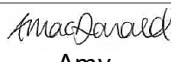
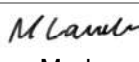








KETCH DECOMMISSIONING PROGRAMMES FINAL JULY 2019



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07	15.02.19	For Consultation	 Mark Lauder	 Paul Barron	 John Wood
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A. TABLE OF TERMS & ABBREVIATIONS

Abbreviation	Explanation
API	American Petroleum Institute
BEIS	Department for Business, Energy and Industrial Strategy
CA	Comparative Assessment
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
COP	Cessation of Production
CtL	Consent to Locate
DECC	Department of Energy and Climate Change (now BEIS)
DNO	DNO North Sea (ROGB) Limited
DP	Decommissioning Programme
DSV	Diving Support Vessel
E	Easting (coordinate)
EA	Environmental Appraisal
ES	Environmental Statement
ESDV	Emergency Shut Down Valve
FLO	Fishing Liaison Officer
HLV	Heavy Lift Vessel
HRA	Habitat Regulations Assessment
HSE	Health and Safety Executive
ICC	Installation Control Centre
ICES	International Conference on Environmental Systems
JNCC	Joint Nature Conservation Committee
km	Kilometre
KP	Kilometre Point
LAT	Lowest Astronomical Tide
LSA	Low Specific Activity
m	Metres
MAT	Master Application Template
MBES	Multi-beam Echo Sounder
MCZ	Marine Conservation Zone
MeOH	Methanol
MMO	Marine Mammal Observer

MPA	Marine Protected Area
MODU	Mobile Offshore Drilling Unit
N	Northing (coordinate)
NE	North East
NW	North West
NNW	North-northwest
NFFO	National Federation of Fishermen's Organisations
NIFPO	Northern Ireland Fish Producers Organisation
NNR	National Nature Reserve
NORM	Naturally Occurring Radioactive Material
N/A	Not Applicable
NUI	Normally Unattended Installation
OESEA2	UK Offshore Strategic Environmental Assessment 2
OGA	Oil & Gas Authority
O & G UK	Oil & Gas UK
OIW	Oil in Water
OPEP	Oil Pollution Emergency Plans
OPRED	Offshore Regulator for Environment and Decommissioning
OSRL	Oil Spill Response Limited
OSPAR	Oslo and Paris Convention
PAM	Passive Acoustic Monitoring
P & A	Plug and Abandonment
PL	Pipe Line
POB	Personnel on Board
PON	Petroleum Operations Notice
QRA	Quantitative Risk Assessment
SAC	Special Area of Conservation
SAT	Subsidiary Application Template
SCAPs	Supply Chain Action Plans
SCI	Site of Community Importance
SLV	Sheer Leg Vessels
SNS	Southern North Sea
SFF	Scottish Fishermen's Federation
SSS	Side Scan Sonar
TBC	To Be Confirmed
Te	Tonnes
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
UKDMAP	United Kingdom Digital Marine Atlas

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1. EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains two Decommissioning Programmes (DPs) for one installation and two pipelines served under Section 29 of the Petroleum Act 1998, for the Ketch field in the Southern North Sea (SNS).

1.2 Requirement for Decommissioning Programmes

Installation: In accordance with the Petroleum Act 1998, the section 29 notice holders of the Ketch Installation (see Table 1.2) are applying to the Department for Business, Energy and Industrial Strategy (BEIS) to obtain approval for decommissioning the installation detailed in Section 2.1 and 2.2 of this programme. (See also Section 8 – Partners' Letters of Support).

Pipelines: In accordance with the Petroleum Act 1998 the section 29 notice holders of the Ketch field export pipeline PL1612 and piggyback pipeline PL1613 (see Table 1.4) are applying to BEIS to obtain approval for decommissioning the pipeline detailed in Section 2.3 of this programme. (See also Section 8 – Partners' Letters of Support).

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and BEIS guidelines. The schedule outlined in this document is for a six year decommissioning project due to begin in 2018.

1.3 Introduction

The Ketch field is located in the Southern Basin of the UKCS, in license block 44/28a, 26.6 km from the Murdoch installation, which acts as the Installation Control Centre (ICC) for Ketch. The Ketch platform was installed in 1998 and exports gas through an 18" line to the Murdoch Platform. From Murdoch, the gas flows to shore at the Theddlethorpe Gas Terminal via a trunk line.

