produce Annex I submarine structures.

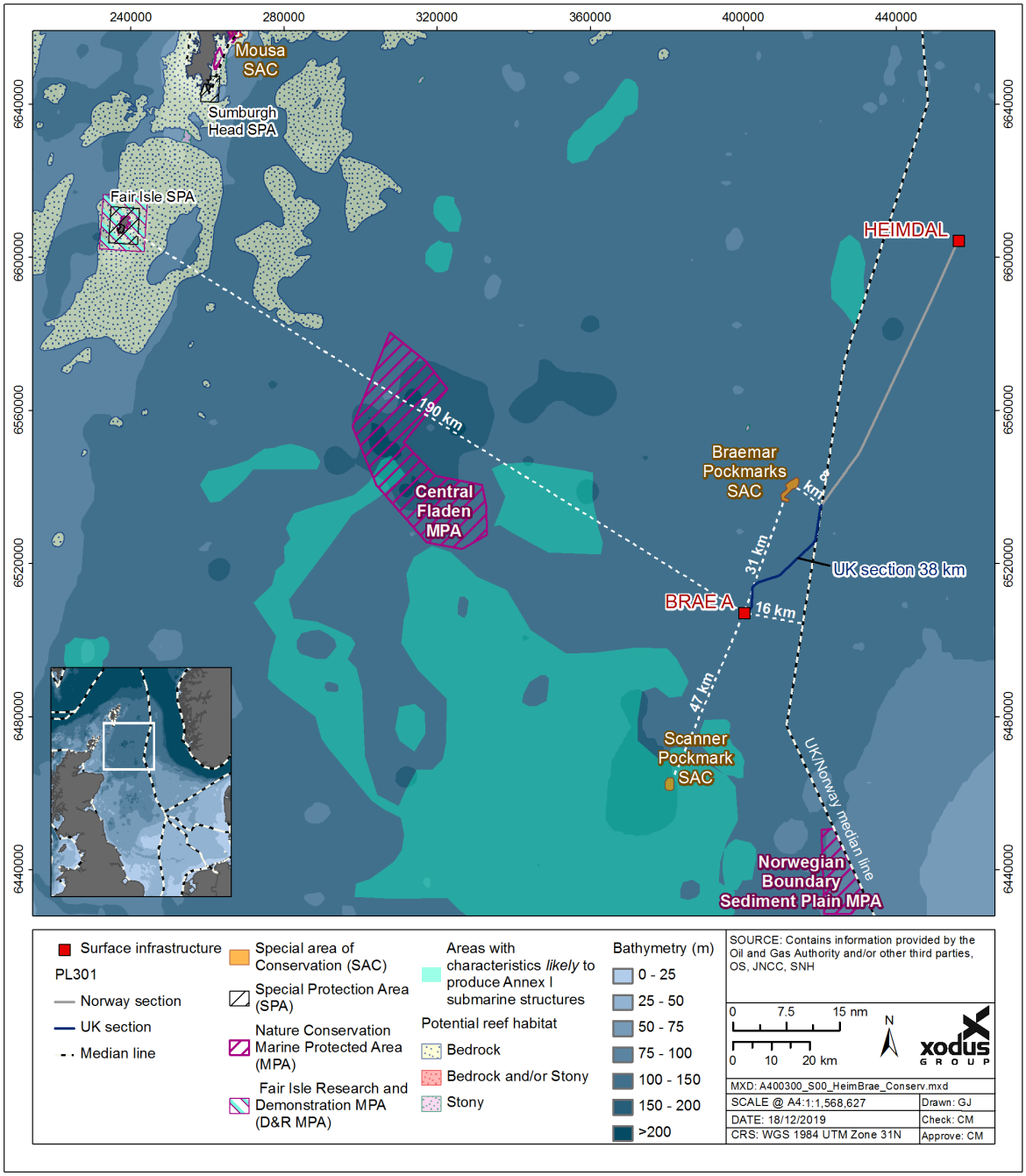


Figure 3-7 Conservation areas proximal to the Brae Alpha and PL301

Whilst the PL301 route does not pass through any areas likely to produce submarine structures, potential pockmarks have been observed along the latter part of the pipeline (Figure 3-2).

There is one protected site within 40 km of the Decommissioning Project. The Braemar Pockmarks SAC is located 8 km west north-west of the PL301 route at the closest point. This site, and the nearest other conservation designations are detailed in Table 3-5 below.

Table 3-5 Conservation areas proximal to the Brae Alpha and PL301 pipeline

Site	Designating features	Distance and direction
Braemar Pockmarks SAC	This area is designated for containing a series of crater-like depressions on the sea floor, two of which contain the Annex I habitat 'Submarine structures made by leaking gases'. In this location large blocks and slabs of methane derived carbonate have been deposited by a process of precipitation. This substrate provides a habitat for species which are usually associated with rocky reefs. Furthermore, the complex structure provides shelter for fish such as cod (JNCC, 2019a).	~8 km WNW
Scanner Pockmark SAC	The Scanner Pockmark is a large seabed depression which contains large areas of Annex I habitat 'Submarine structures made by leaking gases'. The pockmark is approximately 900 m by 450 m. The site also contains an active complex of methane seeps. The carbonate slabs which have formed support fauna typical of rocky reef habitats. They are colonised by anemones and squat lobsters (JNCC, 2019b).	~47 km SSW
Norwegian Boundary Sediment Plain MPA	This area constitutes a relatively shallow sandy plain which has been designated due to its importance to ocean quahog. Ocean quahog are one of the longest-living animals in the world. They are burrowing filter feeders therefore are reliant on suitable sediment conditions – sand and gravel substrates are their preferred habitat. The site lies adjacent to the UKCS/Norwegian median line (Scottish Government, 2014).	~60 km SSE
Central Fladen MPA	The Central Fladen MPA lies within the Fladen Grounds, a large area of mud substrate. Central Fladen specifically includes burrowed mud habitat which is characterised by the prevalence of crustacean burrows. This habitat type supports a rich community of species. 'Burrowed mud' is an OSPAR listed habitat. Several species of seapen are also found in the area, including the nationally uncommon tall seapen *Funiculina quadrangularis* which can grow up to 2m. (Scottish Government, 2017). 'Seapen and burrowing megafauna communities' is also a listed OSPAR habitat.	~70 km WNW

3.6.2 Onshore Conservation

The Brae Alpha and PL301 are located 190 km from the nearest Scottish coastline, which is Fair Isle (Figure 3-7). This island is also the location of the closest coastal site to the Project; the Fair Isle SPA. Due to this distance, there will not be any interactions with onshore conservation sites from activities occurring during the PL301 decommissioning.

3.6.3 Protected Species

A number of marine species in UK waters have been identified for protection under Annex II of the EC Habitats Directive. Annex II species recorded in the offshore areas of the UK that qualify for protection include the grey seal, harbour seal, harbour porpoise and bottlenose dolphin. Of these, harbour and grey seals are not expected in significant numbers around the Decommissioning Project. Harbour porpoise however, have been observed in the Project area in relative abundance (see Table 3-2).

All dolphins, porpoise and whales are European Protected Species (EPS). EPS are listed in Annexes II and IV of the Habitats Directive. Under the Habitats Directive, it is an offence to:

- Deliberately capture, injure or kill any wild animal of an EPS; or
- Deliberately disturb wild animals of an EPS in such a way as to:
  - Impair their ability to migrate, hibernate, survive, breed, or rear or nurture their young; or
  - Significantly affect the local distribution or abundance of the species to which they belong.

Other marine species listed as EPSs include turtles and sturgeon *Acipenser sturio*, which are not likely to be present within this area of the North Sea.

Priority species were those that were identified as being the most threatened and requiring conservation action under the UK BAP. The following UK BAP species have been recorded in the area: blue whiting, cod, European hake, herring, ling, mackerel, sandeel, whiting, common seal, harbour porpoise, minke whale and white-beaked dolphin (JNCC, 2007). OSPAR (2008) 'threatened and/or declining' species that are likely to be present in the Application Blocks are cod, black-legged kittiwake, lesser black-backed gull and harbour porpoise.

The sediment type immediately surrounding the Brae Alpha platform is likely to be sand, therefore it could be a suitable habitat for ocean quahog. However, according to the findings of the 2001 and 2006 surveys around the Brae Alpha platform, ocean quahog numbers were very low (Oil and Gas UK, 2019). Therefore, it is highly unlikely for an aggregation to be present in the Decommissioning Project area.

3.6.4 National Marine Plan

The National Marine Plan (NMP) covers the management of both Scottish inshore waters (out to 12 nautical miles) and offshore waters (12 to 200 nautical miles). The aim of the NMP is to help ensure the sustainable development of the marine area through informing and guiding regulation, management, use and protection of the Marine Plan areas. The proposed operations as described in this permit have been assessed against the Marine Plan objectives and policies, specifically GEN-1, 4, 5, 9, 12, 13, 21. The proposed operations have also been assessed against the Oil and Gas Sector policies and objectives: Oil and Gas 1, 2, 3, 5, and 6.

Assessment of compliance against relevant policies has already been achieved through the impact assessment in Section 6, in support of this EA. The proposed operations do not contradict any of the marine plan objectives and policies. Equinor will ensure they comply with all the new policies that have been introduced; with particular attention being made to those outlined in Table 3-6 and Table 3-7.

Table 3-6 National Marine Plan policies relevant to the PL301 decommissioning project

Policy	Title	Details
GEN-1	General planning and principle	Development and use of the marine area should be consistent with the Marine Plan, ensuring activities are undertaken in a sustainable manner that protects and enhances Scotland's natural and historic marine environment. Equinor will ensure that any potential impacts associated with PL301 decommissioning operations will be kept to a minimum.
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. Equinor will ensure that any potential impacts on other sea users associated with the proposed PL301 decommissioning operations will be kept to a minimum.
GEN-5	Climate change	Marine planners and decision makers should seek to facilitate a transition to a low carbon economy. They should consider ways to reduce emissions of carbon and other greenhouse gasses. Equinor will ensure that any potential impacts associated with PL301 decommissioning operations will be kept to a minimum.
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 Priority Marine Features; • Protect and, where appropriate, enhance the health of the marine area; and • Equinor will ensure that any potential impacts to protected species and sites associated with PL301 decommissioning operations will be kept to a minimum.
GEN-12	Water quality and resource	Developments and activities should not result in a deterioration of the quality of waters to which the Water Framework Directive, Marine Strategy Framework Directive or other related Directives apply. Equinor will ensure that any potential impacts to water quality associated with PL301 decommissioning operations will be kept to a minimum.
GEN-13	Noise	Development and use in the marine environment should avoid significant adverse effects of man-made noise and vibration, especially on species sensitive to such effects. Equinor will ensure that any potential impacts via underwater noise associated with PL301 decommissioning operations will be kept to a minimum.
GEN-21	Cumulative impacts	Cumulative impacts affecting the ecosystem of the marine plan area should be addressed in decision making and plan implementation. Equinor will ensure that any potential impacts to air and water quality and biological communities with PL301 decommissioning operations will be kept to a minimum.

Table 3-7 National Marine Plan Oil and Gas policies relevant to the PL301 decommissioning project

Policy	Details
OIL & GAS: 1	The Scottish Government will work with OPRED, the Oil and Gas Authority and the industry to maximise and prolong oil and gas exploration and production whilst ensuring that the level of environmental risks associated with these activities are regulated. Activity should be carried out using the principles of Best Available Technique (BAT) and Best Environmental Practice. Consideration will be given to key environmental risks including the impacts of noise, oil and chemical contamination and habitat change.
OIL & GAS: 2	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.
OIL & GAS: 3	Supporting marine and coastal infrastructure for oil and gas developments, including for storage, should utilise the minimum space needed for activity and should take into account environmental and socio-economic constraints.
OIL & GAS: 5	Consenting and licensing authorities should have regard to the potential risks, both now and under future climates, to oil and gas operations in Scottish waters, and be satisfied that installations are appropriately sited and designed to take account of current and future conditions.
OIL & GAS: 6	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.

4 EA METHODOLOGY

The Impact assessment is designed to: (1) identify potential impacts to environmental and societal receptors from the proposed decommissioning activities; (2) evaluate the potential significance of any identified impacts in terms of the threat that they pose to these receptors; and (3) assign measures to manage the risks in line with industry best practice; and address concerns or issues raised by stakeholders through consolation.

The impact assessment was undertaken using the following approach:

1. The potential environmental issues arising from decommissioning activities were identified through a combination of the expert judgement of project engineers and marine environmental specialists in a screening workshop, and consultation with key stakeholders (Section 4.1). The potential environmental issues were grouped under the following key receptor risk groups:

- Atmospheric emissions;
- Disturbance to the seabed;
- Physical presence;
- Discharges to sea;
- Underwater noise;
- Resource use;
- Onshore activities;
- Waste; and
- Unplanned events.

2. Undertake initial screening based on a high-level consideration of these aspects against the evaluation criteria. Screening aspects in or out of further detailed assessment. Justification statements will be compiled detailing the rationale for screening out any aspects from further assessment (Section 5.1).

