Heimdal to Brae Alpha Condensate Pipeline PL301 - Decommissioning

Decommissioning Programme

Final Draft for Approval
April 2021

FM_190235-g

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Title:
Decommissioning Programme

Document no.:	Contract no.:	Project:
A-400300-S00-REPT-003		Heimdal-Brae Alpha Gas Condensate Pipeline (PL301) Decommissioning

Classification:	Distribution:
Internal	Offshore Decommissioning Unit - Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)
Expiry date:	Status: Final Draft for Approval

Distribution date:	Rev. no.:	Copy no.:
31 March 2020 (R01)	R05	

Author(s)/Source(s):
Prepared by Xodus under management of Equinor
Subjects: Decommissioning Programme
Remarks: Final Draft for Approval

Valid from:	Updated:
12.04.2021	12.04.2021
Responsible publisher: Equinor	Authority to approve deviations:

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CONTENTS

Terms and Abbreviations

Abbreviation	Explanation
AIS	Automatic Identification System
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
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
ESE	East South East
EU	European Union
EUNIS	European Nature Information System
FPSO	Floating Production Storage and Offloading
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
JNCC	Joint Nature Conservation Committee
km	Kilometer
km^2	Kilometer Square
KP	Kilometer Point
m^2	Meters Square
m^3	Meters Cube
MCDA	Multi Criteria Decision Analysis
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
ODU	Offshore Decommissioning Unit
OGA	Oil and Gas Authority

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 Authorisation
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SFF	Scottish Fisherman's Federation
SMRU	Sea Mammal Research Unit
SNH	Scottish Natural Heritage
SOSI	Seabird Oil Sensitivity Index
SSE	South South East
UKCS	United Kingdom Continental Shelf
VMS	Vessel Monitoring System
WON	Well Operations Notification

Figures and Tables

1 EXECUTIVE SUMMARY

1.1 Decommissioning Programme

This document contains the decommissioning programme for the Heimdal to Brae Alpha 8" Gas Condensate Cross Boundary Pipeline (PL301).

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.

Installations/Facilities associated with PL301 and how they are covered in this decommissioning programme:

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

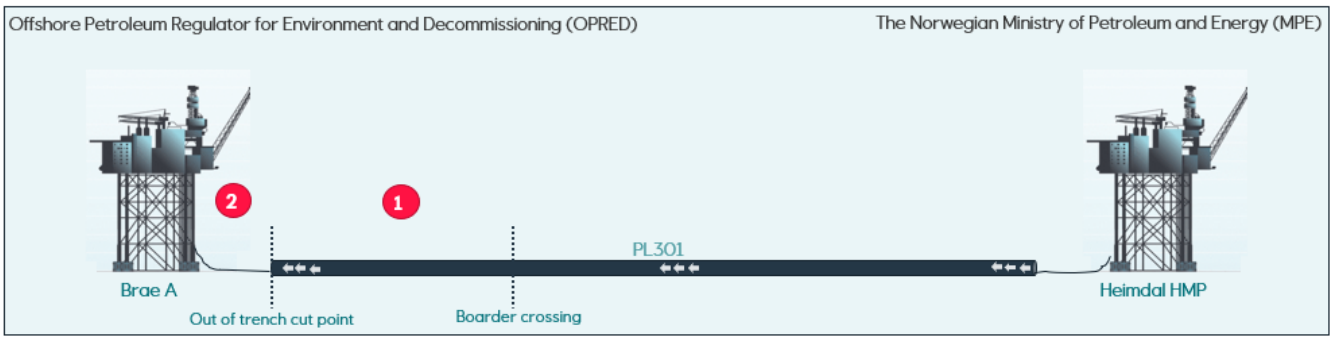


Figure 1-1 UK Decommissioning Programme concept for PL301

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 1-1 above.

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.

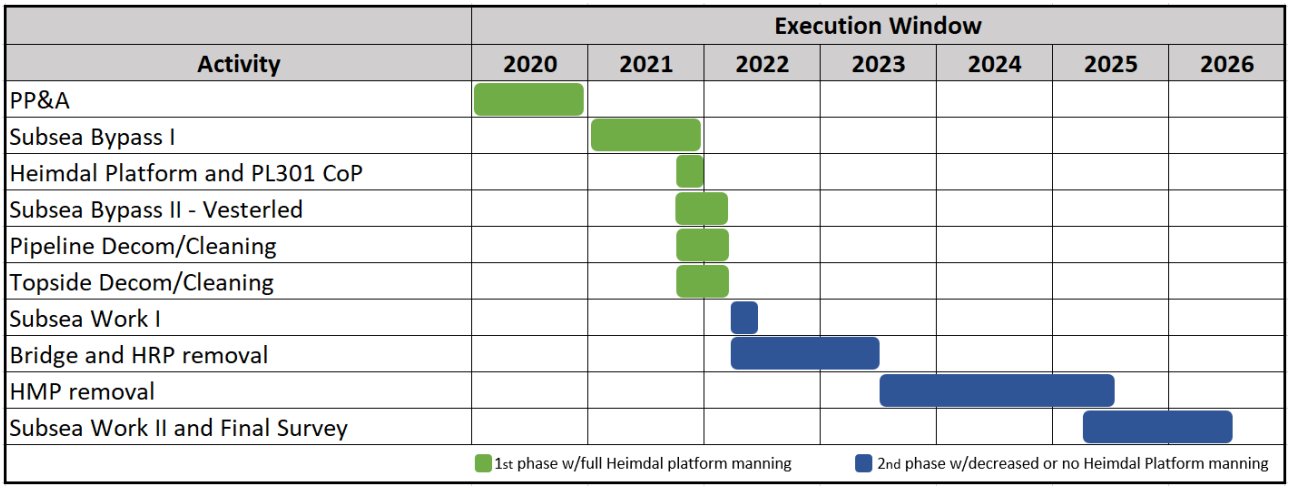
A Norwegian decommissioning plan has been submitted by Equinor to the Norwegian Ministry of Petroleum and Energy (MPE) to allow decommissioning of the Norwegian section of PL301.

1.2 Requirement for Decommissioning Programme

In accordance with the Petroleum Act 1998, the Section 29 notice holders of PL301 (see Table 1-3) are applying to OPRED to obtain approval for decommissioning the pipeline section detailed in Section 2.3 of this programme.

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programme are submitted in compliance with national and international regulations and OPRED guidelines. The schedule outlined in this document is for a seven -year decommissioning project plan due to begin in 2020, for a more detailed schedule see Figure 1-2. The subsea bypass refers to the process of reconfiguring the subsea infrastructure to bypass the Heimdal installation.

Figure 1-2 Heimdal Decommissioning Schedule (Base Case)



The base case for planning the decommissioning of the Heimdal facilities on NCS 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 DP, 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.

A schedule for decommissioning of UKCS section of PL301 can be found in Section 6.3.

1.3 Introduction

The decommissioning programme have been prepared to allow the decommissioning of the PL301. The Heimdal Field is in Block 25/4 in the Norwegian sector of the NNS, whilst the Brae Alpha Field is located in Block 16/7 in the UK sector of the NNS. Both fields are located close to the NCS/UKCS boundary line.

The Heimdal 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 1986. The Heimdal Riser Platform (HRP) was installed in 2002 and serves as a tie-in point for Vale, Byggve/Skrine, Atla and Valemon. The PL301 is a 116 km cross border pipeline (Norway 78 km / 38 km UK) owned by the Heimdal License and operated by Equinor Energy, see Table 1-2. Currently the schedule is aligned to CoP occurring in Q3 2021.

1.4 Overview of Pipeline Being Decommissioned

Table 1-1 Pipeline being decommissioned

Number of Pipelines	1	(See Table 1-3)

Table 1-2 Pipeline section 29 notice holders' details

Section 29 Notice Holders	Registration Number	Equity Interest (%)
Equinor Energy AS	990 888 213	29.443%
Spirit Energy Norway AS	919 603 771	28.798%
Petoro AS	983 382 355	20.0%
Total E&P Norge AS	927 066 440	16.759%
LOTOS Exploration and Production Norge AS	991 735 194	5.0%

Within this DP only the 38 km of PL301 located on the UKCS between the UK – Norway Boundary to KP 116.028 into the Brae Alpha safety zone is within the scope of decommissioning. Decommissioning of the remaining PL301 section within Brae Alpha safety zone and further up to the Brae Alpha installation will be subject to a separate DP at a later stage.