The co-ordinates of the Ketch Platform are: 54° 03' 00.57" N, 02° 29' 23.18" E. (See Table 2.1).

The Ketch installation is a Normally Unattended Installation (NUI) with maximum personnel on board (POB) of 12 plus 2 flight crew, with a temporary overnight shelter.

The owners of the Ketch field have considered several technical and commercial solutions in order to prolong field life as described in the Cessation of Production (COP) document; either as a standalone field or in conjunction with other fields in the area; however, none of them have been assessed to be economic. The Ketch field partnership is now seeking consent for the Cessation of Production in line with the Theddlethorpe Gas Terminal cessation of operations in 2018.

The Ketch installation estimated weights are; Topsides 2,179 tonnes (this includes the weight of the conductors and their trees), Jacket 1,550 tonnes and Piles 690 tonnes.

The Ketch topside is a conventional carbon steel structure with a sub-cellar deck (+19.5m), cellar deck (+23.5m), mezzanine deck (+27.7m) and a top deck (+32.5m). A helideck is situated above the top deck (+37.5m). Access between platform levels is provided by ladders and stairways. There are

twelve well slots of which nine have been drilled. The overall base dimensions of the jacket are 20m x 22m.

The Ketch jacket is a conventional 4-leg skirt piled steel structure with a single tubular pile installed through each leg's skirt structure. The jacket has a single vertical face to facilitate approach of a jack-up rig; the three other faces have a batter.

Following public, stakeholder and regulatory consultation, the decommissioning programmes are submitted without derogation and in full compliance with BEIS guidelines. The decommissioning programmes explain the principles of the removal activities and are supported by an Environmental Appraisal (EA) and in the case of the pipelines and their associated stabilisation features a Comparative Assessment (CA).

1.4 Overview of Installation/Pipelines Being Decommissioned

1.4.1 Installations

Table 1.1: Installation Being Decommissioned			
Field:	Ketch	Production Type (Oil/Gas/Condensate)	Gas
Water Depth (m)	54	UKCS block	44/28a
Surface Installation			
Number	Type	Topsides Weight (Te)	Jacket Weight (Te)
1	4-leg Skirt Piled Steel Jacket	2,179 ^[2]	1,550 ^[1]
Subsea Installation		Number of Wells	
Number	Type	Platform	Subsea
None	N/A	10 ^[3] Platform Wells	0 Subsea Wells
Drill Cuttings pile		Distance to median	Distance from nearest UK coastline
Number of Piles	Total Estimated volume (m ³)	km	km
None	0	23.1 km	147 km

[1] Jacket weight and weight of proportion of piles to be removed with the jacket and weight of marine growth.

[2] Topsides weight includes weight of conductors and trees estimated to be 900 tonnes total.

[3] Total number of wells includes sidetrack well

Table 1.2 Installation Section 29 Notice Holders Details		
Section 29 Notice Holder(s)	Registration Number	Equity Interest (%)
DNO NORTH SEA (ROGB) LIMITED	01852301	60%
TULLOW OIL SK LIMITED	05287330	40%
DNO NORTH SEA (U.K.) LIMITED	04848017	0%
DNO NORTH SEA PLC	04622251	0%
TULLOW OIL PLC	03919249	0%

1.4.2 Pipelines

Table 1.3: Pipelines Being Decommissioned

Number of Pipelines	2	(See Table 2.3)
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Table 1.4: Pipelines Section 29 Notice Holder Details

Section 29 Notice Holders	Registration Number	Equity Interest (%)
DNO NORTH SEA (ROGB) LIMITED	01852301	60%
TULLOW OIL SK LIMITED	05287330	40%
DNO NORTH SEA (U.K.) LIMITED	04848017	0%
DNO NORTH SEA PLC	04622251	0%
TULLOW OIL PLC	03919249	0%

The above table shows current and exited parties for

- PL1612 from and including the Ketch KA to and including the Riser tie-in spool swivel flange at Murdoch.
- PL1613 from and including the Riser spool at Murdoch to and including Ketch Platform