- For aspects which are considered potentially significant, evaluate significance of potential impacts against impact criteria definitions (Section 6); and
- For any potentially significant impact, capture any potential mitigation and/or control measures to be used to further reduce any impact to ‘as low as reasonably practicable’ (ALARP).

4.1 Stakeholder Engagement

The consultation for the decommissioning of PL301 has been largely based on sharing project expectations, approach and specific considerations with key stakeholders including:

- Health and Safety Executive (HSE)
- OPRED Environmental Management Team (EMT)
- OPRED Offshore Decommissioning Unit (ODU)
- Marine Scotland (MS)
- RockRose Energy
- Scottish Fishermen’s Federation (SFF)
- Joint Nature Conservation Committee (JNCC)

The results of the consultations are summarised in Appendix A and full details of the consultation to date are provided in Section 5 of the DP (Equinor, 2019).

4.2 EA Process

4.2.1 Overview

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

The method presented here has been developed by reference to the Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for marine impact assessment (CIEEM, 2018), the Marine Life Information Network (MarLIN) species and ecosystem sensitivities guidelines (Tyler-Walters *et al.*, 2004) and guidance provided by SNH in their handbook on environmental impact assessment (SNH, 2013) and by The Institute of Environmental Management and Assessment (IEMA) in their guidelines for environmental impact assessment (IEMA, 2015; 2016).

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

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

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

- Assessment of the consequence/extent of the impact, defined by the nature and type of impact, and the spatial extent of the impact on the receptor;
- Identification of the duration and frequency of the effect of the receptor;
- Definition of magnitude of impact, based on the magnitude of the shift from the environmental baseline conditions;
- Definition of the probability of impacts; and
- Ranking of impact significance, considering the probability that it will occur, the spatial and temporal extent and the magnitude of the impact and any residual effects after mitigations are applied.

Each of these variables are expanded upon in the following Sections to provide consistent definitions across all EA topics. In each impact assessment, these terms are used in the assessment summary table to summarise the impact and are enlarged upon as necessary in any supporting text. It should be noted that all impacts discussed in this EA report are adverse unless explicitly stated otherwise.

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

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

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

4.2.2 Baseline Characterisation

In order to make an assessment of potential impacts on the environment it was necessary to firstly characterise the different aspects of the environment that could potentially be affected (the baseline environment). The baseline environment has been described in Section 3.4 and is based on desk studies combined with additional site-specific studies such as surveys and modelling where required. Information obtained through consultation with key stakeholders was also used to help characterise specific aspects of the environment in more detail.

The EA process requires identification of potential receptors which could be affected by the Decommissioning Project (e.g. commercial fisheries, water quality, and seabed impacts). Important receptors are identified within the impact assessments (Section 6).

4.2.3 Impact Definition

4.2.3.1 Impact Consequence/Extent

The impact consequence is based on the geographical extent, as described in Table 4-1.

Table 4-1 Impact consequence criteria

Ranking	Consequence	Criteria
High	**Major**	Extent of change: Impact occurs over a large scale or spatial geographical extent.
Medium	**Moderate**	Extent of change: Impact occurs over a local to medium scale/spatial extent and/or has a prolonged duration.
Medium	**Minor**	Extent of change: Impact occurs on-site or is localised in scale/spatial extent.
Low	**Negligible**	Extent of change: Impact is highly localised.

4.2.3.2 Duration/Frequency of Effect

The duration of effect is key to determining the final ranking of impact significance. This criterion takes account of:

- Duration over which the impact is likely to occur e.g. days, weeks; and
- Frequency and/or intensity of impact, i.e. how often the impact is expected to occur.

These variables are defined in Table 4-2 and Table 4-4, and the overall ranking methodology of duration of effects is provided in Table 4-5.

Table 4-2 Definition of duration criteria

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

Table 4-3 Definition of frequency criteria

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

Table 4-4 Overall duration/frequency ranking criteria

Ranking	Duration	Criteria
High	**Major**	Frequency/intensity of impact: high frequency (occurring repeatedly or continuously for a long period of time) and/or at high intensity.
Medium	**Moderate**	Frequency/intensity of impact: medium to high frequency (occurring repeatedly or continuously for a moderate length of time) and/or at moderate intensity or occurring occasionally/intermittently for short periods of time but at a moderate to high intensity.
Medium	**Minor**	Frequency/intensity of impact: low frequency (occurring occasionally/intermittently for short periods of time) and/or at low intensity.
Low	**Negligible**	Impact is very short-term in nature (e.g. days/few weeks).

4.2.3.3 Impact Magnitude

The impact magnitude requires an understanding of how far the receptor will deviate from its baseline condition as a result of the impact. The resulting effect on the receptor is considered under vulnerability and is an evaluation based on scientific judgement. Table 4-5 defines the criteria for impact magnitude.

Table 4-5 Impact magnitude criteria

Ranking	Magnitude	Criteria
High	**Major**	Total loss or major alteration to key elements/features of the baseline conditions.
Medium	**Moderate**	Partial loss or alteration to one or more key elements/features of the baseline conditions.
Medium	**Minor**	Minor shift from the baseline conditions. Impact is localised and temporary/short-term with minor detectable change to site characteristics or a minor change to a small proportion of the receptor population. Low frequency impact occurring occasionally or intermittently.
Low	**Negligible**	Very slight change from baseline conditions. Impact is highly localised and short-term resulting in very slight or imperceptible changes to site characteristics.

4.2.3.4 Impact Probability

The probability of an impact is another factor that is considered in this impact assessment. This captures the probability that the impact will occur and also the probability that the receptor will be present and is based on knowledge of the receptor and experienced professional judgement. Table 4-6 provides definitions of the different levels of probability of impact that are used in the Decommissioning Project impact assessment.

Table 4-6 Impact probability criteria

Ranking	Probability	Criteria
High	**Major**	The impact is likely to occur.
Medium	**Moderate**	The impact is moderately likely to occur.
Medium	**Minor**	The impact is possible.
Low	**Negligible**	The impact is unlikely to highly unlikely.

4.2.4 Receptor Definition

As part of the assessment of impact significance it is necessary to differentiate between receptor sensitivity, vulnerability and value. The sensitivity of a receptor is defined as 'the degree to which a receptor is affected by an impact' and is a generic assessment based on factual information whereas an assessment of vulnerability, which is defined as 'the degree to which a receptor can or cannot cope with an adverse impact' is based on professional judgement taking into account an number of factors, including the previously assigned receptor sensitivity and impact magnitude, as well as other factors such as known population status or condition, distribution and abundance.

4.2.4.1 Receptor Sensitivity

Receptor sensitivity to potential impact activities ranges from negligible to very high. Definitions for assessing the sensitivity of a receptor are provided in Table 4-7.

Table 4-7 Criteria for assessment of sensitivity of receptor

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

4.2.4.2 Receptor Vulnerability

Information on both impact magnitude and receptor sensitivity is required to determine receptor vulnerability. These criteria, described in Table 4-5 and Table 4-7 are used to define receptor vulnerability as per Table 4-8.

Table 4-8 Criteria for assessment of vulnerability of receptor

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

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

4.2.4.3 Receptor Value

The value, or importance, of a receptor is based on a pre-defined judgement established in legislative requirements, guidance or policy. Where these may be absent, it is necessary to make an informed judgement on receptor value based on perceived views of key stakeholders and specialists. Examples of receptor value definitions are provided in Table 4-9.

Table 4-9 Criteria for assessment of value of receptor

Receptor Value	Definition
Very high	Receptor of international importance (e.g. United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site). Receptor of very high importance or rarity, such as those designated under international legislation (e.g. EU Habitats Directive) or those that are internationally recognised as globally threatened (e.g. International Union for Conservation of Nature (IUCN) red list). Receptor has little flexibility or capability to utilise alternative area. Best known or only example and/or significant potential to contribute to knowledge and understanding and/or outreach.
High	Receptor of national importance (e.g. Nature Conservation Marine Protected Area (NCMPA), Marine Conservation Zone (MCZ)). Receptor of high importance or rarity, such as those which are designated under national legislation, and/or ecological receptors such as United Kingdom Biodiversity Action Plan (UKBAP) priority species with nationally important populations in the study area, and species that are near-threatened or vulnerable on the IUCN red list. Receptor provides the majority of income from the Decommissioning Project area. Above average example and/or high potential to contribute to knowledge and understanding and/or outreach.
Medium	Receptor of regional importance. Receptor of moderate value or regional importance, and/or ecological receptors listed as of least concern on the IUCN red list, but which form qualifying interests on internationally designated sites, or which are present in internationally important numbers. Any receptor which is active in the Decommissioning Project area and utilises it for up to half of its annual income/activities. Average example and/or moderate potential to contribute to knowledge and understanding and/or outreach.
Low	Receptor of local importance. Receptor of low local importance and/or ecological receptors such as species which contribute to a national site, are present in regionally. Any receptor which is active in the Decommissioning Project area and reliant upon it for some income/activities. Below average example and/or low potential to contribute to knowledge and understanding and/or outreach.

Receptor Value	Definition
Negligible	Receptor of very low importance, no specific value or concern. Receptor of very low importance, such as those which are generally abundant around the UK with no specific value or conservation concern. Receptor of very low importance and activity generally abundant in other areas/ not typically present in the Decommissioning Project area. Poor example and/or little or no potential to contribute to knowledge and understanding and/or outreach.

4.2.5 Impact Significance Ranking

The initial ranking of impact significance is based on the criteria described in Sections 4.2.3 and 4.2.4. It involves:

- Determination of the extent of impact, the duration/frequency, the impact magnitude and its probability;
- Consideration of sensitivity, vulnerability and value of the receptor; and
- Existing controls which can be industry standards, legislation requirements or prescriptive.

The sensitivity, vulnerability and value of receptor are combined with the impact magnitude (and probability, where appropriate) using informed judgement to arrive at a significance assessment for each impact, as described in Table 4-10. The assessment of significance considers mitigation measures that are embedded within the proposed activities.

Table 4-10 Criteria for assessment of significance

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

4.2.6 Cumulative Impact Assessment

While the scope of this impact assessment is restricted to the Project decommissioning activities, there will be other marine activities which have the potential to interact with the activities completed under the decommissioning work scope. The impact assessments presented in the following Sections consider the potential for significant cumulative impacts to occur as a result of overlapping activities.

4.2.7 Transboundary Impact Assessment

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

4.2.8 Mitigation

Where potentially significant impacts (i.e. those ranked as ‘moderate’ or ‘major’ in Table 4-10) are identified, mitigation measures must be considered. The intention is that mitigations should remove, reduce or manage potential impacts to a point where the resulting residual significance is at an acceptable or insignificant level. Mitigation is also proposed in some instances to maintain the significance levels of impacts defined as ‘not significant’. The impact assessment conclusions define the residual impact significance after mitigations are applied.

5 INITIAL ASSESSMENT SCREENING AND JUSTIFICATION

An impact assessment screening workshop was undertaken to discuss the proposed decommissioning activities and any potential impacts these may pose. This discussion identified ten potential impacts based on the proposed removal methods identified in Section 2. Two of these potential impacts could not be screened out of further assessment based on the significance or likelihood of the impact occurring. The ten potential impacts and their screening rationales are detailed in Section 5.1, and those impacts carried forward for further assessment are defined in Section 5.2.

5.1 Assessment of Potential Impacts

The screening of potential environmental impacts from the Decommissioning Project for further assessment is provided in Table 5-1, including summarised rationales for the screening outcomes.