1.5 Summary of Proposed Decommissioning Programme

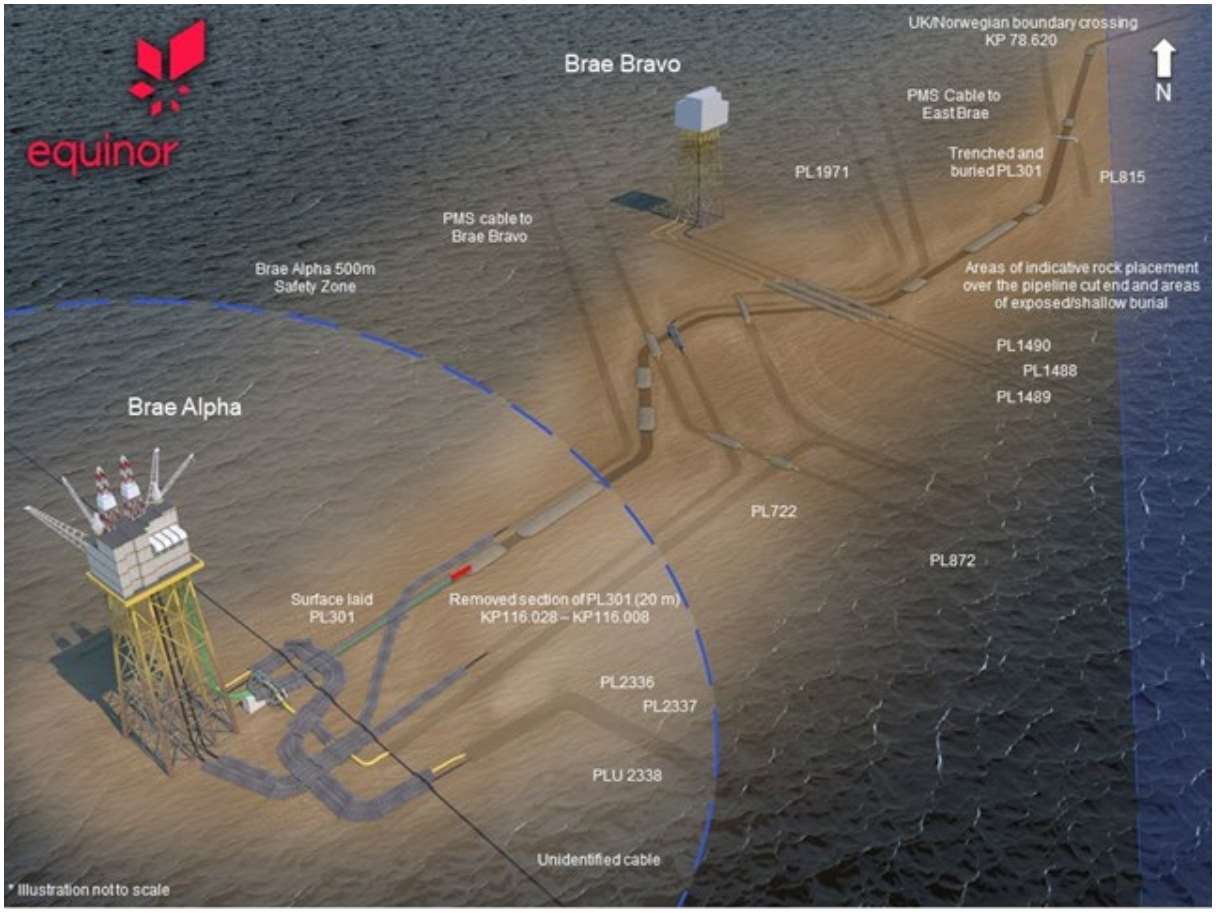
Table 1-3 Summary of Decommissioning Programme

Proposed Decommissioning Solution	Reason for Selection
Rock cover areas of spans / Exposure: Removal and recovery of short surface laid section out with existing trench. Rock placement or trenching to remediate snag risk from cut end at transboundary line. Rock placement at all areas of spans and exposure	Comparatively assessed against Environmental, Safety, Technical, Social and Economic criteria as the preferred option. PL301 was initially laid in an open trench and has shown natural backfilling for the majority of its length of this time (circa 95%).
Pipeline crossings: Leave As-is	At all crossing locations within the scope of this DP PL301 is the underlying pipeline, and therefore the overlying assets(s) and the protection material attributed to these crossings are the responsibility of their respective operators at the point of their decommissioning.
Pipeline Stabilisation Features: Leave As-is	
Interdependencies	
The decommissioning of PL301 in the UKCS is to be carried out as part of a greater campaign decommissioning the whole of PL301 (including the Norwegian section). Decommissioning of the remaining section of PL301 within Brae Alpha safety zone from cut point KP 116.028 and further up to the Brae Alpha installation will be decommissioned in line with the Brae Alpha facilities. There are 7 pipeline crossings locations within the scope of this DP, however these will not be impacted by the proposed decommissioning method of decommissioning *in situ*. Note: Spans and exposure of the PL301 are shown in Appendix A, Appendix B and Appendix C.	

1.6 Field Location Including Field Layout and Adjacent Facilities

The pipeline route and the field locations of the Heimdal and Brae Alpha are shown in Figure 1-3. The route of PL301 is also shown in the figure. Figure 1-4 shows PL301's route from Heimdal to Brae and the location of the pipeline on the UKCS.