Table 1.5: Murdoch Riser Section 29 Notice Holder Details

Section 29 Notice Holders	Registration Number	Equity Interest (%)
CONOCOPHILLIPS (U.K.) LIMITED	00524868	31.75%
CONOCOPHILLIPS (U.K.) BETA LIMITED	02316577	15%
PREMIER OIL E&P UK LIMITED	02761032	20%
TULLOW OIL SK LIMITED	05287330	17%
NEPTUNE E&P UKCS LTD	03386464	16.25%
TULLOW OIL PLC	03919249	0%

The above table shows current and exited parties for:-

- PL1612 from but not including the Riser tie-in spool swivel flange at Murdoch to and including Murdoch MD
- PL 1613 from and including the Murdoch Platform to but not including the Riser tie-on spool at Murdoch

1.5 Summary of Proposed Decommissioning Programmes

There are currently two options under consideration for the decommissioning of the Ketch platform. The topsides and jacket will be rendered hydrocarbon free. They will then either be:-

- Completely removed and re-used or recycled. (default option) or;
- Remain in situ and be converted to an offshore windfarm support facility.

Once this reuse option has come to an end, the first complete removal option will be followed.

Liaison between DNO and an offshore wind farm company regarding the feasibility of the platform being converted to an offshore windfarm facility are currently ongoing. A final decision regarding whether the platform is to be reused or removed and disposed of onshore will be made in 2020, when the reuse feasibility studies and any reuse commercial agreements have been completed. Following the feasibility / commercial evaluation process DNO will inform OPRED of the result and vary the DP to show the final removal option.

Table 1.6: Summary of Decommissioning Programmes		
Selected Option	Reason for Selection	Proposed Decommissioning Solution
1. Topsides		
Topsides to remain in situ and be converted to an offshore windfarm support facility.	Complies with OSPAR requirements. Reuse in situ is the most economic and environmentally friendly post decommissioning option.	Remove all hydrocarbons and hydrocarbon related equipment. Convert and remodel topsides for use as an offshore wind farm support facility.
Complete removal and re-use or recycle	Complies with OSPAR requirements and maximizes recycling of materials.	Decontaminate the topside and remove the topside either by HLV or combination of crane vessel and piece small dismantling. Re-use followed by recycle and then landfill will be the prioritised disposal options for the topside.
2. Jacket		
Jacket to remain in situ to support topsides converted to an offshore windfarm support facility.	Complies with OSPAR requirements. Reuse in situ is the most economic and environmentally friendly post decommissioning option.	Jacket to remain in situ. Topsides hydrocarbon production related equipment to be removed. Re-use followed by recycle then landfill will be the prioritised disposal options for the topside equipment.
Complete removal and recycling.	Leaves clean seabed, removes a potential obstruction to fishing operations and maximizes recycling of materials, to comply with OSPAR requirements.	Jacket legs will be removed and dismantled at an onshore location. Recycle and then landfill will be the prioritised disposal options. Piles will be severed at least -3.0m below the seabed. If any practical difficulties are encountered DNO will consult BEIS.
3. Subsea Installations		
There are no subsea installations associated with Ketch. Exploratory wells. All exploratory wells have been plugged and abandoned.		
4. Pipelines, Flowlines & Umbilical		
The 18" export line (PL1612) will be pigged, flushed and naturally	Minimal seabed disturbance, lower energy usage, reduced risk to	Pipelines will be flushed to Murdoch and fluids disposed of down a disposal well.

trenched and buried in situ. The 3" MeOH line (PL1613) will be flushed and buried in situ.	personnel engaged in the activity. Pipelines are sufficiently buried and are stable. Survey burial profiles can be found in the appendix.	PETS applications and required PWA's will be made. The 18" export line along with the 3" MeOH line will be left in situ, with the cut ends naturally re-buried along with the rest of the pipeline at such a depth to ensure that any remains are unlikely to become uncovered. Surveys indicate the pipelines will remain buried; degradation will occur over a long period within seabed sediment and is not expected to represent a hazard to other users of the sea. The pipeline ends will be naturally buried, if they do not remain buried they will be buried with biodegradable grout bags. Pipeline burial profiles are included in the appendices.
5. Wells		
Plug and abandoned to comply with the HSEs "Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996" and in accordance with O & G UK guidance for the Suspension and Abandonment of Wells.	Meets HSE regulatory requirements in accordance with O & G UK and OGA.	A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) will be submitted in support of works carried out. A PON 5 will also be submitted to the OGA in support of works carried out.
6. Drill Cuttings		
Drill cuttings were removed to shore when wells were drilled.	N/A	N/A
7. Interdependencies		
Whole of jacket can be removed. Small amounts of sediment may have to be displaced to allow cutting of jacket piles.		