Table 5-1 Environmental impact screening summary for the decommissioning Project

Potential impact	Further assessment?	Rationale
Emissions to air	No	Emissions during decommissioning activities, (largely comprising fuel combustion gases) will occur in the context of the CoP. As such, emissions generated by infrastructure, equipment and vessels associated with operation of the asset will be replaced by those from vessels and equipment required for decommissioning activities, as well as the recycling of any 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. 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. The majority of atmospheric emissions for the Decommissioning Project relate to vessel time or are associated with the structures decommissioned *in situ*. As the decommissioning activities proposed are of short duration, emissions are not anticipated to result in significant impacts. The estimated CO_2 emissions to be generated by the selected decommissioning options is 9,487.14 Te (over an estimated 53 days), this equates to 0.19% of the total UKCS vessel emissions (excluding fishing vessels) for the year 2017 (7,800,000 Te; BEIS, 2019). Considering the above, atmospheric emissions do not warrant further assessment.
Seabed disturbance	Yes	There is potential for decommissioning and legacy activities to generate disturbance to the seabed; these include activities associated with the *in situ* decommissioning of the trenched and buried PL301, as well as any associated remediation post-

		decommissioning. The end of PL301 will be removed by cut and lift. Exposed sections of the flowline will be remediated as appropriate. Seabed impacts may range in duration from short-term impacts, such as temporary sediment suspension or smothering, to permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire. Seabed disturbance from the decommissioning activities has the potential to modify the habitat in a way which might impact upon other sea users which utilise the seabed. The end section of the PL301 will be cut and lifted therefore reverse reeling will not occur. This eliminates potential to generate clay berms in the sediment. However, exposed sections of the PL301 will be remediated with rock placement minimising any residual snag hazard. Non-intrusive post-decommissioning surveys will occur to ensure that the PL301 has been left in an acceptable condition. Impacts to the seabed from project activities have been assessed further in Section 6.1, whilst impacts to commercial fisheries generated by seabed disturbance are assessed in Section 6.2 below.
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 PL301. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation and decommissioning activities. 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. The PL301 Decommissioning Project is estimated to require five different vessel types. These would not all be on location at the same time. Vessel activities are expected to over over approximately 53 days; most of these days are attributed to rock placement activities. In consideration of the duration and location of vessel presence in conjunction with employment of standard practices, temporary presence of vessels does not require further assessment.
Physical presence of infrastructure decommissioned *in situ* in relation to other sea users	Yes	PL301 will be decommissioned *in situ*. PL301 will be cut at 20m out of trench at the Brae Alpha end this section will be lifted. Removal of the section of PL301 will cause short-term disturbance; meaning the impacts will last less than a year. The cut end of the PL301 and exposed sections are to be remediated during decommissioning. The placement of rock results in a change in substrate. While this will ultimately become covered by sediment deposition, the time scale associated with this process is such that remediation is defined as a permanent impact. Future monitoring work will ensure the integrity of the Depth of Burial (DoB) of these structures and ensure that snagging risks do

		not arise. Further consideration of the proposed activities was deemed necessary and therefore has been addressed within this EA. The frequency of this monitoring work and any subsequent maintenance regime will be established after consultation with OPRED. Stabilisation measures (mattresses and grout bags) associated with any crossings of the PL301 will be left and considered during the subsequent decommissioning of the respective pipelines. Further assessment related to potential snagging risks associated with the decommissioning of infrastructure *in situ* is provided in Section 6.2.
Water quality	No	PL301 will be both pigged and flushed prior to the commencement of decommissioning activities. All flushing products will be routed into the production stream via Brae Alpha. This should remove the majority of contaminated material. Any residual traces of produced water, hydrocarbons, scale, metal oxides and other trace elements from the formation fluids are therefore expected to be low, although precise quantification is difficult to specify. It should also be noted that PL301 has been regularly pigged during its operational life and therefore scale deposits should be minimal in the first instance. Pigging and flushing is a pre-decommissioning activity therefore will be permitted as appropriate and falls outside the scope of this EA. During the cutting of PL301 ends there may be a small release of any residual material held within the pipeline. As stated, the volume of any residual material is expected to be low across the entire pipeline and will have been flushed to an acceptable level of cleanliness prior to the commencement of the decommissioning activities. Therefore, as PL301 cuts will only be at either end, any release will be equal to or less than typical licensed produced water discharges and will dissipate before it reaches the surface with no long-term persistence expected. The potential for discharges will be fully risk assessed and consented in the appropriate manner. PL301 pipeline left *in situ* will degrade overtime and contaminants contained within the pipeline material (e.g. coating) will be released. Releases are expected to occur in very small quantities and over a long period of time. Additionally, since the PL301 pipeline coating is covered with a concrete coating and primarily buried, the pathway for contaminant releases will be limited. Given the small quantities of contaminants expected to be released and the long-term degradation of the pipeline left *in situ*, no significant impacts are anticipated. Vessel discharges are managed through existing, International Convention for the Prevention of Pollution from Ships (MARPOL) compliant controls, including bilge management procedures and good operating practices. Post-flushing and/or water jetting, residual liquids present during the decommissioning of pipelines and substructures will be treated before being discharged to sea, such that the discharge will comprise treated water. Any residual remaining material will be in trace levels/volumes following the

		flushing and pigging regime and will not pose any significant risk to water quality.
Underwater noise emissions	No	Vessel presence will be limited in scale (i.e. the size and number of vessels) and duration and, therefore, does not constitute a significant or prolonged increase in noise emissions across the project area. To remove the PL301, the cutting of the flowline will likely be done with shears, thereby minimising produced underwater noise during this activity. All other noise generating activities associated with the decommissioning of PL301 are considered negligible in the context of ambient noise levels and are likely to be masked by project related vessel activities. Multibeam echosounder survey equipment is likely to be used for imaging and identification of pipeline exposures. At present, there is no requirement for seismic activity relating to the decommissioning activities. Should there be a requirement of seismic survey in the future, the appropriate JNCC (2017) Guidelines will be adhered to for mitigation of noise impacts to marine mammals. None of the activities associated with the decommissioning of the PL301 are considered to generate significant noise levels which may cause injury or significant disturbance to marine species or other users. The project is not located within a marine mammal protection area. On this basis, underwater noise does not require further assessment.
Resource use	No	Generally, the main source of resource use from the proposed activities will be fuel use. Any opportunities for increasing fuel efficiency and reducing use of resources will be identified and implemented where possible. The estimated total energy usage for the project is 32,199 GJ. This is considered very low, compared to the resources generated during the production phase of the project. Considering the above, resource use does not warrant further assessment.
Onshore activities	No	The OPRED Guidance states that onshore activities are not in scope of Decommissioning EAs, and this topic does not require further assessment. 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.

Waste	No	The recycling and disposal of wastes are covered by the Equinor's Waste Management Strategy, which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous and special waste, and TFSW. The Waste Management Strategy is also guided by Equinor's HSES Policy and commitments to best practice in waste management. This includes the mapping and documenting of waste management arrangements for each phase of the decommissioning activities in individual Active Waste Management Plans (AWMPs) and ongoing monitoring of waste procedures and performance review against target Key Performance Indicators (KPIs). Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned material. 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. However, the weight and/or volume of such material is not expected to result in substantial landfill use. On this basis, no further assessment of waste is necessary.
Unplanned events	No	There will be three vessel types on-site during the decommissioning process. The CSV, used for cutting and removing the end section of rigid pipeline, is expected to have the largest fuel inventory of the few vessels involved in the decommissioning activities. Therefore, a worst-case accidental diesel inventory release would be associated with the CSV. However, the inventory is expected to be less than the worst-case crude oil spill from loss of well containment modelled and assessed in the Brae Alpha Offshore Oil Pollution Emergency Plan (OPEP), which considers and immediate release of 1,823 m^3 of diesel (Marathon UK, 2017c). The vessel's fuel inventory 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 are covered by separate Shipboard Oil Pollution Emergency Plans (SOPEPs). Equinor will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP. Consequently, any impact from vessel-based fuel inventory release will be less than that already assessed and mitigated against within the OPEP for the operational phase of the PL301. Should an accidental release occur, the appropriate measures and permits will be sought and put in place to address the situation. In addition to the mitigation measures outlined in the OPEP, Equinor maintains manned bridges, navigational aids and monitoring of safety zones. Considering the above, the potential

		impacts from accidental chemical/ hydrocarbon releases during decommissioning activities do not warrant further assessment. As the proposed operations are to remove only the end section of the surface laid section of PL301. This section is the only lift procedure associated with the project, thus there should be minimal risk of any dropped objects. No diver operation will be required either so the process itself is of minimal risk. However, 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. Post-decommissioning debris clearance surveys will aid in the identification of any dropped objects should they occur. In line with the mitigation measures in place, unplanned loss of materials to the sea do not require further assessment.

5.2 Aspects taken Forward for Further Assessment

Based on the initial screening provided in Section 5.1, the following potential environmental and societal impacts have been identified as requiring further assessment within the EA:

- Seabed impacts; and
- Commercial fisheries.

These potential impacts are addressed in detail within Section 6.

5.3 Proposed Mitigations and Existing Controls

To ensure that impacts remain as described above, Equinor will follow routine environmental management activities, for example appropriate project planning, contractor management, vessel audits, activity permitting and legal requirements to report discharges and emissions, such that the environmental and societal impact of the decommissioning activities will be minimised. The activities associated with the Decommissioning Project are not likely to result in significant impacts to the environment or other sea users, including fishing or seabed communities, if appropriate mitigation and control measures are effectively applied. A summary of the proposed control and mitigation measures is shown in Table 5-2.

Table 5-2 Proposed mitigation and control measures

General and Existing

• Lessons learnt from previous decommissioning scopes will be reviewed and implemented as appropriate;
• Vessels will be managed in accordance with Equinor's existing marine procedures, including:
  ○ The vessels' work programme will be optimised to minimise vessel use where possible;
  ○ All pipeline will be pigged and flushed, these activities will be assessed and permitted under existing operational permits prior to decommissioning, to ensure minimal residual contaminants are present in the infrastructure before decommissioning operations commence;
  ○ The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of large hydrocarbon releases and to mitigate their impacts should they occur;

○ All vessels undertaking decommissioning activities will have a MARPOL-approved SOPEP; ○ Existing processes will be used for contractor management to assure and manage environmental and social impacts and risks; ○ Equinor's management of change process will be followed should changes of scope be required; and ○ Careful planning, selection of equipment, subsequent management and implementation of activities. • A pre-decommissioning environmental seabed survey, centred along the PL301 route, will be carried out. The survey will focus on chemical, physical and biological changes, disturbances. Results of this survey will be available once the work is complete, with a copy forwarded to OPRED. • The route of PL301 will be the subject to an as-left verification survey (non-intrusive) when decommissioning activity has concluded, and if deemed necessary, an oilfield debris clearance survey. • The main risk from infrastructure remaining *in situ* is the potential for interaction with other users of the sea, specifically from fishing related activities. Where PL301 is trenched below seabed level or trenched and buried below, the effect of interaction with other users of the sea is considered to be negligible. Other areas of exposure will be covered with rock leaving an overtrawlable condition. • The infrastructure is currently shown on Admiralty Charts and the FishSafe system. When decommissioning activity has been competed, updated information will be made available to update Admiralty Charts and FishSafe system. • The licence holders recognise their commitment to undertake post-decommissioning monitoring of infrastructure left *in situ*. After the post-decommissioning survey reports have been submitted to OPRED and reviewed, a post-decommissioning monitoring survey regime, scope and frequency, will be agreed with OPRED. • Any snagging risk to other sea users will be minimised by continual monitoring of degrading structures or exposure.
Large-scale Releases to Sea
• Post-flushing water will be routed into the production lines via Brae Alpha so there will be no discharge of fluids. • All solid waste will be skipped and shipped to shore for disposal, rather than being discharged at sea. • Risk of full inventory loss from a vessel is very low given that the majority of vessels have multiple, separated fuel tanks, making full contaminant loss highly unlikely and the distance from shore would prevent any significant volume of diesel reaching any shoreline. Any potential diesel fuel spillages resulting from unplanned collisions will be minimised by approved OPEP/SOPEP, in which risks associated with the decommissioning activities have been appropriately assessed and planned for.
Waste Management
• All waste will be managed in accordance with the Waste Management Plan, including any marine growth waste, or NORM identified during flushing, cleaning or decommissioning of the pipeline. • The Active Waste Management Plan will involve the use of a waste inventory, and all residual wastes being shipped to shore for processing and tracking.

6 IMPACT ASSESSMENT

The following receptors have been identified as requiring further assessment against potential impacts from the proposed decommissioning activities:

- Seabed impacts; and
- Commercial fisheries.

Sources and environmental response to potential impacts to these receptors are detailed in the sections below.

6.1 Seabed Impacts

The impact of the Decommissioning Project activities on seabed receptors is discussed in this Section, along with measures proposed to minimise the scale and duration of any potential impact.

6.1.1 Approach

Activities expected to cause seabed disturbance during the Decommissioning Project will include; cutting, lifting and removal of subsea infrastructure; material placement and remediation. A non-intrusive survey will be employed firstly to establish the post-decommissioning status of PL301 and establish if any further remediation is required. Further consultation with OPRED will be undertaken once post-decommissioning survey results have been obtained.

There are two impact mechanisms associated with the decommissioning operations. The first is direct physical disturbance of seabed sediments and habitats. Physical disturbance is the main impact mechanism associated with the PL301 decommissioning operation. This will occur due to removal of infrastructure from the seabed, and remediation of snagging hazards from the placement of material (rock armour) on the seabed. The total area of seabed expected to be impacted by direct physical disturbance has been calculated by adding together the individual areas of disturbance estimated for each activity. All dimensions used in calculating the disturbance area of each decommissioning activity are available in Appendix B.

The second impact mechanism is indirect disturbance occurring outside of the direct disturbance footprint due to re-suspension and settlement of natural seabed sediments. The scale of indirect disturbance due to re-suspension and settlement of natural sediment has been estimated based on the expected area of direct disturbance rock placement and pipeline section removal.

6.1.2 Sources of Potential Impact

6.1.2.1 Overview

The following activities have been identified as sources of potential seabed disturbance (Figure 6-1):

- Pipeline decommissioning:
  - Cutting and removal of the end section of PL301 within the Brae Alpha safety zone.
- Stabilisation materials:
  - Deposition of new rock armour to protect the cut exposure of the PL301 decommissioned *in situ*; and
  - Deposition of new rock armour to cover exposed/free span areas of the pipeline decommissioned *in situ*.