Figure 1-3 Arrangement of Heimdal to Brae A infrastructure post decommissioning



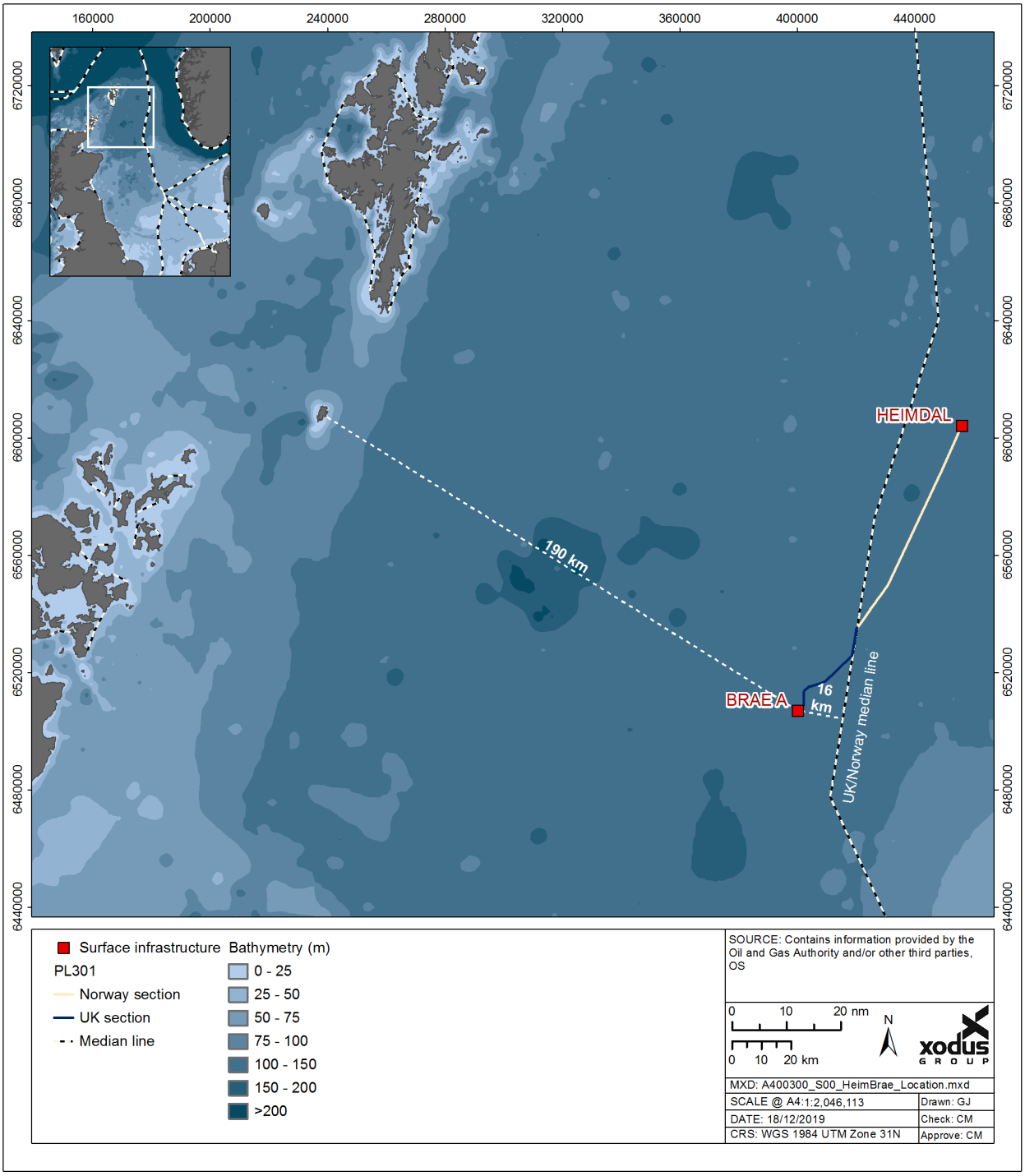


Figure 1-4 Location of Heimdal, Brae Alpha and the route of PL301

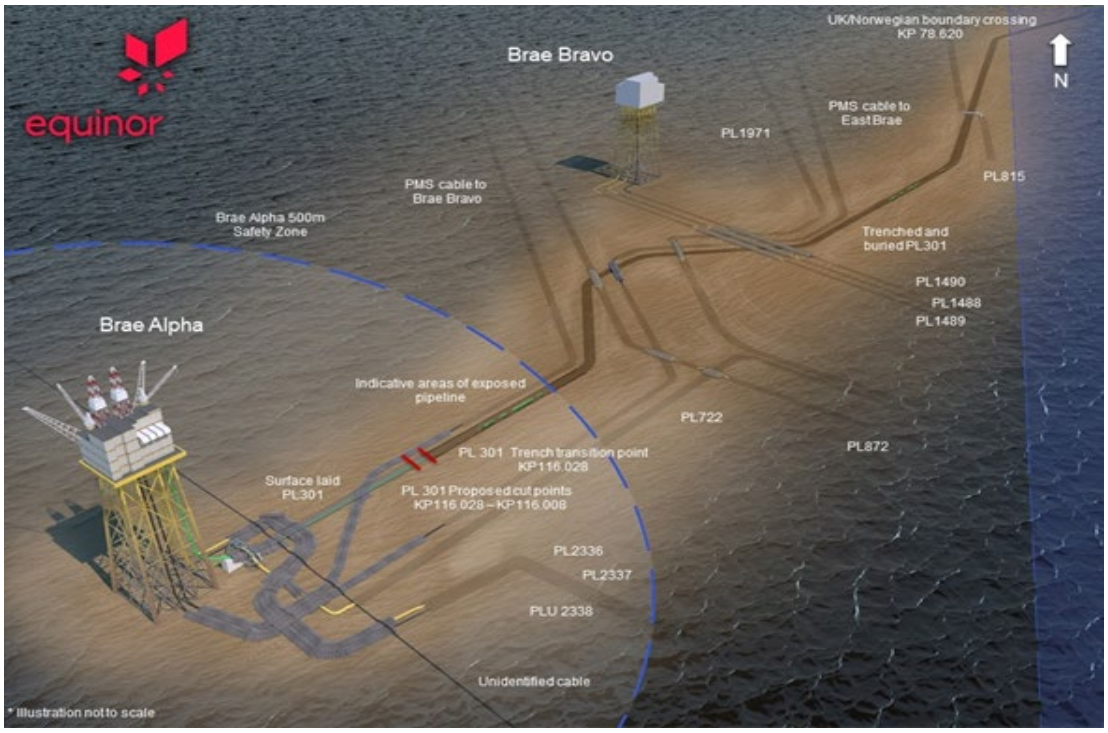


Figure 1-5 Layout of PL301 on the UKCS

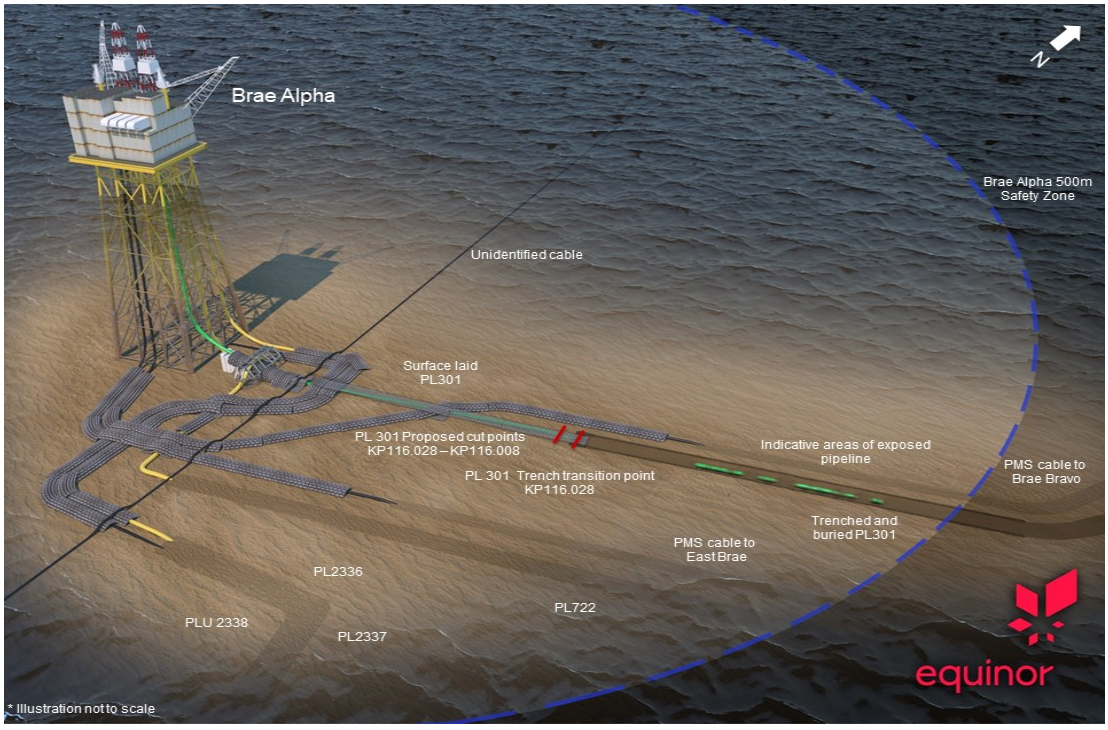


Figure 1-6 Arrangement of PL301 in the Brae A safety zone

The table below shows the installations that are located around the infrastructure that are included in the scope of this DP.

Table 1-4 Adjacent facilities

Operator	Name	Type	Distance/ Direction	Information	Status
BP	Miller	Footings and subsea infrastructure	7.7 km ENE	Located on the UKCS	Decommissioned
Taqa	Brae B	Platform	11.7 km NNE	Located on the UKCS	Post CoP
Taqa	East Brae	Platform	24.9 km NNE	Located on the UKCS	Producing
Equinor	Gudrun Jacket	Platform	31.7 km ENE	Located on the NCS	Producing
Equinor	Heimdal	Platform	78.0 km NE	Located on the NCS	Producing
Taqa	Brae A	Platform	34,7 km SSE	Located on the UKCS	Producing
Impacts of Decommissioning Proposals					
There are no identified impacts on adjacent facilities through the decommissioning of the PL301 section covered in this DP. There are a number of pipeline crossings however these will not be impacted by the proposed decommissioning method of decommissioning *in situ*. 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. At all crossing locations within the scope of this DP PL301 is the underlying pipeline, and therefore the overlying assets(s) and the protection material attributed to these crossings are the responsibility of their respective operators at the point of their decommissioning.					

Note: Adjacent facilities refer to those potentially impacted by this programme. More detailed information regarding the PL301 crossings are found in Appendix D, the information is based on survey data collected in 2017.