Seabed disturbance may be classified in the following sections as short-term, temporary, prolonged or permanent; these terms are defined in Table 4-2.

6.1.2.2 PL301 Decommissioning

PL301 will be decommissioned *in situ*. At 20 m out of trench the Brae Alpha end of the PL301 will be cut and removed. This section is surface laid and within the Brae Alpha 500 m safety zone.

The area of seabed disturbed by recovery of the end section has been estimated by multiplying the length of the line by the outer diameter. Buried sections of rigid flowline that are decommissioned *in situ* (i.e. the rest of the PL301) are not expected to cause any seabed disturbance and are excluded from the table. The disturbance areas associated with these proposed operations are summarised in Table 6-1.

In addition to the calculated direct disturbance from pipeline decommissioning, an estimate has been made of the possible indirect disturbance due to re-suspension and settlement of sediment. Most re-suspended sediment will settle within the initial disturbance area, but it has been assumed that some will land within an additional 100 m wide peripheral area around the margins of the direct disturbance area (20m section of pipeline). Therefore, the area exposed to indirect disturbance was assumed to be equal to the area of direct disturbance plus a 100 m buffer around the entire direct disturbance area; this has been included within a separate column in Table 6-1.

Disturbance due to placement of rock armour to protect the exposed end of the PL301, and exposed spans of pipeline, has been assessed separately in Section 6.1.2.3.

Table 6-1 Seabed disturbance associated with PL301 decommissioning

Activity	Quantity and dimensions	Expected duration of disturbance	Direct disturbance area	Indirect disturbance area
Removal of surface laid section of PL301	One pipeline (8" diameter) of which the end section will be removed.	Temporary	0.000005 km^2 (5 m^2)	0.002005 km^2 (2,005 m^2)
		Total	**0.002010 km^2 (2,010 m^2)**	

6.1.2.3 Stabilisation Materials

Concrete mattresses and grout bags have previously been deployed along the PL301 to protect the pipeline and other pipeline crossings.

As noted in Section 2.4.2, the intention is that all current stabilisation materials (including mattresses and grout bags) will remain *in situ*, as they are exclusively associated with the seven pipeline crossing points. These will be considered at a later date as part of the decommissioning programmes for those associated lines and will be the responsibility of the respective assets' owner/operator. New deposits of rock armour will also be required in order to protect the newly cut end of the PL301 due to be decommissioned *in situ*. An estimated 14,120 m^2 of rock material will be deposited at the cut ends and along the exposed sections of pipeline. The total length of exposed pipeline along the UK section of PL301 pipeline is 1.3 km (with most exposures being less than 5 m in length). This is considered a source of permanent disturbance.

In addition to the calculated direct disturbance from the placement of stabilisation material, an estimate has been made of the possible indirect disturbance due to re-suspension and settlement of sediment. Most re-suspended sediment will settle within the initial disturbance area, but it has been assumed that some will land within an additional 100 m wide peripheral area around the margins of the direct disturbance. Therefore, the area exposed to indirect disturbance was assumed to be equal to the area of direct disturbance plus a 100 m buffer around the entire direct disturbance area.

The seabed disturbance associated with the stabilisation materials, including existing materials decommissioned *in situ* and new materials deposited to protect the pipeline end and exposed spans, is summarised in Table 6-2.

Table 6-2 Seabed disturbance associated with stabilisation materials

Activity	Quantity and dimensions	Expected duration of disturbance	Direct disturbance area	Indirect disturbance area
Deposition of new rock armour to protect infrastructure decommissioned *in situ*	Rock armour covering a total area of approximately 14,120 m^2	Permanent	0.01412 km^2 (14,120 m^2)	0.13 km^2 (130,000 m^2)
		Total	**0.14412 km^2 (144,120 m^2)**	

6.1.2.4 Clean Seabed Verification

As described in Section 2.4.3, following the decommissioning of all infrastructure, it is necessary to identify any potential residual snagging hazards associated with any changes to the seabed. A Clear Seabed Verification survey will be conducted to ensure the seabed is left in a safe condition for future fishing effort, in line with the current Decommissioning Guidance (BEIS, 2018). The clear seabed will be validated by a non-intrusive method, should any residual snag risk be identified, then remediation methods will be agreed with OPRED. Results of this survey will be available once the work is complete, with a copy forwarded to OPRED.

Pre- and post-decommissioning surveys shall be conducted, and any debris identified shall be recovered and recycled / disposed of accordingly.

At present, the intended method of the Clean Seabed Verification survey will be non-intrusive, as described above. Therefore, there is no seabed disturbance of any kind anticipated for this activity and it has not been considered further.

6.1.2.5 Summary of Seabed Impacts

Seabed disturbance from the decommissioning activities discussed earlier in this Section is summarised in Table 6-3. This illustrates a worst-case scenario for seabed disturbance, in which the majority of the seabed impact is from temporary indirect disturbance as a result of suspended sediment created by pipeline removal and rock armour placement operations.

The disturbance attributed to the placement of stabilisation materials is considered independently of the temporary disturbance area as it is a permanent impact on the seabed.

The temporary indirect disturbance area was only calculated for the area of seabed potentially impacted by resuspended sediment from pipeline removal and/or rock armour placement, as the other decommissioning activities are unlikely to impact a wide-reaching area.

Table 6-3 Total potential seabed disturbance from the decommissioning activities

Activity	Temporary direct disturbance	Temporary indirect disturbance	Permanent disturbance
Removal of surface laid section of PL301	0.000005 km^2 (5 m^2)	0.002005 km^2 (2,005 m^2)	0
Deposition of new rock armour to protect infrastructure decommissioned *in situ*	n/a	0.13 km^2 (130,000 m^2)	0.01412 km^2 (14,120 m^2)
Total	**0.000005 km^2 (5 m^2)**	**0.132005 km^2 (132,005 m^2)**	**0.01412 km^2 (14,120 m^2)**

6.1.3 Effects on Sensitive Receptors

6.1.3.1 Direct Disturbance

Decommissioning activities are expected to lead to two types of direct physical disturbance. The first is temporary disturbance, which will result from the removal of infrastructure from the seabed, and from rock placement. The sediment will be disturbed by the action of retrieving equipment from the seabed and the placement of rock protection, but once decommissioning is complete, the affected areas will be free of anthropogenic material, however, in the case of rock armour placement, this will only apply to the wider area impact by suspended sediments, not the area covered by rock armour. This 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 direct disturbance will be permanent disturbance caused by the deposition of additional rock armour on the seabed to protect infrastructure decommissioned *in situ*. This type of disturbance will effectively change the seabed type in the affected areas from the naturally occurring sand (as described in Section 3.4) to a hard substrate. These materials will be permanently left on the seabed and ultimately will 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 effects expected to be associated with each type of direct disturbance are discussed in the subsections below.

6.1.3.1.1 Temporary Direct Disturbance

As noted in Table 6-3, approximately 5 m^2 of seabed would be affected by temporary direct disturbance. The scale of the disturbance is very small when compared to other forms of disturbance that occur in the area, such as commercial trawling. A commercial trawler with a 12 m wide beam trawl trawling at its slowest rate of approximately 4.7 km/h would cover an area of roughly 0.06 km^2 per hour so would therefore take minimal time to cover the anticipated direct disturbance area (FAO, 2019). As stated in Section 3.5, fishing effort in ICES rectangle 46F1, within which the PL301 is located, in 2018 amounted to 347 days (8,328 hours). In this context, the limited scale of the disturbance associated with the decommissioning activities is clear.

Decommissioning disturbance will cause mortality, due to injuries arising from the crushing of benthic and epibenthic fauna which are sedentary or unable to move quickly. Mobile fauna will likely also be disturbed. The sediment structure, including the burrows of any animals present, will be affected. Past surveys of benthic fauna around the Brae Alpha platform identified communities of polychaetes (*P. jeffreysii* being most numerous in both years), echinoderms, annelids, molluscs and brittle stars (as described in Section 3.4, Oil and Gas UK, 2019). The habitat ‘seapens and burrowing megafauna in circalittoral fine mud’ may occur along PL301

although species typical of this habitat, for example seapens and burrowing crustaceans *Calocaris macandreae* or *Callianassa subterranean*, were not observed in the vicinity of the Brae Alpha during surveys (Oil and Gas UK, 2019).

Seapens have some resistance to being disturbed and generally can reinsert themselves into the sediment if removed, as long as they remained undamaged. However, damaged individuals show poor recovery, and therefore resilience is considered low, giving an overall sensitivity of medium (MarLIN, 2018). As such, temporary disturbance is expected to cause some mortality to any seapens that are physically damaged during operations, but this is expected to be extremely localised and not have any effect on the viability of the local population. Replacement of damaged individuals would be expected to occur either from the plankton or from "adult" seapens moving in from the surrounding area. The removal of the end section of PL301 will occur within close proximity of the Brae Alpha platform. Therefore, it is unlikely that species associated with this habitat will be affected as they are more likely to be present further along the PL301.

No other species of conservation concern, or those which are sensitive to disturbance, have been identified within the Decommissioning Project area so temporary decommissioning activities are not likely to have a substantial impact on benthic communities.

In addition to fauna, the benthic habitats around the area are not designated or protected in any way. EUNIS habitats A5.27 'Deep circalittoral sand' and A5.37 'Deep circalittoral mud' are representative of the Decommissioning area (EMODnet, 2019). In particular habitat A5.27 'Deep circalittoral sand' is one of the most prevalent seabed habitats in the North Sea, covering an approximate area of 150,506 km^2 throughout UK waters. As such, temporary disturbance of a small area of seabed (approximately 0.00009% of the total habitat) is expected to have a negligible effect in the context of the regional environment.

6.1.3.1.2 Permanent Direct Disturbance

Permanent direct disturbance will occur due to leaving hard substrate on the seabed in perpetuity. This encompasses both the leaving *in situ* of existing material that has previously been introduced (rock armour and difficult to recover concrete mattresses), and the introduction of new rock armour to protect exposed sections of flowlines that will be decommissioned *in situ*. Approximately 14,120 m^2 of seabed will be subject to permanent direct disturbance due to the introduction of hard substrate.

The immediate effect of the introduction of new hard substrate will be mortality and injury of benthic and epibenthic fauna that cannot move away from the activities, as well as disturbance of motile fauna. Following the introduction of the material, the ongoing effect will be the change of an area of softer habitat to a hard substrate, and a related change in the types of organisms that can use the habitat. Organisms such as sea pens and burrowing bivalves, anemones and crustaceans will no longer be able to use the area affected, while new habitat will be created for other groups such as encrusting sponges and other species of anemone. As the 'seapens and burrowing megafauna in circalittoral fine mud' is only thought to be found along part of the PL301 route, it is unlikely that the decommissioning activities will significantly affect the benthic community.

While the introduction of hard substrate 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 sandy and muddy seabed available in the NNS. Recovery of the affected areas is expected to take many years but will eventually occur as the deposited rock material is gradually buried by natural sediment deposition (however the time period is such that this is still considered a permanent disturbance). Therefore, the community is expected to recover and revert to pre-disturbance composition with time.

6.1.3.2 Indirect Disturbance

6.1.3.2.1 Suspended Sediment in the Water Column

Increased suspended sediment load in the water column, and the subsequent settling can negatively affect seabed habitats and species. The effect mechanisms are interference with feeding due to an individual's inability to keep their feeding apparatus clear of sediment, and physical burial of individuals that are unable to recover to the surface through layers of newly deposited sediment (Gubbay, 2003; Rogers, 1990). The potential area of direct seabed disturbance is 0.014 km^2 (Table 6-3). Taking into account the footprint of indirect impact, this amounts to a cumulative 0.13 km^2 of seabed indirectly impacted by sediment settlement.

The Braemar Pockmark SAC is the closest designated conservation area to the Decommissioning Project. It lies 8 km west north-west of the PL301 where it crosses the UK/Norway median line. It is designated for the presence of submarine structures created by leaking gases which can support unique and diverse benthic communities (as described in Section 3.6). The distance from the Decommissioning Project activities to the SAC is sufficient to determine that Project activities will not impact the habitat, and respective species, in the area. Furthermore, rock armour placement would be the main cause of increased sediment in the water column and the area estimate in Table 6-3 is likely to be an over-estimate. The remaining decommissioning activities associated with the Project are highly localised therefore indirect disturbance is not likely to impact the areas surrounding the Decommissioning Project.

6.1.4 Cumulative and Transboundary Impacts

The closest installations are the Miller B platform, which is currently being decommissioned (Operator: BP), and the Brae B platform (Operator: Marathon UK), located 7.7 km and 11.7 km north east of the Decommissioning Project respectively. It is not expected that impacts from the decommissioning activities will interact with impacts from operations at these structures.

PL301, where it begins, at the Brae Alpha platform is located 16 km west of the UK/Norway median line (Figure 1-1). The PL301 route eventually comes to, and runs along, median line for a portion prior to crossing into Norwegian waters. Therefore, there is potential for some transboundary impacts.

6.1.5 Mitigation Measures

There are mitigation measures relating to the placement of rock armour. Rock armour will be placed by a fall pipe vessel equipped with an underwater camera on the fall pipe. This will ensure accurate placement of the rock armour, that the rock armour footprint will be as small as possible, and that the minimum safe quantity of rock is used.

6.1.6 Conclusion

Receptor	Impact Magnitude	Receptor Sensitivity	Receptor Vulnerability	Receptor Value
Seabed features	Low	Low	Low	Low
Validation				
Activities associated with the decommissioning of PL301 will result in temporary direct disturbance to the seabed amounting to 5 m2, or 0.13 km2 when accounting for temporary suspended sediment disturbance during pipeline removal or rock armour placement. Permanent disturbance caused by long term rock armour placement will affect 14,120 m2. The EUNIS habitat types found along the length of PL301 are A5.27 'Deep circalittoral sand' and A5.37 'Deep circalittoral mud' which are widely distributed across the North Sea. The scale of direct and indirect disturbance associated with the decommissioning activities is small relative to the area of similar habitat available. An anticipated 0.00009% of this habitat will be affected by the decommissioning activities proposed. As such, the magnitude of seabed impact is classed as low. Temporary direct seabed disturbance may cause injury and mortality to the benthos within the disturbance footprint, whilst indirect temporary disturbance may interfere with feeding, and smother individuals that are unable to burrow back to the surface through settled sediment. Permanent direct disturbance will result in the loss of a small area of soft-sediment habitat, which will be replaced with an equivalent area of hard substrate. The benthos composition around the Brae Alpha and along the PL301 comprises a polychaete dominant community. The species typical of the area are therefore capable of adapting to changes in substrate and so will recover from the anticipated impacts. Therefore, receptor sensitivity has been deemed low. In addition, the highly localised impacts associated with the proposed activities are unlikely to affect the benthos at a community level long-term and so vulnerability is also low. Furthermore, no habitats or species of conservation concern were identified within the immediate decommissioning footprint. This, in combination with the large area of similar habitat that will remain unaffected by the decommissioning activities, mean that the receptor value is considered low. Based on the localised, small-scale and mostly temporary nature of the disturbance, the impact of the PL301 decommissioning activities on seabed receptors is expected to be negligible.				
Residual Impact Significance	Negligible			

6.2 Commercial Fisheries

The impact of the Decommissioning Project activities on commercial fisheries is discussed in this Section, along with measures proposed to minimise the scale and duration of potential impacts.

6.2.1 Approach

Potential impacts to other sea users from decommissioning of infrastructure are limited to possible snagging risks to commercial trawl fisheries and other fisheries which utilise the seabed. The presence of decommissioning vessels may also impact fisheries by temporarily modifying the area of available fishing grounds. However, existing controls on vessel use across the project area, including Notices to Mariners (NMs), ensure the severity of such impacts are limited to a minor disturbance to localised fishing operations. For these reasons, potential impacts associated with decommissioning vessel presence do not require further assessment. Therefore, the following sections discuss the potential impacts of the proposed decommissioning activities to commercial fisheries associated with snagging risks only.

6.2.2 Sources of Potential Impacts

The greatest identified risk to commercial fisheries is the potential snagging of fishing gears on exposed infrastructure or seabed modified by removal of infrastructure (e.g. clay berms generated by the removal of flexible umbilicals). Free-spans, associated with infrastructure decommissioned *in situ* during their initial decommissioning and long-term degradation, have the potential to snag demersal fishing gears. For commercial fisheries, snagging can mean the loss of gear and catches or, in the worst-case scenario, the possible loss of life if a vessel is capsized (MAIB, 1998). Data from the Marine Accident Investigation Branch (MAIB) (www.gov.uk/maib) shows that 15 vessels have been sunk by snagged fishing gear between 1989 and 2014, resulting in 26 fatalities. According to official fisheries statistics, trawl gear (a type of demersal gear) was the most utilised gear type in 2018 (Scottish Government, 2019a). The nature of trawl gear means it may be susceptible to snagging.

PL301 will be decommissioned *in situ*. An exposed surface-laid end section of the pipeline, within the Brae Alpha 500 m safety zone, will be cut and lifted for removal. Furthermore, as discussed in Section 3.4, the sediment surrounding the Brae Alpha is mostly sandy. Due to the nature of the seabed substrate, and method of pipeline removal, there is minimal potential for clay berms to form regardless of removal method.

PL301 is known to be stable and is buried along 94.7% of its entire length (Deepocean, 2017). Information on the DoB of the existing pipeline infrastructure indicates it is buried along most of its length (Appendix C) and is showing continued natural burial over time, though there are few exposed areas (Appendix D). Survey observations have determined that even in exposed sections the pipeline is well supported by natural seabed (Deepocean, 2017). These exposed sections are primarily between 5-20 m in length, as presented in Figure 6-2, however these exposures still sit within an open trench with much of their profile below that of the adjacent seabed. The DoB for PL301 ranges from surface laid to a maximum depth of 93 cm, with the average DoB being 19 cm. During decommissioning, present exposed areas of PL301 will be covered by rock armour. The rock will be laid within the current trench and designed to have an overtrawlable profile for fishing gear.

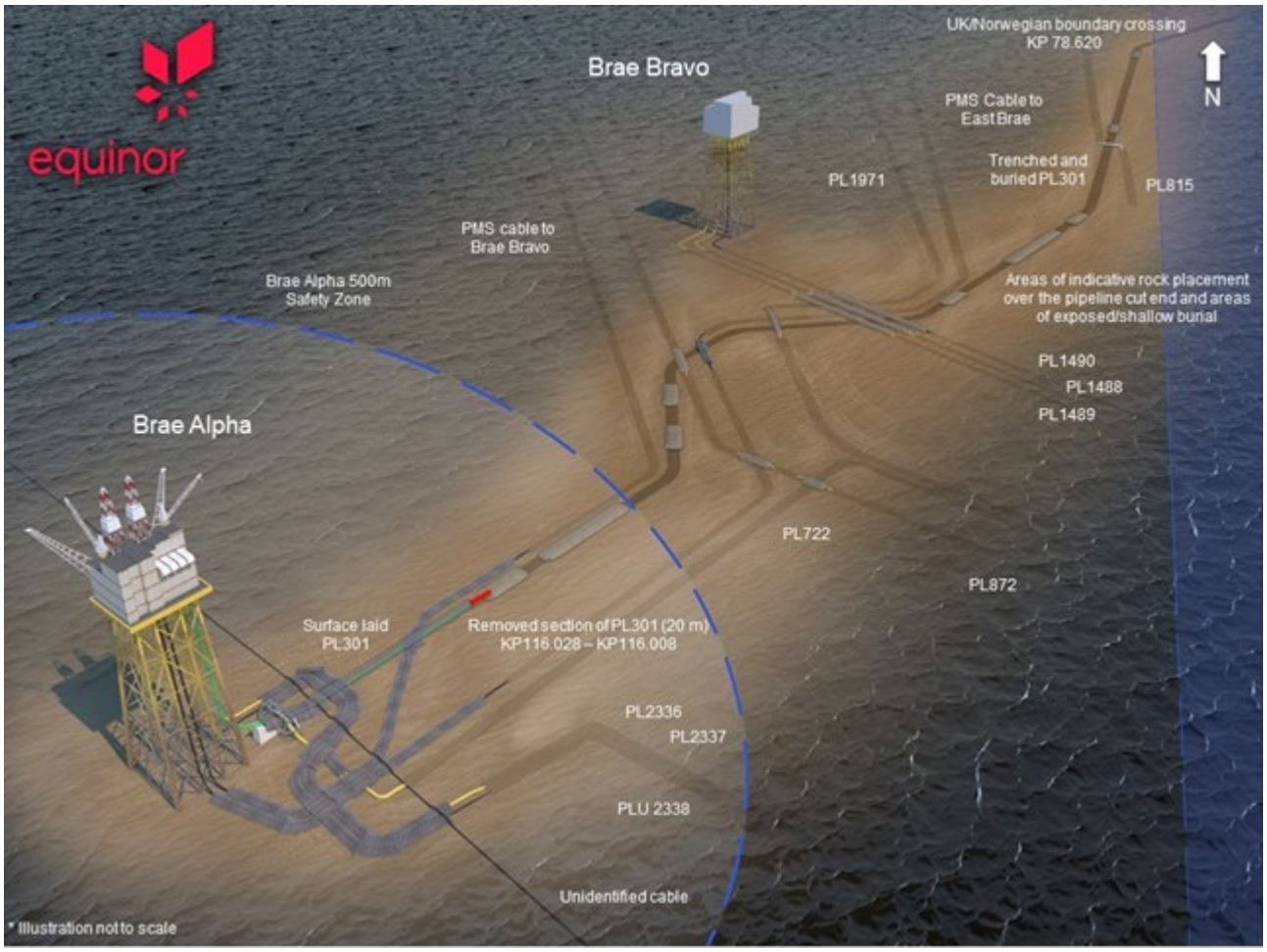


Figure 6-1 Post-decommissioning overview of PL301 (pipeline end cut and indicative remedial spot rock placement)

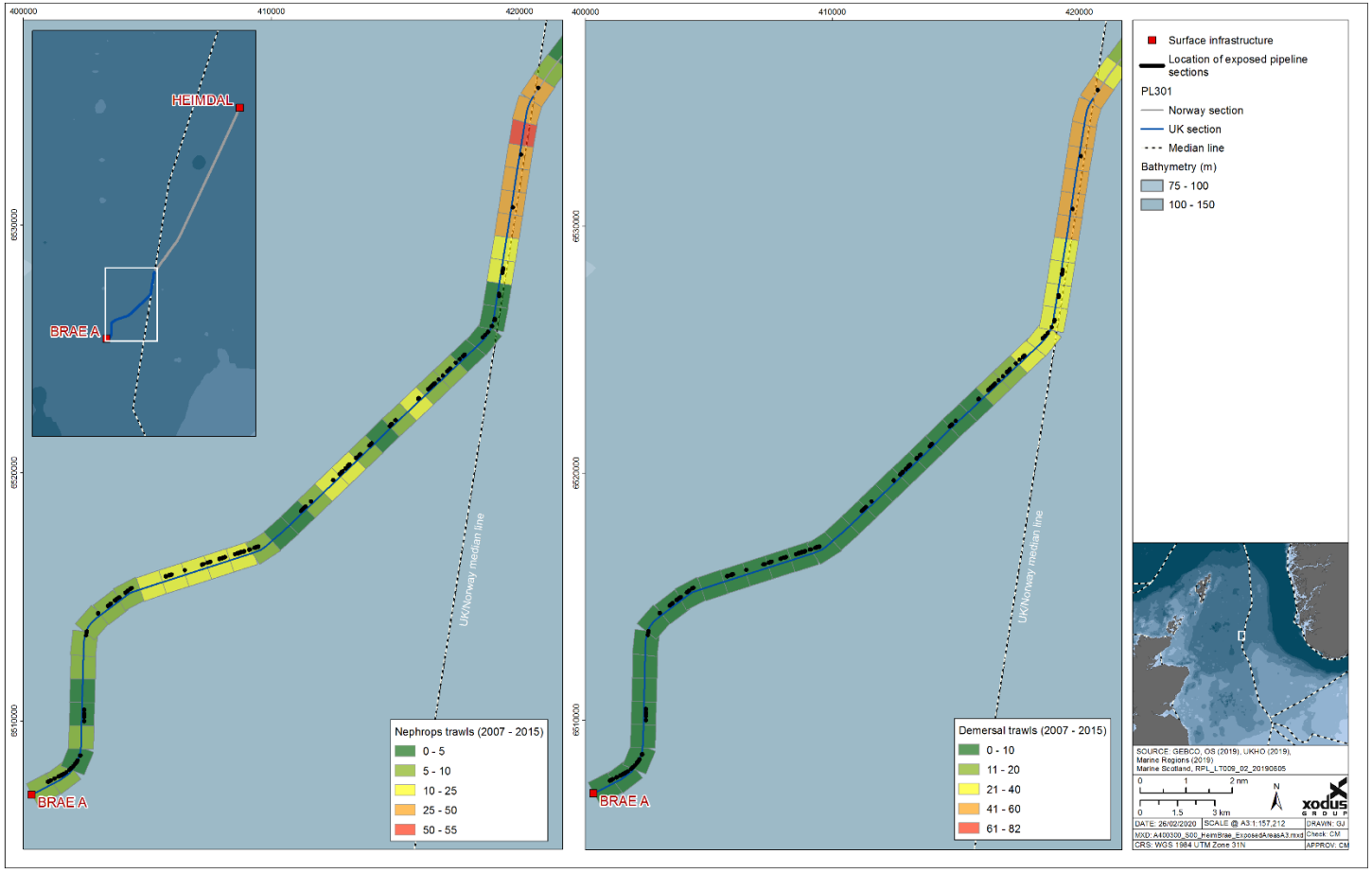


Figure 6-2 Areas of exposed pipeline in relation to *Nephrops* and demersal trawl intensity across PL301

Future monitoring work will ensure the integrity of the DoB of these structures in maintained and remediated if necessary. The potential for legacy impacts to commercial fisheries due to the degradation of infrastructure decommissioned *in situ* remains, which therefore warrants further monitoring as part of an ongoing monitoring plan to be agreed with OPRED post-decommissioning.