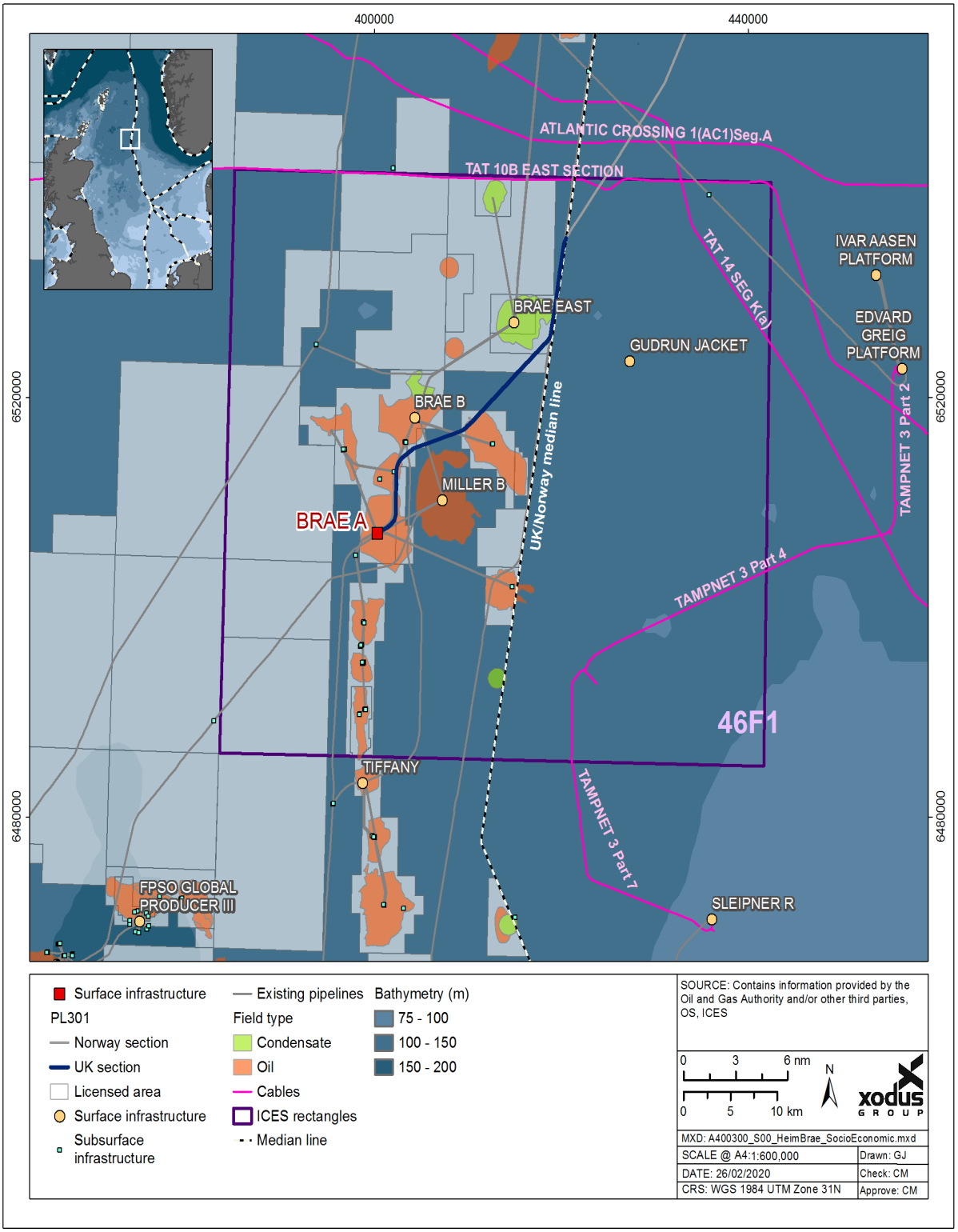


Figure 1-7 Adjacent facilities

1.7 Industrial Implications

The PL301 decommissioning activities will be managed by Equinor Energy AS from their Norwegian offices and will be undertaken by the Heimdal decommissioning team.
Equinor has dialog with Brae Alpha operator throughout the pre-decommissioning process, in particular to the section of PL301 between the trench transition point within the Brae Alpha 500m zone and the Brae Alpha installation. Equinor will continue to coordinate with Brae operator as the decommissioning of PL301 moves forward.
Equinor will utilise frame agreements, already in place, to undertake any subsea work or rock placement deemed necessary to undertake and successfully complete the PL301 decommissioning activities outlined in this document.
All decommissioning activity shall be carried out in accordance to Equinor Energy's sustainability process which provides the basis for enabling cost effective environmental and social performance that protects and creates value for Equinor and communities, enables us to effectively address the climate change challenge and to respect human rights and that secures our licence to operate.

2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Pipelines Including Stabilisation Features

Table 2-1 Pipeline information

Description	Pipeline No. (as per PWA)	OD (in)	Length (km)	Description of component parts	Product Conveyed	End Points From	End Points To	Burial Status	Pipeline Status	Current Contents
Condensate Export Pipeline (NCS)	PL301	8	78.620	Concrete Coated Steel	Condensate	Heimdal	Brae Alpha	Trenched and partially buried	Active	Condensate
Condensate Export Pipeline (UKCS) DP 1 section	PL301	8	37.408	Concrete Coated Steel	Condensate	Heimdal	Brae Alpha	Trenched and partially buried	Active	Condensate
Condensate Export Pipeline (UKCS) DP 2 section	PL301	8	0.265	Concrete Coated Steel	Condensate	Heimdal	Brae Alpha	Surface laid	Active	Condensate

Within the scope of work, KP 78.620 to KP 116.028, the 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 the PL301 crossings are found in Appendix D, the information is based on survey data collected in 2017.

2.2 Inventory Estimates

Table 2-2 and Figure 2-1 provide an estimate of the total weight of materials associated with the section of PL301 between the Norway UK boundary and KP 116.028. A summary of the material associated with PL301 can be found in Section 2 of the accompanying Environmental Appraisal (A-400300-S00-REPT-001). The amount of material being recovered is small as only 20 m of pipeline is being removed. The breakdown of the recovered material is 1.1 Te of steel, 1.8 Te of concrete and 0.1 Te of bitumen.

Table 2-2 Inventory of material associated with PL301 (Norwegian/UK Boundary to KP 116.028)

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)	5,778.3

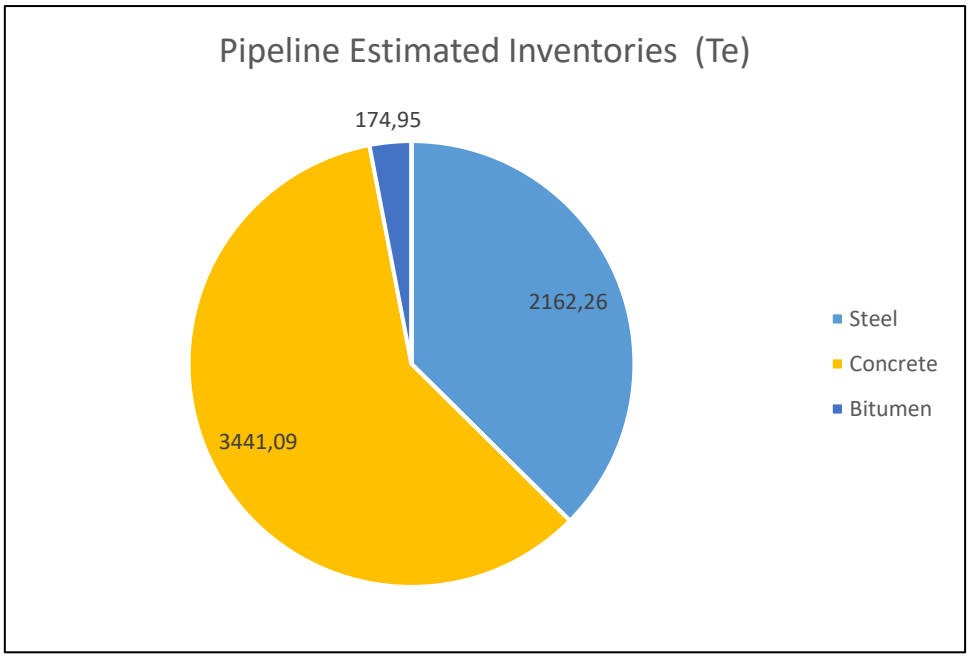
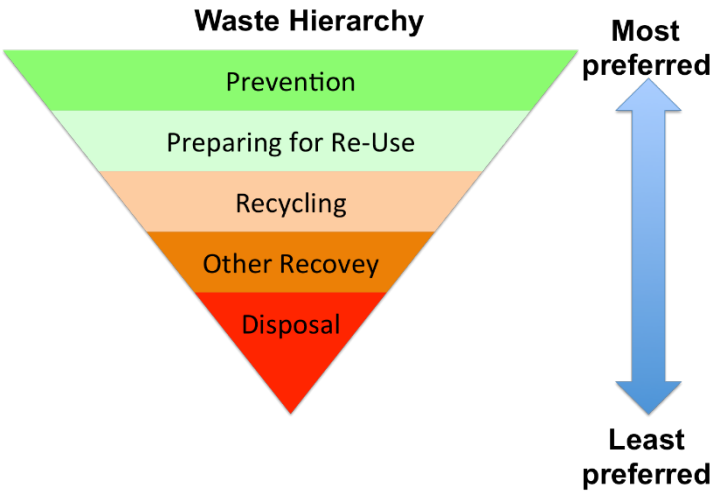


Figure 2-1 Pie chart of pipeline estimated inventory (Norwegian/UK Boundary to KP 116.028)

3 REMOVAL AND DISPOSAL METHODS

Decommissioning of the PL301 will generate a quantity of waste. Equinor is committed to establishing and maintaining environmentally acceptable methods for managing wastes in line with the principles of the waste hierarchy:



Recovered infrastructure will be returned to shore and transferred to a suitably licenced decommissioning facility. It is envisaged that only a small amount of material shall be returned to shore as the decommissioning strategy selected sees the majority of the pipeline decommissioned *in situ*. The only items being removed are a small section of PL301 and any stabilisation associated with that area of PL301 (currently no mattresses or grout bags expected to be present in this section Ref. survey in 2017)

Any concrete mattresses and grout bags that may be recovered as part of decommissioning operations will be cleaned of marine growth if required, and either reused, recovered as aggregate for infrastructure projects or disposed of in landfill sites.

An appropriately licensed disposal company and yard will be identified through a selection process that will ensure that the chosen facility demonstrates a proven track record of waste stream management throughout the deconstruction process, the ability to deliver innovative reuse / recycling options, and ensure the aims of the waste hierarchy are achieved. Once a disposal yard has been selected, the appropriate regulatory bodies will be advised.

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 regulatory authorities will ensure that any issues with TFSW are addressed.

Equinor will engage with other companies and industries to identify potential reuse opportunities. However, Equinor believes that such opportunities are best achieved through the tendering and selection of a waste management contractor with the expert knowledge and experience in this area.

3.1 Pipelines

3.1.1 Decommissioning Options

Table 3-1 Decommissioning options

Grouping	Option	Description
Re-use	1	Re-use
Full Removal	2a	Cut and Lift with Deburial
	2b	Reverse Reel without Deburial
	2c	Reverse Reel with Deburial
Leave in-situ - Major intervention	3a	Rock Placement over Entire Line
	3b	Retrench and Bury Entire Line
Leave in-situ – Minor intervention	4a	Rock Placement over Exposures
	4b	Trench & Bury Exposures
	4c	Remove Exposures
Leave in-situ - Ongoing monitoring	5	Leave As-is

All the options outline in Table 3-1 were screened against five criteria (Safety, Technical, Environmental, Societal and Economic) with the option regarded as the best case against these five criteria carried forward as the preferred decommissioning option for this project. A summary of the screening process can be found in Appendix E. Options to re-use the PL301 *in situ* for future hydrocarbon or alternative developments have been considered. The age, condition and material composition of the UK section of PL301 (and its Norwegian counterpart) would not make it a suitable candidate for future CCS projects.