6.2.3 Effects on Sensitive Receptors

As discussed in Section 6.2.2, the potential impacts to commercial fisheries from decommissioning activities are most severe for demersal mobile fisheries, which utilise gears which are towed along the seabed (including trawls). Trawl was the prevalent gear type in 2018 within ICES rectangle 46F1 where the Decommissioning Project is located, though fishing effort is relatively low in the area (see Section 3.5.2). Demersal species catch has been increasing over the last five years; accounting for 21% of the catch by weight, in 2014, to 62% of the catch in 2018 for the ICES rectangle 46F1. Shellfish catch, by weight, in 2018 contributed 38% to the total catch in 46F1. This can be attributed to *Nephrops* trawling. Where PL301 runs along the UK/Norway median line through EUNIS habitat A5.37 'Deep circalittoral mud', there is increased *Nephrops* trawling effort. There is also an increase in demersal trawl generally in this area of the PL301 (Figure 3-6). On review of demersal trawling activity in the North Sea, Rouse *et al.* (2017) found that a low percentage (0.93%) of demersal trawling trips specifically targeted oil and gas pipelines compared with surrounding areas.

As PL301 will be decommissioned *in situ*, there will be very little change in the area thus the Project is not likely to have significant impacts on economic value of fisheries operating within this region. Furthermore, there have been no documented incidents between fishing vessels and the pipeline in the past, and it is unlikely that decommissioning will change this. During decommissioning the intention is to cover all exposed sections of the pipeline with rock material, this will be deposited in the current pipeline trench and will be designed with an overtrawlable profile further minimising any residual risk to commercial fishers.

6.2.4 Cumulative and Transboundary Impacts

The Decommissioning Project is located partially on the UK-Norway border (Figure 1-1). As such, this region experiences moderate levels of fishing by foreign vessels compared to other regions of the UKCS (Scottish Government, 2019a; Marine Scotland, 2012). Activity by fishing fleets of several non-UK nationalities may be recorded throughout the waters surrounding the PL301; the most common of which being Norwegian, French and Dutch vessels which predominantly operate demersal gears (MMO, 2015).

As PL301, once decommissioned *in situ*, will be left in an overtrawlable condition, no cumulative impacts to any UK and/or foreign fishing fleets, demersal or otherwise, are expected to result from the Decommissioning Project.

6.2.5 Mitigation Measures

The existing controls of continued monitoring for an agreed period, remediation where required, accurate mapping of the location and state of PL301 which has been decommissioned *in situ* reduces the probability of impacts to commercial fisheries.

The physical presence of vessels during decommissioning operations can cause disturbance to commercial fishing vessels. There are a number of existing controls which Equinor is utilising for the impact of vessel presence on commercial fisheries. Stakeholder engagement will be continued prior to commencement of operations, including the announcement of NMs detailing any decommissioning activities. Appropriate navigation aids will be used in accordance with the Consent to Locate conditions to ensure that sea users are made aware of the presence of vessels undergoing decommissioning activities. In addition, there will be continual use of Automatic Identification System satellite vessel tracking and all decommissioning vessel activities will be in accordance with national and international regulations.

The decommissioning operations will be designed and executed to minimise the area of seabed that is disturbed. As all decommissioning activities associated with this Project entail infrastructure being left *in situ*, the area being disturbed is very small.

Equinor has a responsibility to ensure all potential residual impacts to fisheries from snagging risk are minimised, given the magnitude of this impact factor. A post-decommissioning survey using non-intrusive geophysical survey methods to provide a collective profile of PL301 to identify potential free spans, as well as identify any remaining field debris will be carried out. Any identified snagging hazards will be remediated with rock placement or other stabilisation materials, however the likelihood of this is low given the seabed stability and the evidence of self-burial of the pipeline overtime. Following this, continued monitoring and remediation, if needed, will take place to ensure that all buried infrastructure remains stable and without exposures or spans.

6.2.6 Conclusion

Receptor	Impact Magnitude	Receptor Sensitivity	Receptor Vulnerability	Receptor Value
Commercial Fisheries	Low	Medium	Negligible	Low
Validation				
PL301 will be decommissioned *in situ* and its continued presence in the area is unlikely to have an impact on commercial fisheries. There has been no associated impact thus far and this is not likely to change in the wake of the decommissioning activities. Residual impacts from the potential degradation of the pipeline will be managed through continued monitoring and communications with other sea users. Considering the low likelihood of generating snagging risks predicted from the proposed decommissioning operations and the management and control measures that will be in place, it is considered that the decommissioning of the PL301 will not adversely impact upon commercial fisheries operating within the Decommissioning Project area. Therefore, impact magnitude is considered low. However, due to the potential significance of the threat associated with snagging, receptor sensitivity has been classed as medium. Commercial fisheries are adaptable, and the proposed activities will not happen over a long-term period therefore the vulnerability of the receptor to the decommissioning activities is considered negligible. Finally, the area surrounding the Brae Alpha and PL301 is not considered particularly important to fishing when compared with the wider region. Fishing effort is consistently low year-round and between years. As such, the receptor value is considered low. Overall, due to the nature of the anticipated activities and the general low importance of the area to commercial fisheries, impacts to fisheries are considered negligible.				
Residual Impact Significance	Negligible			

7 CONCLUSION

7.1 Summary

PL301 connects the Brae Alpha and Heimdal platforms. The PL301 is 116 km in length, 38 km of which lies within UK waters. This section of PL301 is the focus of this decommissioning EA. PL301 will be decommissioned *in situ* with a short section cut at the end. Exposed sections of PL301 will be remediated using rock placement.

Following detailed review of the proposed decommissioning activities, the environmental sensitivities characteristic of the Project area, industry experience with decommissioning activities, and consideration of stakeholder concerns, it was determined that potential project-related impacts to the seabed and commercial fisheries required further consideration. The worst-case aspects from the proposed decommissioning method were considered and assessed in line with a tried and tested EA Methodology described in Section 0 and the results are detailed in Section 6.

PL301 is located well offshore in the NNS, remote from coastal sensitivities and approximately 8 km away from the nearest offshore conservation site, the Braemar Pockmarks SAC. The potential to impact upon the integrity of this site was reviewed in the assessment of Seabed impacts (Section 6.1). The scale of direct and indirect disturbance associated with the decommissioning activities is very small relative to the area of similar habitat available. Furthermore, no habitats or species of conservation concern were identified within the decommissioning footprint or its immediate vicinity. Based on the highly localised nature of the disturbance, the impact of the PL301 decommissioning activities on seabed receptors is considered **negligible**.

Activities with the potential to impact upon commercial fisheries were limited to the potential snagging of fishing gears on exposed pipeline or seabed modified by removal of sections of pipeline. Such impacts are restricted to commercial fisheries which make active contact with the seabed, such as those which trawl gears. Given the prevalence of this fishing type in the area (see Section 3.5.2), there is potential for interaction between commercial fisheries and the pipeline. However, as the PL301 will be decommissioned *in situ* and commercial fisheries have thus far not been affected by its presence, it unlikely that the decommissioning activities will change this. Based on this observation, coupled with the continued stability of the PL301, and mitigation measures which include post-decommissioning surveys and monitoring for exposures, impacts to commercial fisheries from snagging risk from the decommissioning of the PL301 will be highly localised and short-term and therefore deemed **negligible**.

In order to ensure that the environmental and societal impact of the decommissioning activities remains as low as reasonably practicable, Equinor will adhere to their in-house management procedures, including but not limited to contractor management, vessel inspections and audits and the legal obligation to report any accidental discharges and emissions which may occur. As the impact assessment in this report details, the decommissioning of PL301 is unlikely to have a significant impact on the environment of other users (both offshore and onshore) if the control and mitigation measures are applied effectively. A summary of all proposed mitigation measures is shown in Table 7-1.

Table 7-1 Proposed mitigation and control measures

General and Existing
• Lessons learnt from previous decommissioning scopes will be reviewed and implemented as appropriate; • Vessels will be managed in accordance with Equinor's existing marine procedures, including: – The vessels' work programme will be optimised to minimise vessel use where possible; – All pipeline will be pigged and flushed, these activities will be assessed and permitted under existing operational permits prior to decommissioning, to ensure minimal residual contaminants are present in the infrastructure before decommissioning operations commence;

- The OPEP is one of the controls included in a comprehensive management and operational control plan developed to minimise the likelihood of large hydrocarbon releases and to mitigate their impacts should they occur;
- All vessels undertaking decommissioning activities will have a MARPOL approved SOPEP;
- Existing processes will be used for contractor management to assure and manage environmental and social impacts and risks;
- Equinor's management of change process will be followed should changes of scope be required; and
- Careful planning, selection of equipment, subsequent management and implementation of activities.

- A pre-decommissioning environmental seabed survey, centred along the PL301 route, will be carried out. The survey will focus on chemical, physical and biological changes, disturbances. Results of this survey will be available once the work is complete, with a copy forwarded to OPRED.
- The route of PL301 will be the subject to an as-left verification survey (non-intrusive) when decommissioning activity has concluded, and if deemed necessary, an oilfield debris clearance survey.
- The main risk from infrastructure remaining *in situ* is the potential for interaction with other users of the sea, specifically from fishing related activities. Where the pipeline is trenched below seabed level or trenched and buried below, the effect of interaction with other users of the sea is considered to be negligible. Other areas of exposure will be covered with rock leaving an overtrawlable condition.
- The infrastructure is currently shown on Admiralty Charts and the FishSafe system. When decommissioning activity has been competed, updated information will be made available to update Admiralty Charts and FishSafe system.
- The licence holders recognise their commitment to undertake post-decommissioning monitoring of infrastructure left *in situ*. After the post-decommissioning survey reports have been submitted to OPRED and reviewed, a post-decommissioning monitoring survey regime, scope and frequency, will be agreed with OPRED.
- Any snagging risk to other sea users will be minimised by continual monitoring of degrading structures or exposure.

Large-scale Releases to Sea

- Post-flushing water will be routed into the production lines via Brae Alpha so there will be no discharge of fluids.
- All solid waste will be skipped and shipped to shore for disposal, rather than being discharged at sea.
- Risk of full inventory loss from a vessel is very low given that the majority of vessels have multiple, separated fuel tanks, making full contaminant loss highly unlikely and the distance from shore would prevent any significant volume of diesel reaching any shoreline. Any potential diesel fuel spillages resulting from unplanned collisions will be minimised by approved OPEP/SOPEP, in which risks associated with the decommissioning activities have been appropriately assessed and planned for.

Waste Management

- All waste will be managed in accordance with the Waste Management Plan, including any marine growth waste, or NORM identified during flushing, cleaning or decommissioning of the pipeline.
- The Active Waste Management Plan will involve the use of a waste inventory, and all residual wastes being shipped to shore for processing and tracking.

7.2 Final Remarks

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

Based on the findings of this EA, including the identification and subsequent application of appropriate mitigation measures and Project management according to Equinor's HSES Policy and EMS, it is considered that the proposed PL301 decommissioning activities do not pose any threat of significant impact to environmental or societal receptors within the UKCS or internationally.

8 SUPPORTING DOCUMENTS

Table 8-1 Supporting documents

Document Number	Title
A400300-S00-REPT-003	Decommissioning Programme
A400300-S00-REPT-005	Comparative Assessment

9 REFERENCES

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APPENDIX A STAKEHOLDER COMMENTS

Relevant Party	Comment/Concerns Raised	Response
Informal Consultations		
	Equinor has engaged with interested parties and stakeholders who participated in CA workshops. No objections have been raised to date.	N/A
Statutory Consultations		
Marine Scotland	Scoping Letter - The fish spawning and nursery sensitivity section refers to ICES 36F1, however, it is assumed this should read 46F1.	Amended. Environmental Appraisal Section 3.5.2
Marine Scotland	Scoping Letter - Norway pout spawning should also be included and that the full spawning period of each species is considered not just the peak spawning period.	Amended Environmental Appraisal Section 3.3
Marine Scotland	Scoping Letter - It is highlighted that new aggregated VMS fishing effort data sets for 2009 - 2016 are now available on the National Marine Plan Maps interactive web site (NMPi). The data are split into three groups of fishing method: bottom trawls, dredges and crustaceans caught by bottom trawl (i.e. *Nephrops*). The *Nephrops* and crustaceans layer is a subset of the dredges layer but also includes data for 2017. Further information may be obtained here http://marine.gov.scot/node/12832. This information would benefit from being shown visually	Amended Environmental Appraisal Section 3.5.2
Marine Scotland	Scoping Letter - Marine Scotland has recently added nine new spatial layers to the National Marine Plan interactive (NMPi) showing changes over the last five years of published statistics for: 1. tonnage for demersal, pelagic and shellfish species; 2. value (£) for demersal, pelagic and shellfish species;	Amended Environmental Appraisal Section 3.5.2

	3. effort (days) (by UK vessels >10m length) for demersal active (bottom trawls, dredges etc.); pelagic active (pelagic trawls, purse seines etc.); and passive (pots/creels, gillnets etc.).	
OPRED EMT	Terms of Reference - What evidence is available to support the integrity concerns associated with the Reverse Installation option?	Concrete coating damage observed on a number of ROV PL301 survey videos. Actual pipe integrity unknown but main concern is how spalling concrete will be dealt with during lifting and removal process.
OPRED EMT	Terms of Reference - Presumably if environmental impact of processing returned materials is assessed then any environmental benefits of re-use or recycle are also considered?	Energy and Emissions is calculated for all options. The environmental impact of sourcing these materials is not covered by these assessments. Calculations have been made in line with current guidance.
OPRED EMT	Scoping Letter - Commercial fishing - This data is at least 4 years old. Is there more up to date data available?	VMS, landings and effort data will be updated with most recent available. Environmental Appraisal Section 3.5.2
OPRED EMT	Scoping Letter - Is shipping activity low or is there a range of activities?	The shipping actives levels are Low as per OGA licence block data set. AIS data also appears consistent with this. Environmental Appraisal Section 3.5.1
OPRED EMT	Terms of Reference - What evidence is available to support this position i.e. what documented challenges were faced during pipeline install that would preclude re-trench and bury entire length?	PL301 was installed in 80s, installation records are limited. However, variation is usually due to soil stiffness and whether this has achieved original depth or collapsed before pipe was laid. This would also disturb a larger area of sediment.

OPRED EMT	Term of Reference - As per option 3B - What evidence is available to support this position i.e. what documented challenges were faced during pipeline install that would preclude this as an option? This option would relate only to spans/exposures - how does this influence conclusion i.e. please clarify why the number and nature of spans/exposures and seabed in these locations mean that this is not a viable option.	See above comment
OPRED EMT	Scoping Letter - It is stated that the baseline will rely heavily on environmental data Equinor and other operators have collected to date. No information has been presented that would allow an assessment on the suitability of this data to inform this project. Further details are required of survey types, dates, locations in proximity to the proposed activities and how they are deemed suitable to inform this assessment. A map showing survey locations would be useful.	A survey data report is being compiled and will highlight whether suitable coverage is available with current survey data held in order to undertake assessment with the provision that a pre decom survey will be conducted to verify current understanding. Environmental Appraisal Section 3.2
OPRED EMT	Scoping Letter - As per section 12 of the OPRED decommissioning guidance notes, the EA should be a standalone document and the type and level of information expected in an EA are outlined within Table 1 of this section. The EA should meet these requirements and the level of information in the EA should be proportionate to the scale of the activities described in the DP.	Noted, clarification will be sought from OPRED regarding screen out text and aspects being assessed fully as per agreed approach. Environmental Appraisal Section 5.0
OPRED EMT	Scoping Letter - What other decommissioning activities have Equinor AS undertaken on the UKCS and how does the knowledge and experience gained relate to proposed mitigation and control measures for this project?	Equinor AS has undertaken a number of decommissioning operations on the Norwegian CS, however, part of the reason Xodus has been employed is due to their experience in undertaking decommissioning assessments and supporting studies for over 60 projects within the UKCS.

OPRED EMT	Scoping Letter - There do not appear to be any proposed mitigation measures for option 2A - full removal.	There are limited mitigation measures during this type of operation other than best practice in terms of vessel operations and a post decommissioning survey to ensure no residual snag risks from spalled concrete etc.
OPRED ODU	CA Workshop - What was the target depth of trenching during installation?	At the time of installation, the target depth was 0.9 m
OPRED ODU	CA Workshop - Are there berms present along the edge of the trenches?	Berms are still present, but they are relatively small and pose no hazard to fishing
SFF	CA Workshop - “The low number of crossings is not purely down to low fishing effort across the pipeline but might also be due to the presence of the pipeline itself deterring fishing in the area”	Noted
OPRED ODU	CA Workshop - How is the subsea cutting going to be conducted? Will it utilise divers or diver-less methods?	Cutting will be diver-less using hydraulic shears. Decommissioning Programme Section 1.5
HSE	CA Workshop - Is there any history of span intervention along the pipeline?	No there is not, while a number of spans are over the threshold in length, the overall height of the spans above the trench (in which it sits) is not.
OPRED ODU	CA Workshop - Have other simultaneous decom operations (Brae A and adjacent fields) been considered as activities by other users of the sea?	This can be looked at in further detail.
OPRED ODU	CA Workshop - How many surveys (post decom) have been allowed for?	Three in total, one none invasive post decommissioning survey, then two further surveys, one at 5 years and one at 10 years post decom.
JNCC	CA Workshop - In the marine impacts criteria what is included within the number of days?	Only on-site durations, no mob/demob or transit time

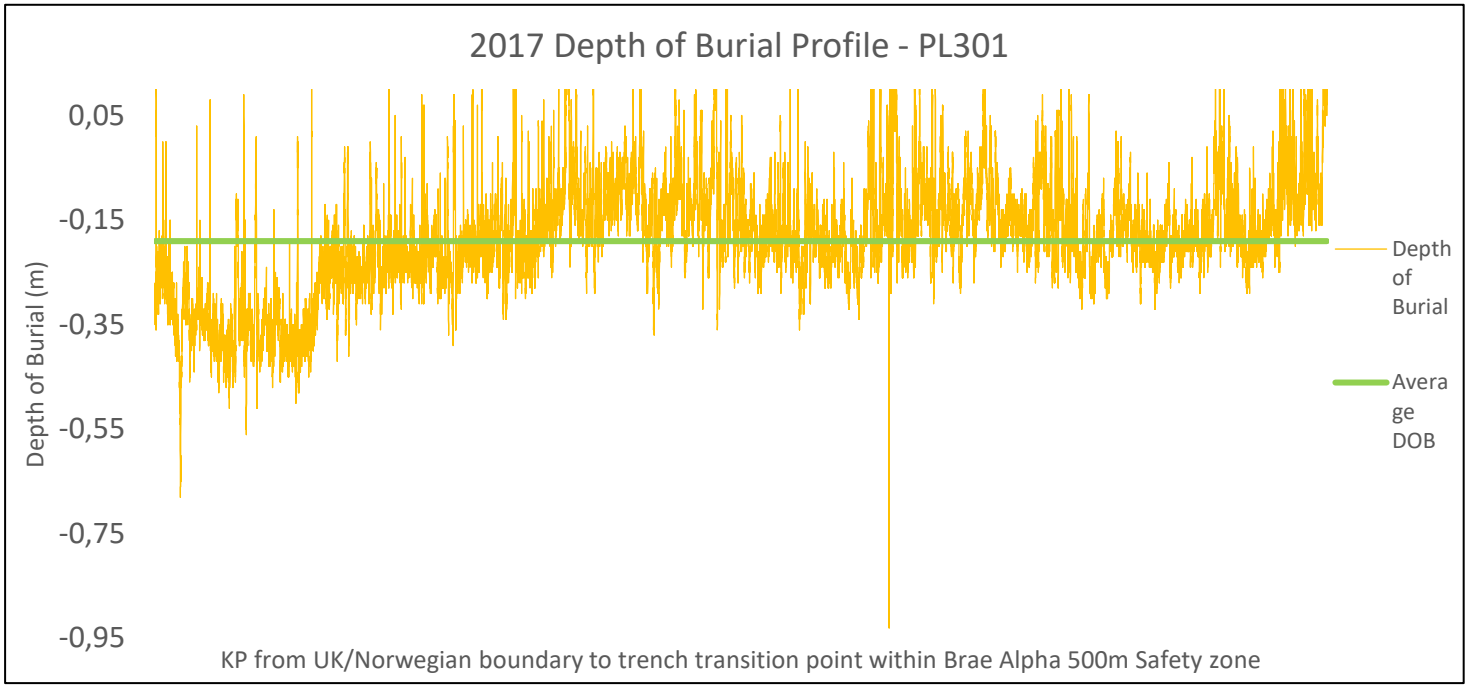
Marine Scotland	CA Workshop - Is rock placement included within the operational marine impact section?	No, the rock placement is captured within another section '2.4 Seabed Disturbance'.
OPRED ODU	CA Workshop - Do the emissions values capture the emissions generated by future monitoring work?	Yes, the emissions include the outlined 3 post decom surveys.
OPRED ODU	CA Workshop - Is it possible to separate between the execute stage fuel and the residual monitoring fuel use?	Yes, this can be done if required.
SFF	CA Workshop - "If rock dumping is properly carried out then there should not be a residual safety issue, however, in SFF opinion the number of post decom surveys is a bit light especially if interaction between the rock placement and fishing equipment occur over a prolonged period of time after decommissioning has been undertaken. Consideration needs to be taken in planning future survey requirements".	Better visualisation of where fishing activity occurs and where rock placement will be considered as part of the DP.
SFF	CA Workshop - Does the outcome of the CA (emerging recommendation) match the proposed decommissioning strategy in Norwegian water?	Option 4A is preferred option on the NCS.

APPENDIX B SUMMARY OF MATERIAL INVENTORY

Item	Description	Weight (Te)
Metals	Ferrous (steel - all grades)	2,162.3
	Non-Ferrous (copper, aluminium	0
Concrete	Aggregates (mattresses, grout bags, sand bags)	3,441.1
Plastic	Rubbers, polymers	0
Hazardous	Bitumen coating	174.9
	Residual fluids (hydrocarbons, chemicals)	0
	NORM scale	0
Other	(Glass filament, Silica)	0
	Total (Tonnes)	5,778.29

APPENDIX C PL301 DEPTH OF BURIAL PROFILE

The depth of burial chart presented below shows PL301 between the UK/Norway boundary and the transition point within the Brae Alpha 500m safety zone. The average depth of burial along the pipeline is -0.19m. The depth of burial chart, in conjunction with the exposures table presented in Appendix D, shows that PL301 its buried for the majority of its length. As PL301 was originally laid in an open trench to achieve an average of -0.19m burial with approximately 95% of the line buried indicates sediment deposition across the region.



APPENDIX D PL301 EXPOSURES

Figure D- 1 Summary of past pipeline survey data, between 2009 and 2017, along PL301

Item	2009	2013	2017
Length of buried pipe (within EA scope) (m)	36322	35305	35807
% Coverage	95%	92%	94%
Number of freespans (within EA scope)*	1	6	3
Length of freespans (m) (within EA scope)	6	34	28
Average Depth of Cover (m) (within EA scope)	-	0.21	0.19

*All spans within the scope of this EA/ DP are less than 0.8m in height or 10m in length and as such are non-reportable.

Figure D- 2 Summary of exposures and freespans along PL301 (Deepocean, 2017)

Exposure/Freespan	Number	Total Length (m)
Exposures < 5 m	67	175
Exposures 5-20 m	54	492
Exposures >20 m	13	678
Freespans	3	28

Figure D- 3 Location, length and depth of exposures along PL301 (Deepocean, 2017)

KP Point Start	KP Point End	Distance (km)	Depth to Top of Pipe (ToP) (m)	Depth of Adjacent Mean Seabed (m)	Depth of Trench (m)	Depth of Cover (DoC) (m)
78.148	78.153	0.005	121.42	120.76	0.66	0
79.447	79.447	0.000	122.10	121.55	0.55	0
79.879	79.879	0.000	121.29	120.71	0.58	0
80.961	80.962	0.001	120.88	120.42	0.46	0
83.131	83.132	0.001	120.64	120.17	0.47	0
85.617	85.618	0.001	118.92	118.47	0.45	0
85.813	85.814	0.001	118.66	118.24	0.42	0
86.665	86.666	0.001	117.39	117.01	0.38	0
86.771	86.772	0.001	117.29	116.92	0.37	0
86.747	86.749	0.002	117.27	116.92	0.35	0
87.683	87.748	0.065	116.24	116.16	0.08	0
88.004	88.005	0.001	116.59	116.29	0.30	0
88.282	88.284	0.002	116.62	116.21	0.41	0
88.303	88.304	0.001	116.65	116.25	0.40	0
88.455	88.456	0.001	116.66	116.25	0.41	0
88.586	88.595	0.009	116.60	116.33	0.27	0
89.603	89.607	0.004	116.26	116.01	0.25	0
89.610	89.616	0.006	116.25	116.09	0.16	0
89.631	89.637	0.006	116.23	116.05	0.18	0
89.642	89.645	0.003	116.21	116.07	0.14	0