Table 3-2 Pipeline or pipeline groups decommissioning options

Pipeline or Group (as per PWA)	Condition of line/group (Surface laid/ Trenched/ Buried/Spanning)	Whole or part of pipeline/group	Decommissioning options considered
Group 1: PL301	Trenched & Partially Buried	Whole	2a, 4a, 4c

3.1.2 Comparative Assessment Methodology:

Comparative Assessment is integral to the overall planning and approval of decommissioning options.

Equinor's strategy for the CA process is aligned with the Oil & Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes and OPRED Guidance Notes for the Decommissioning of Offshore Oil and Gas Installations and Pipelines (BEIS 2018).

As there is only one pipeline there was only the need for one CA group. All feasible decommissioning options for the infrastructure have been identified, assessed, ranked and screened, utilising the OPRED Guidance Notes: Decommissioning of Offshore Oil and Gas Installations and Pipelines to carry forward credible decommissioning options to be assessed through the Comparative Assessment process.

The Comparative Assessment process uses five assessment criteria, which are; Safety, Environment, Technical, Societal and Economic to compare the relative merits of each credible decommissioning option for of the infrastructure. The assessment criteria are equally weighted to present a balanced assessment and represent the views of the each of the stakeholders.

An independent consultancy utilising its bespoke Multi Criteria Decision Analysis (MCDA) process was employed to facilitate the Comparative Assessment workshops. The workshops were attended by specialists from the Operator and representatives from key stakeholders namely:

- Scottish Fishermen's Federation
- Joint Nature Conservation Committee
- Marine Scotland
- OPRED EMT
- OPRED ODU
- Equinor Energy AS

At the workshop, each decommissioning option for the infrastructure was assessed against each of the assessment criteria utilising a pairwise comparison system. The relative importance of each of the criteria was assessed in a qualitative way, supported by quantification where appropriate.

The process provides for differentiation between decommissioning options in each infrastructure group taking account of stakeholder views, the workshop also allowed for sensitivities to be run adjusting the relationship between different options across the five main criteria.

3.1.3 Outcome of the Comparative Assessment

Table 3-3 Outcomes of Comparative Assessment

Pipeline or Group	Recommended Option	Justification
Group 1: PL301	Rock Placement over areas of spans / exposure	The emerging recommendation of the Comparative Assessment is Option 4A – Leave *in situ* (Minor Intervention) – Rock placement over spans / exposures. The seabed footprint of the rock expected to be required is 0.01373 km^2. The locations of spans that will be remediated can be found in Appendix B. This option scored the highest against Safety, scored second highest against Environmental, joint highest for Technical and joint second for Societal considerations. Economic considerations are not justifiable to be the driving characteristic in decision making, however, Option 4A also had the best economic score.

A Comparative Assessment report has also been produced to accompany this DP and provide further information regarding the CA process and the emerging recommended option for decommissioning is presented. This decommissioning option is consistent with the decommissioning activities planned to be undertaken along the Norwegian Continental Shelf section of PL301. For a full list of supporting documentation see Table 7-1.

3.2 Waste Streams

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 and Equinor will adhere to their Duty of Care obligations as outlined under the requirements of Section 34 of the Environmental Protection Act, 1990. Due to the transboundary nature of PL301 it is possible that waste may be transported over international boundaries, requiring the consideration of Trans Frontier Shipment of Waste (TFSW), including hazardous materials. Early engagement with the relevant regulatory authorities will ensure that any issues with TFSW are addressed.

Table 3-4 Waste stream management methods

Waste Stream	Removal and Disposal method
Bulk liquids	No bulk liquids are expected to be removed or disposed of during this decommissioning project. The PL301 will be flushed and cleaned prior to decommissioning operations commencing. All flushing liquids will be routed into new pipeline system for further export. There will be no discharge of solids or fluids from this flushing and cleaning process.
Marine growth	No marine growth is expected to be removed offshore. Disposal of the small section of PL301 will be managed by the selected onshore waste management contractor.

Waste Stream	Removal and Disposal method
NORM/LSA Scale	NORM is not expected for the small section of PL301 that will be removed, however if NORM contaminated material is present removal and disposal will be done under appropriate permit and licenced contractor.
Asbestos	No asbestos is expected to be removed or disposed of during this decommissioning project.
Other hazardous wastes	Will be recovered onshore and will be managed by the selected waste management contractor and disposed of under appropriate permit.
Onshore Disposal	Appropriate licenced contractor and sites will be selected. Facility selected must demonstrate competence and proven disposal track record and waste stream management & traceability throughout the deconstruction process and (preferably) demonstrate their ability to deliver innovative recycling options. Once a disposal yard has been selected, the appropriate regulatory bodies will be advised.

Table 3-5 Inventory disposition

	Total Inventory Tonnage (Te)	Planned tonnage to shore (Te)	Planned left *in situ* (Te)
Pipelines	5,775.3	3.0	5,772.3

All recovered material will be brought onshore for re-use, recycling or disposal. It is not possible to predict the market for reusable materials with any confidence; so, the figures in Table 3-6 are disposal aspirations. For a full breakdown of the materials inventory and the emissions associated with the waste material see Section 5 within the Environmental Appraisal report.

Table 3-6 Recovered inventory reuse, recycle, disposal aspirations

	Reuse (Te)	Recycle (Te)	Disposal (Te)
Pipelines	0	1.1	1.9

Waste streams shall be managed in accordance with Equinor's waste management policies by suitable qualified contractors and compliance with the relevant international and national guidelines and regulations.

Refer to Section 5 of the Environmental Assessment for further details

4 ENVIRONMENTAL APPRAISAL OVERVIEW

4.1 Summary of Environmental Sensitivities

Table 4-1 Environmental sensitivities

Environmental Receptor	Main Features
Conservation interests	No decommissioning activity occurs within designated areas however, there are several sites in the vicinity of PL301 that are designated. The Braemar Pockmarks SAC is a conservation interest that it is located 8 km NW of PL301 at the point it crosses onto the UKCS. 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' (JNCC, 2019). Pipeline inspection surveys have identified the presence of small pockmarks along the PL301 however Methane Derived Authigenic Carbonate (MDAC) was not observed (Deepocean, 2017). The closest Nature Conservation Marine Protected Area (NCMPA) is the Norwegian Boundary Sediment Plain NCMPA (~60 km SSE of the Brae Alpha). It has been designated due to its importance to ocean quahog. The site lies adjacent to the UKCS/Norwegian median line (Scottish Government, 2014). There is no evidence of protected species or habitats along the PL301.
Seabed Habitats and Fauna	The seabed around the Brae Alpha is classified as EUNIS habitat complex A5.27 'Deep circalittoral sand' (EMODnet, 2019). The majority of the 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). This area is classified as EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019). Survey result confirmed that the sediment in the area around Brae Alpha has a substantial silt and clay component (Oil and Gas UK, 2019). EUNIS complex A5.27 'Deep circalittoral sand' (EMODnet, 2019) is likely to be characterised by a diverse range of polychaetes, amphipods, bivalves and echinoderms (European Environment Agency, 2019a). Communities associated with EUNIS habitat A5.37 'Deep circalittoral mud' (EMODnet, 2019) are typically dominated by polychaetes but often with high numbers of bivalves such as *Thyasira spp*., echinoderms and foraminifera (European Environment Agency, 2019b). All surveys conducted around the Brae Alpha and nearby fields presented communities dominated by polychaetes (in particular *Paramphinome jeffreysii* was consistently the most abundant). Echinoderms were also prevalent, and molluscs made up a lesser component of the benthos (BP 2011, Marathon 2017a, 2017b, Oil and Gas UK, 2019). The existing survey data indicates a relatively stable marine environment with a limited or low rate of change in benthic species and habitat over an extended period of time. The following PMF benthic features are known to occur close to the Brae Alpha platform and PL301: 'Ocean quahog *Arctica islandica*' (an OSPAR 2008 listed habitat), 'Mud burrowing amphipod *Maera lovenii*', 'Seapens and burrowing megafauna in circalittoral fine mud' (an OSPAR 2008 listed habitat), and 'Burrowed mud' (SNH, 2014). *A. islandica* was only found at a few sites within each survey area and in very low numbers which did not indicate the presence of aggregations. Seapens (including both *Pennatula phosphorea* and *Virgularia mirabilis* species) and occasional to frequent megafauna burrows were observed along the pipeline route.