89.655	89.657	0.002	116.22	116.08	0.14	0
89.688	89.690	0.002	116.79	116.11	0.68	0
89.870	89.873	0.003	116.00	115.61	0.39	0
90.080	90.081	0.001	115.80	115.42	0.38	0
90.104	90.104	0.000	115.79	115.36	0.43	0
90.407	90.410	0.003	115.53	115.19	0.34	0
90.521	90.522	0.001	115.30	115.03	0.27	0
90.578	90.581	0.003	115.25	114.95	0.30	0
90.819	90.822	0.003	114.96	114.54	0.42	0
91.056	91.058	0.002	114.16	113.98	0.18	0
91.265	91.268	0.003	113.63	113.47	0.16	0
91.286	91.393	0.107	113.57	113.42	0.15	0
91.462	91.466	0.004	113.74	112.98	0.76	0
91.487	91.487	0.000	113.69	112.97	0.72	0
91.527	91.529	0.002	113.59	112.94	0.65	0
91.537	91.538	0.001	113.55	112.96	0.59	0
91.606	91.623	0.017	113.08	112.96	0.12	0
91.630	91.631	0.001	113.06	112.94	0.12	0
92.154	92.182	0.028	111.58	111.45	0.13	0
93.440	93.449	0.009	107.65	107.52	0.13	0
93.655	93.659	0.004	108.87	108.74	0.13	0
93.660	93.677	0.017	108.88	108.76	0.12	0
93.687	93.713	0.026	109.09	108.97	0.12	0
93.777	93.778	0.001	109.71	109.24	0.47	0
94.788	94.788	0.000	110.12	109.92	0.20	0

94.791	94.815	0.024	110.11	109.92	0.19	0
94.865	94.865	0.000	110.26	110.04	0.22	0
94.924	94.925	0.001	110.11	109.97	0.14	0
95.075	95.075	0.000	110.27	110.02	0.25	0
95.409	95.409	0.000	109.92	109.77	0.15	0
95.414	95.416	0.002	109.91	109.75	0.16	0
95.452	95.471	0.019	109.85	109.70	0.15	0
95.490	95.492	0.002	109.75	109.62	0.13	0
95.587	95.591	0.004	109.61	109.49	0.12	0
95.609	95.615	0.006	109.71	109.55	0.16	0
95.637	95.649	0.012	109.75	109.58	0.17	0
95.976	95.976	0.000	109.43	109.35	0.08	0
96.013	96.013	0.000	109.38	109.30	0.08	0
96.018	96.019	0.001	109.38	109.30	0.08	0
96.039	96.121	0.082	109.39	109.28	0.11	0
96.251	96.257	0.006	109.50	108.77	0.73	0
96.417	96.426	0.009	108.70	108.03	0.67	0
96.442	96.450	0.008	108.54	108.06	0.48	0
96.462	96.468	0.006	108.39	108.03	0.36	0
96.571	96.579	0.008	107.91	107.77	0.14	0
96.926	96.937	0.011	108.28	107.78	0.50	0
98.165	98.172	0.007	106.84	106.43	0.41	0
98.485	98.486	0.001	106.40	106.14	0.26	0
98.727	98.731	0.004	106.33	105.97	0.36	0
100.987	101.002	0.015	105.45	105.35	0.10	0

101.073	101.078	0.005	105.56	105.10	0.46	0
101.088	101.110	0.022	105.57	105.14	0.43	0
101.138	101.141	0.003	105.58	105.07	0.51	0
101.158	101.162	0.004	105.46	105.02	0.44	0
101.353	101.359	0.006	105.23	104.86	0.37	0
101.364	101.366	0.002	105.10	104.80	0.30	0
101.370	101.374	0.004	105.11	104.83	0.28	0
101.379	101.388	0.009	105.24	104.81	0.43	0
101.586	101.759	0.173	104.87	104.45	0.42	0
101.789	101.902	0.113	104.99	104.87	0.12	0
101.979	101.980	0.001	105.33	104.87	0.46	0
102.406	102.407	0.001	104.93	104.65	0.28	0
102.469	102.492	0.023	105.02	104.59	0.43	0
102.507	102.516	0.009	104.90	104.55	0.35	0
102.610	102.610	0.000	104.53	104.39	0.14	0
102.627	102.639	0.012	104.49	104.35	0.14	0
102.663	102.663	0.000	104.43	104.28	0.15	0
103.023	103.040	0.017	103.73	103.48	0.25	0
103.046	103.052	0.006	103.82	103.45	0.37	0
103.135	103.140	0.005	103.55	103.16	0.39	0
103.309	103.327	0.018	103.01	102.96	0.05	0
103.372	103.376	0.004	103.32	102.96	0.36	0
104.098	104.105	0.007	103.34	103.24	0.10	0
104.189	104.189	0.000	103.36	103.19	0.17	0
104.664	104.697	0.033	102.77	102.66	0.11	0

104.714	104.751	0.037	102.77	102.64	0.13	0
104.879	104.919	0.040	102.67	102.60	0.07	0
105.070	105.073	0.003	102.61	102.43	0.18	0
106.359	106.363	0.004	102.40	102.09	0.31	0
106.419	106.422	0.003	102.54	102.17	0.37	0
106.563	106.583	0.020	102.76	102.66	0.10	0
106.612	106.618	0.006	103.00	102.90	0.10	0
106.677	106.679	0.002	103.37	103.24	0.13	0
106.863	106.863	0.000	104.45	104.17	0.28	0
106.986	106.994	0.008	104.86	104.72	0.14	0
107.030	107.053	0.023	105.00	104.79	0.21	0
107.063	107.095	0.032	105.23	104.83	0.40	0
107.164	107.204	0.040	105.20	105.17	0.03	0
107.415	107.430	0.015	105.90	105.76	0.14	0
107.499	107.505	0.006	106.37	105.94	0.43	0
107.563	107.564	0.001	106.50	106.12	0.38	0
107.675	107.677	0.002	106.81	106.47	0.34	0
108.056	108.056	0.000	107.03	106.70	0.33	0
108.934	108.936	0.002	106.76	106.64	0.12	0
108.993	108.996	0.003	106.93	106.83	0.10	0
109.097	109.102	0.005	107.27	107.16	0.11	0
111.848	111.848	0.000	109.20	108.90	0.30	0
112.093	112.127	0.034	109.89	109.54	0.35	0
112.150	112.150	0.000	110.21	109.73	0.48	0
112.166	112.166	0.000	110.25	109.81	0.44	0

112.248	112.254	0.006	110.37	110.09	0.28	0
112.263	112.278	0.015	110.50	109.97	0.53	0
112.316	112.318	0.002	110.76	110.44	0.32	0
112.394	112.398	0.004	111.31	110.58	0.73	0
112.562	112.566	0.004	111.82	111.00	0.82	0
112.574	112.576	0.002	111.79	111.00	0.79	0
113.957	113.972	0.015	110.31	110.11	0.20	0
114.162	114.162	0.000	110.63	109.93	0.70	0
114.191	114.195	0.004	110.56	110.03	0.53	0
114.251	114.265	0.014	110.60	110.11	0.49	0
114.280	114.285	0.005	110.61	110.13	0.48	0
114.335	114.337	0.002	110.64	110.25	0.39	0
114.350	114.350	0.000	110.69	110.28	0.41	0
114.359	114.360	0.001	110.77	110.12	0.65	0
114.368	114.373	0.005	110.81	110.32	0.49	0
114.478	114.478	0.000	110.97	110.71	0.26	0
114.492	114.493	0.001	111.03	110.70	0.33	0
114.511	114.516	0.005	111.18	110.74	0.44	0
114.572	114.572	0.000	111.27	110.94	0.33	0
114.593	114.597	0.004	111.41	110.97	0.44	0
114.606	114.608	0.002	111.32	110.98	0.34	0
114.613	114.617	0.004	111.39	110.96	0.43	0
114.634	114.635	0.001	111.40	111.05	0.35	0
114.649	114.649	0.000	111.45	111.07	0.38	0
114.653	114.656	0.003	111.44	111.15	0.29	0

114.712	114.713	0.001	111.62	111.28	0.34	0
114.860	114.869	0.009	112.07	111.69	0.38	0
114.888	114.888	0.000	111.99	111.73	0.26	0
114.957	114.982	0.025	112.05	111.86	0.19	0
114.988	114.988	0.000	112.14	111.89	0.25	0
115.008	115.021	0.013	112.13	111.93	0.20	0
115.033	115.035	0.002	112.21	111.99	0.22	0
115.043	115.054	0.011	112.18	112.01	0.17	0
115.073	115.100	0.027	112.32	112.08	0.24	0
115.119	115.142	0.023	112.58	112.16	0.42	0
115.162	115.170	0.008	112.91	112.25	0.66	0
115.189	115.189	0.000	112.73	112.36	0.37	0
115.213	115.224	0.011	112.90	112.43	0.47	0
115.275	115.275	0.000	112.93	112.61	0.32	0
115.387	115.404	0.017	113.11	112.82	0.29	0
115.418	115.418	0.000	113.19	112.89	0.30	0
115.505	115.505	0.000	113.20	112.90	0.30	0
115.562	115.700	0.138	113.06	112.83	0.23	0

Figure D- 4 Areas of possible pipeline spans along PL301

Start KP	End KP	Length (m)
91.332	91.335	3
91.344	91.365	21
91.371	91.375	4

APPENDIX E PL301 CROSSING DETAILS

PRODUCT_NAME	Crossing Product	X	Y	Description of crossing	KP	Survey/log		Operator
Heimdal 8in Condensate	Mariner Tampnet 4 Fibre Optic Cable	455815,562	6603960,234	Buried and mattress covered PL301 crosses under exposed unidentified cable	769,74	ST17648		Tampnett
Heimdal 8in Condensate	Havfrue communication cable - segment	431994,537	6551761,337	No info, probably installed after 2017?	58344	ST17648		TE Subcom
Heimdal 8in Condensate	TAT 14 (K)	429217,692	6547311,717	PL301 crosses under TAT 14 (K). Both products gravel covered	63611,97	ST17648		British telecom international (BTI)
Heimdal 8in Condensate	Utsira High Gas Pipeline	428513,71	6546331,567	P440 UHGP crosses over PL301 Heimdal-Brae A Condensate Pipeline. Both lines buried under gravel	64829,41	ST17648		Gassco
Heimdal 8in Condensate	Atlantic Crossing1 (AC1)	427273,205	6544604,79	PL301 crosses under Atlantic Crossing 1 (AC1). Both products gravel covered	66950,17	ST17648		Centurylink
Heimdal 8in Condensate	TAT 10 (B) East	424175,13	6540289,62	PL301 crosses under TAT10 (Seg.B) East disused cable. Both products gravel covered	72281,27	ST17648		Deutche telekom AG
Heimdal 8in Condensate	PL815	418991,353	6526172,012	PL301 crosses under PL815 24in condensate. Both products gravel covered	87718,12	ST17648		Serica Enegy Limited
Heimdal 8in Condensate	PLU1490	408884,508	6516841,586	PL301 crosses under PL1490 umbilical. Both products gravel covered	101603,02	ST17648		Shell UK E&P
Heimdal 8in Condensate	PL 1488	408818,428	6516824,343	PL301 crosses under PL 1488 to Brae B. Both products gravel covered	101669,38	ST17648		Shell
Heimdal 8in Condensate	PL 1489	408763,965	6516808,793	PL301 crosses under PL 1489 to Brae B. Both products gravel covered	101730,03	ST17648		shell
Heimdal 8in Condensate	PL1971	405743,058	6515836,257	PL301 crosses under PL1971 16in Gas Miller to Brae B. Both products gravel covered	104903,07	ST17648		BP exploration
Heimdal 8in Condensate	Brae A to East Brae cable	403816,49	6514960,9	PL301 crosses under Brae A to East Brae cable. Both products mattress covered	107043,05	ST17648		RockRose UKCS8 LLC
Heimdal 8in Condensate	PL872	403708,727	6514878,269	PL301 crosses under PL872 10in Gas Tiffany to Brae A-B Tee. Both products gravel covered	107187,42	ST17648		CNR International
Heimdal 8in Condensate	PMS cable to Brae B	400587,236	6507332,697	PL301 crosses under PMS Brae B to A cable. Both products mattress covered	116148,72	ST17648		Marathon
Heimdal 8in Condensate	PL2337	400505,993	6507287,451	PL2337 crosses under mattress covered PL301	116244,83	EQ19644		Repsol
Heimdal 8in Condensate	PL2336	400505,646	6507287,263	PL2336 crosses under mattress covered PL301	116245,15	EQ19644		Repsol
Heimdal 8in Condensate	PLU2338	400505,078	6507286,997	PLU2338 crosses under mattress covered PL301	116245,74	EQ19644		Repsol
Heimdal 8in Condensate	PL722	400488,918	6507278,098	PL722 under crossing protection cover crosses over mattress covered PL301	116262,06	EQ19644		BP exploration
colour coding:								
Norwegian Continenal shelf								
uk continental shelf- up to cut piont. (part of this DP)								
UK continental shelf- from cut point and up to Brae Alpha . (not part of this DP)								