Fish	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* 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). The probability of 0 group (i.e. juvenile) fish species occurring in the vicinity of the Brae Alpha and PL301 was low across all species (Aires *et al.*, 2014).
Commercial Fisheries	The PL301 route is located within International Council for the Exploration of the Seas (ICES) Rectangle 46F1. According to fishing data from the Scottish Government (2019a), fisheries in 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. Monkfish/anglerfish were also amongst the highest value catch in the area (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.
Marine Mammals	Harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), and white-beaked dolphins (*Lagenorhynchus albirostris*) are the most likely cetaceans to be seen within the project area, though they are usually found in low densities: 0.6 animals/km^2; 0.03 animals/km^2; and 0.2 animals/km^2 respectively (Hammond *et al.*, 2017). Harbour porpoise are common in UK waters and, according to observational data, are most likely to be observed in the vicinity of the project in January and June (Reid *et al.*, 2003). Minke whale are most likely to be sighted around the project area in the spring and summer months (Hammond *et al.*, 2017). White-beaked dolphin may be found around the project area from summer into the early winter months (Reid *et al.*, 2003). Pinnipeds are not expected in significant numbers in the project vicinity due to the site being approximately 190 km offshore. Both harbour seals and grey seals are found at densities of 0-1 individuals per 25 km^2 in the project area (SMRU, 2011).
Seabirds	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* (Kober *et al*., 2010). 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).
Onshore Communities	Waste generated during decommissioning will be transported to shore in an auditable manner through licensed waste contractor. An onshore decontamination and dismantlement facility will be used that has demonstrated it is able to comply with all relevant permitting and legislative requirements for the materials associated with the project.
Other Users of the Sea	The area around Brae Alpha and PL301 are located in the NNS in an area of extensive oil development. Further detail on oil and gas associated infrastructure and installations within the vicinity of the decommissioning project are provided in Table 1-7. Shipping activity in Blocks 16/3, 16/7 and 16/8, through which the PL301 passes, is considered low (Oil and Gas Authority, 2016). Cargo vessels and tankers constitute the majority of marine traffic around the Brae Alpha and along the PL301. Passenger and service craft are also present in the area to a lesser extent (MMO, 2016). The closest telecommunication cables in the vicinity of the project area is the telecom Tampnet 3 cable (25.5 km ESE). There are no renewable sites near the project area. There are no military restrictions on Blocks 16/3, 16/7 and 16/8 (Oil and Gas Authority, 2019). There are 10 wrecks within 20 km of the project area, nine of which are unknown. There are no protected wrecks in the vicinity (Scottish Government, 2019b).
Atmosphere	The majority of atmospheric emissions for the Decommissioning Project relate to vessel time, or are associated with the structures decommissioned *in situ*, or production of remediation materials. As the decommissioning activities proposed are of short duration, this aspect is 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, this equates to 0.19% of the total UKCS vessel emissions (excluding fishing vessels) in 2017 (7,800,000 Te; BEIS, 2019).

4.2 Potential Environmental Impacts and their Management

4.2.1 Environmental Impact Assessment Summary:

The EA addresses potential environmental and societal impacts by characterising the likelihood and significance of interactions between the proposed decommissioning activities and the local environment, whilst considering stakeholder response. The EA also details mitigation measures designed to abate potential impacts in accordance with Equinor's Environmental Management System (EMS) and Health, Safety, Environment and Security (HSES) Policy.

Key potential environmental and societal impacts which were considered to be 'potentially significant', and thus requiring further assessment, were identified through an internal environmental issue identification (ENVID) workshop; they include: seabed impacts; and impacts to commercial fisheries. These potential impacts have undergone detailed assessment within the EA. The following environmental and societal impacts were screened out from further assessment due to existing controls limiting the likelihood of potential significant impacts:

- emissions to air;
- vessel presence;
- underwater noise emissions;
- resource use;
- onshore activities;
- waste; and
- unplanned events.

The justifications for screening out these impact pathways are detailed in Section 5 of the accompanying EA.

The EA concludes that the recommended options to decommission PL301 can be completed without causing significant impact to environmental or societal receptors.

4.2.2 Overview

Table 4-2 describes the potential impact pathways identified from the relevant infrastructure to be decommissioned, alongside the proposed management measures in place to mitigate against them.

Table 4-2 Environmental impact management

Activity	Main Impacts	Management
Decommissioning Rigid Flowlines (incl. Stabilisation Features)	Seabed impacts from decommissioning of rigid flowlines *in situ*: • Rock placement along spans / exposures; and • overtrawling. Potential residual snagging risk associated with pipelines decommissioned *in situ*. Environmental Appraisal Section 6.1.2.2	There are mitigation measures relating to the placement of rock along exposures / spans. Rock 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 material, that the deposited rock footprint will be as small as possible, and that the minimum safe quantity of rock is used. Rock will be deposited into an existing trench and the profile designed to present the smallest profile to commercial fishing gear as possible. The existing controls of continued monitoring for an agreed period, remediation where required, accurate mapping of the location and state of the PL301 which has been decommissioned *in situ* reduces the probability of impacts to commercial fisheries. 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 geophysical survey methods to provide a collective profile of the PL301 to identify potential free spans, as well as identify any remaining field debris will be carried out. Overtrawling will only be used if necessary, as a form of remediation of any potential snag risk.
Decommissioning other Mattresses and Grout Bags (Difficult Recovery)	Legacy impacts from mattresses and grout bags decommissioned *in situ* include: • snagging risk to commercial fisheries; and • seabed impacts, including from the deposition of new rock material (where required). Environmental Appraisal Section 6.1.2.3	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. Rock placement will be carefully managed, e.g. through use of an ROV to limit the areas covered (reducing unnecessary spreading) and depth of coverage to that required to ensure no snagging hazards remain.

5 INTERESTED PARTY CONSULTATIONS

5.1 Consultations Summary

The stakeholder consultation for the decommissioning of the 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)
- Brae Alpha Operator
- Scottish Fishermen's Federation (SFF)
- Joint Nature Conservation Committee (JNCC)

The results of the consultations are summarised in Table 5-1.

Table 5-1 Summary of stakeholder comments

Who	Comment	Response
Informal Stakeholder Consultations		
Public	No public comments have been received	
Statutory Consultations		
National Federation of Fisherman's Organisations (NFFO)	E-mail sent outlining high-level explanation of project on 17. June 2020	No response
Northern Irish Fish Producers Organisation (NIFPO)	E-mail sent outlining high-level explanation of project on 17. June 2020	No response
Global Marine Systems Limited	As there are no existing active telecommunication cables in the region, GMS have no further comments. In the event that the decom program changes, and seabed invasive operations are to occur near existing telecom infrastructure, it will be important to notify any nearby cable owners of any upcoming operations	Noted

Scottish Fisherman's Federation (SFF)	We accept the reasoning behind the recommendation (based on the outcome of the comparative assessment of feasible options) of leaving in situ with minimum intervention in order to minimise seabed disturbance. As you will be aware, any pipelines/umbilicals left on the seabed represent a legacy issue and will require on going monitoring. Where rock cover is deployed, we would look for the size and profile of the rock to follow normal industry standards and would recommend that such rock dump berms are incorporated into post decommissioning debris clearance trawl sweeps to verify that, at the time of deposit, they did not pose a risk to fishing. We would take this opportunity to highlight that the SFF has serious reservations and is yet to be convinced regarding the use of alternative methods of verifying to fishermen that it is safe for fishing to resume in an area following the removal of oil and gas related infrastructure, and has made its views known to OPRED. For where an area of seabed was previously bottom trawled prior to oil and gas operations taking place and where bottom trawling is permitted to take place following decommissioning works, it is our view that the best way to satisfy fishermen that the area is safe for fishing to resume is to undertake a trawl sweep, under controlled conditions, which replicates the most common method of fishing that takes place in that locality.	The proposed method for clear seabed validation is through non-intrusive methodologies, a post decommissioning overtrawl sweep will be performed on areas of potential snag risk. The methods used will be discussed and finalised with OPRED.

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Project Management team will be appointed to manage suitable contractors for the decommissioning of PL301. Standard procedures for operational control and hazard identification and management will be used. The Project Management team will monitor and track the process of consents and the consultations required as part of this process. Any changes in detail to the offshore decommissioning programme will be controlled by Equinor's Management of Change processes and discussed and agreed with OPRED.

6.2 Post-Decommissioning Debris Clearance and Verification

During site clearance activities, reasonable endeavours will be made to recover any dropped objects and items subject to any outstanding Petroleum Operations Notices. All recovered seabed debris related to offshore oil

and gas activities will be returned for onshore disposal or recycling in line with existing disposal arrangements. A post decommissioning site survey, to verify decommissioning activities have been completed, will be carried out along a 100m corridor (50m either side) over the entire PL301 length (38 km).

The proposed method for clear seabed validation is through non-intrusive methodologies, a post decommissioning overtrawl sweep will be performed on areas of potential snag risk. The methods used will be discussed and finalised with OPRED.

6.3 Schedule

The high-level Gantt chart Figure 6-1 provides the overall schedule for the decommissioning activities of the PL301.

Figure 6-1 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								

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 DP, 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.

6.4 Costs

An overall cost estimate following UK Oil & Gas Guidelines on Decommissioning Cost Estimation (Issue 3, October 2013) will be provided to OPRED.

6.5 Close Out

In accordance with the OPRED Guideline Notes, a close out report will be submitted to OPRED and posted on the Equinor website reconciling any variations from the Decommissioning Programme within one year of the completion of the offshore decommissioning scope. This will include debris removal and, where applicable independent verification of seabed clearance, and the first post-decommissioning environmental survey.

6.6 Post-Decommissioning Monitoring and Evaluation

The route of PL301 will be subject to oilfield debris clearance and a non-invasive as-left verification survey when decommissioning activity has concluded.

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 infrastructure is trenched below seabed level or trenched & buried below, the effect of interaction with other users of the sea is considered to be negligible.

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.

7 SUPPORTING DOCUMENTS

Table 7-1 Supporting documents

Document Number	Title
A400300-S00-REPT-001	Environmental Appraisal
A400300-S00-REPT-005	Comparative Assessment

8 PARTNER LETTERS OF SUPPORT

Offshore Petroleum Regulator for Environment and Decommissioning
Department for Business, Energy & Industrial Strategy
3rd Floor, Wing C
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

13th of April 2021

Dear Sir or Madam

HEIMDAL TO BRAE ALPHA CONDENSATE PIPELINE PL301
DECOMMISSIONING PROGRAMME PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 25th of March 2021.

We, Spirit Energy Norway AS, confirm that we authorise Equinor Energy AS to submit on our behalf an abandonment programme relating to the abandonment of the Heimdal to Brae Alpha Condensate Pipeline PL301 as directed by the Secretary of State on 25th of March 2021.

We confirm that we support the proposals detailed in the Equinor Energy AS Decommissioning Programme dated 12th of April 2021, which is to be submitted by Equinor Energy AS in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully

DocuSigned by:
Haavard Nygaard
7F2BDC9B0EAB422...

Haavard Nygård
Asset Manager Heimdal
For and on behalf of Spirit Energy Norway AS

Offshore Petroleum Regulator for Environment and Decommissioning
Department for Business, Energy & Industrial Strategy
3rd Floor, Wing C
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

Stavanger 13th of April 2021

Dear Sir or Madam

HEIMDAL TO BRAE ALPHA CONDENSATE PIPELINE PL301 DECOMMISSIONING PROGRAMME PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 25th of March 2021.

We, Petoro confirm that we authorise Equinor Energy AS to submit on our behalf an abandonment programme relating to the abandonment of the Heimdal to Brae Alpha Condensate Pipeline PL301 as directed by the Secretary of State on 25th of March 2021.

We confirm that we support the proposals detailed in the Equinor Energy AS Decommissioning Programme dated 12th of April 2021, which is to be submitted by Equinor Energy AS in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully

Gunnar Nybø
Asset Manager
For and on behalf of Petoro AS

Offshore Petroleum Regulator for Environment and Decommissioning
Department for Business, Energy & Industrial Strategy
3rd Floor, Wing C
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

13th of April 2021

Dear Sir or Madam

HEIMDAL TO BRAE ALPHA CONDENSATE PIPELINE PL301 DECOMMISSIONING PROGRAMME PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 25th of March 2021.

We, Total E&P Norge AS confirm that we authorise Equinor Energy AS to submit on our behalf an abandonment programme relating to the abandonment of the Heimdal to Brae Alpha Condensate Pipeline PL301 as directed by the Secretary of State on 25th of March 2021.

We confirm that we support the proposals detailed in the Equinor Energy AS Decommissioning Programme dated 12th of April 2021, which is to be submitted by Equinor Energy AS in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully
Mikkel FJELDHEIM
Digitally signed by Mikkel FJELDHEIM
Date: 2021.04.12 12:02:13 +02'00'
Mikkel Fjeldheim
Director HSE and Operations
For and on behalf of Total E&P Norge AS

Offshore Petroleum Regulator for Environment and Decommissioning
Department for Business, Energy & Industrial Strategy
3rd Floor, Wing C
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

13th of April 2021

Dear Sir or Madam

HEIMDAL TO BRAE ALPHA CONDENSATE PIPELINE PL301 DECOMMISSIONING PROGRAMME PETROLEUM ACT 1998

We acknowledge receipt of your letter dated 25th of March 2021.

We, LOTOS Exploration & Production Norge AS, confirm that we authorise Equinor Energy AS to submit on our behalf an abandonment programme relating to the abandonment of the Heimdal to Brae Alpha Condensate Pipeline PL301 as directed by the Secretary of State on 25th of March 2021.

We confirm that we support the proposals detailed in the Equinor Energy AS Decommissioning Programme dated 12th of April 2021, which is to be submitted by Equinor Energy AS in so far as they relate to those facilities in respect of which we are required to submit an abandonment programme under section 29 of the Petroleum Act 1998.

Yours faithfully

Piotr Statkiewicz

CEO
For and on behalf of LOTOS Exploration & Production Norge AS

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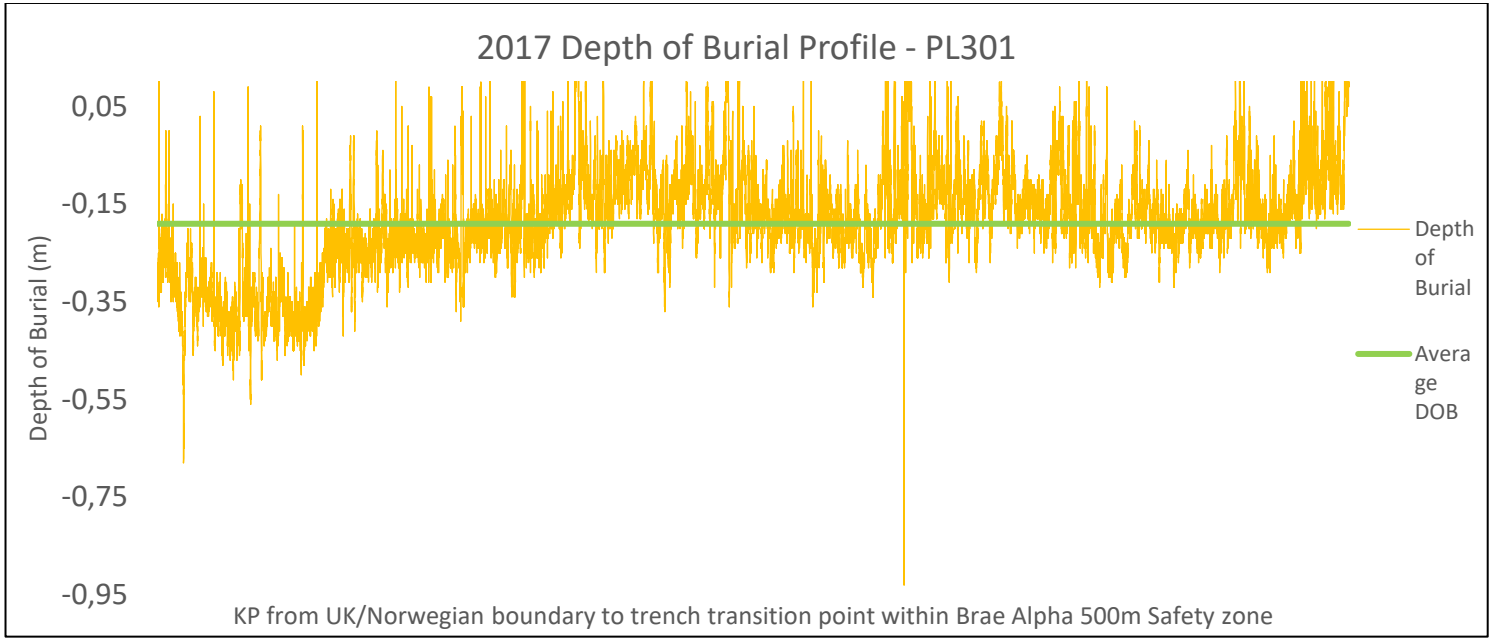
APPENDIX A PL301 DEPTH OF BURIAL

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 B, 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 B PL301 EXPOSURES

Table B- 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 DP are less than 0.8m in height or 10m in length and as such are non-reportable.

Table B- 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

Table B- 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

Table B- 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 C PL301 Images

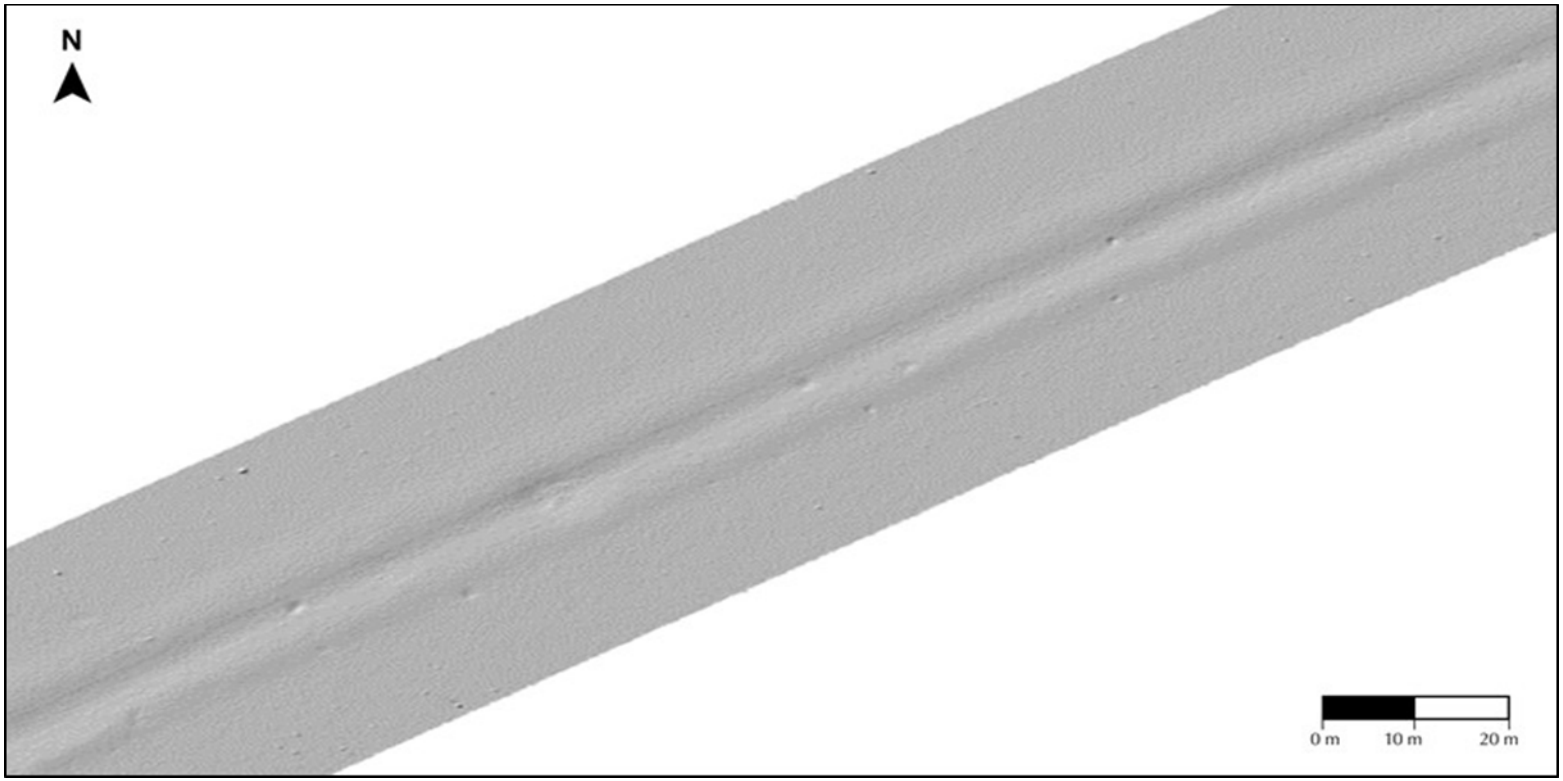


Figure C-1Section of Multibeam Echosounder image from 2017 survey between KP100.042 and KP100.941 showing typical seabed appearance over trenched and naturally backfilled PL301

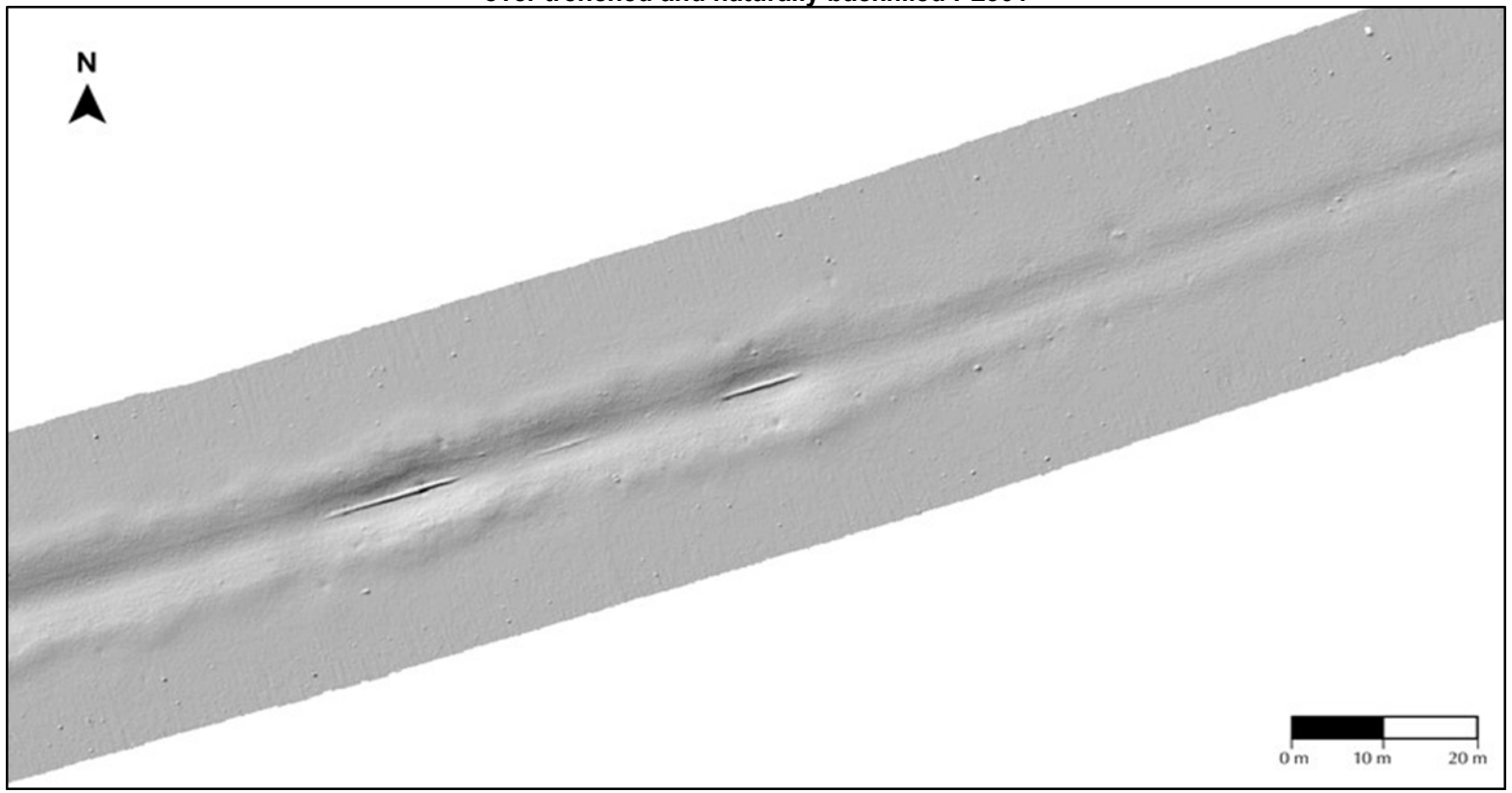


Figure C-2 Section of Multibeam Echosounder image from 2017 survey between KP 100.940 and KP 101.837 showing short sections of PL301 exposures within the trench

Figure C-3 Image from 2013 pipeline survey at KP 91.363 showing section of PL301 exposure within the trench

Figure C-4 Image from 2017 pipeline survey at KP 91.364 showing section of PL301 naturally backfilling within the trench

APPENDIX D 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)

APPENDIX E PL301 CA SCREENING SUMMARY

		Re-use	Full Removal			Leave in-situ - Major Intervention		Leave in-situ - Minor Intervention			Leave As-is
		Option 1 - Re-use	Option 2A - Cut and Lift with Deburial	Option 2B - Reverse Installation (S-lay or Reel) without Deburial	Option 2C - Reverse Installation (S-lay or Reel) with Deburial	Option 3A - Rock Placement over Entire Line	Option 3B - Re-trench & Bury Entire Line	Option 4A - Rock Placement Over Areas of Spans / Exposure	Option 4B - Trench & Bury Areas of Spans / Exposure	Option 4C - Remove Areas of Spans / Exposure	Option 5 - Leave as-is
Criteria	Safety	A review of potential reuse options has indicated that there are no viable reuse options in this location. Ruled out as a technical showstopper accordingly.		Although an integrity study is needed to inform and provide evidence re: ability to Reverse Install concrete coated line due to pipe integrity, it is felt that visual evidence supports the theory that structural integrity of the concrete coating is already compromised and would therefore make this a show stopper on both technical and safety grounds.	Although an integrity study is needed to inform and provide evidence re: ability to Reverse Install concrete coated line due to pipe integrity, it is felt that visual evidence supports the theory that structural integrity of the concrete coating is already compromised and would therefore make this a show stopper on both technical and safety grounds.	Although technically feasible this option is considered an Environmental showstopper due to the large volume of rock required to bury the entire length of the pipeline within the UKCS (circa 38km), and the resulting permanent biological impact and changes sediment type rock placement would cause.	Overall, given the challenges associated with achieving depth of lowering over the entire pipeline length during installation, this has been considered a technical showstopper.		Overall, given the challenges associated with achieving depth of lowering over the entire pipeline length during installation, this has been considered a technical showstopper.		Due to the presence of known spans, leaving this pipeline would present an unacceptable snag hazard. Considered a safety showstopper accordingly.
	Environment										
	Technical										
	Societal										
	Economic										
Summary			Retained					Retained		Retained	

Criteria	Key
Attractive	
Acceptable	
Unattractive	
Showstopper	