1.6 Field Location Including Field Layout and Adjacent Facilities

Figure 1.1: Ketch location within Southern North Sea

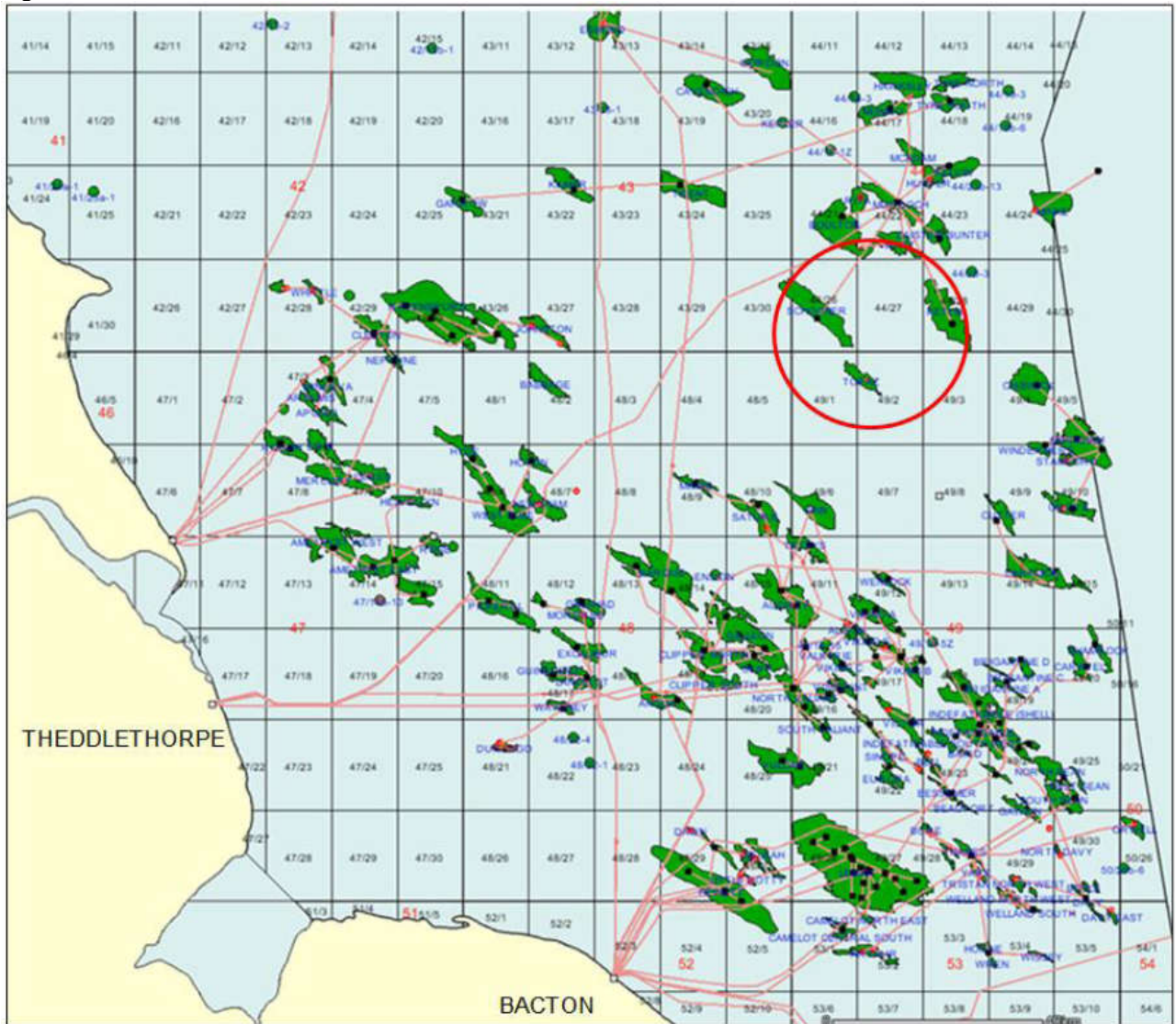


Figure 1.2: Field Layout

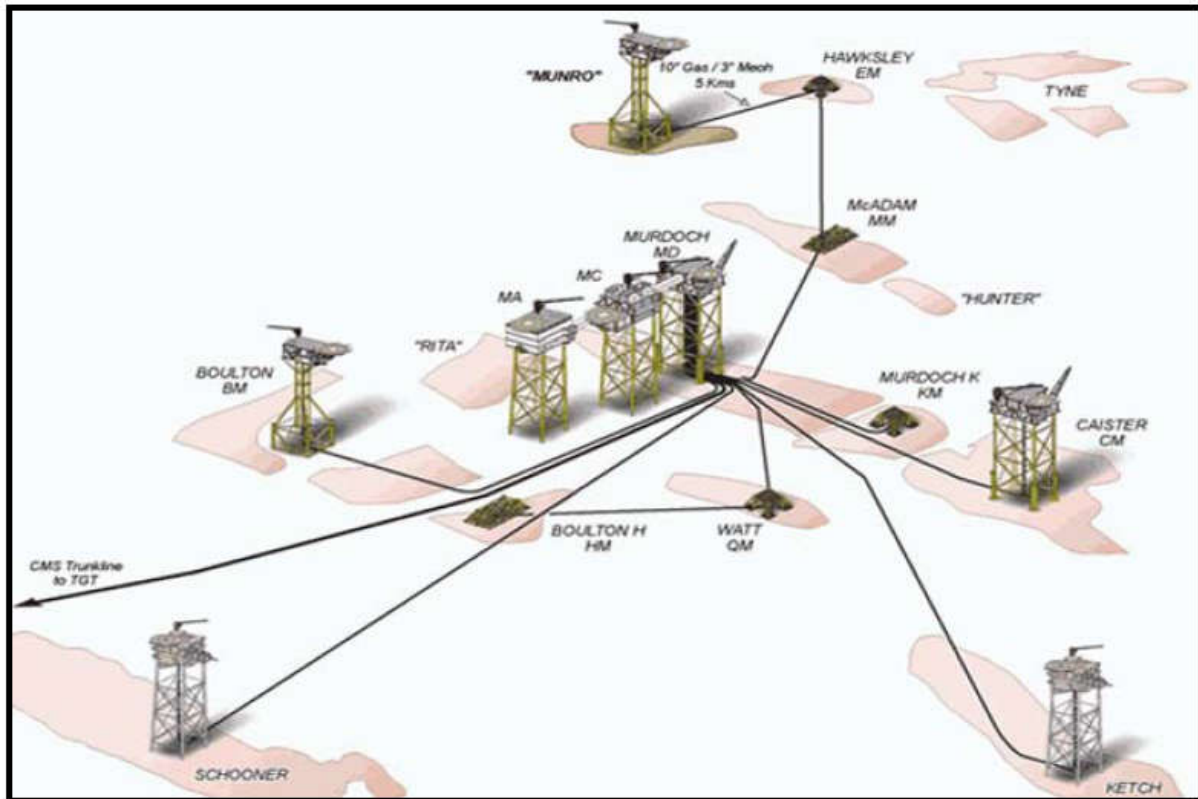


Table 1.7 List of Adjacent Facilities

Owner	Name	Type	Distance/Direction	Information	Status
ConocoPhillips (U.K.) Limited	Murdoch MA	Platform	Located 26.6 km NNW of Ketch.	Installation control centre for Ketch and Schooner. Bridge linked to MC and MD platforms	Operational
ConocoPhillips (U.K.) Limited	Murdoch MC	Platform	Located 26.6 km NNW of Ketch.	Installation control centre for Ketch and Schooner. Bridge linked to MC and MD platforms	Operational
ConocoPhillips (U.K.) Limited	Murdoch MD	Platform	Located 26.6 km NNW of Ketch.	Installation control centre for Ketch and Schooner. Bridge linked to MC and MD platforms Link for onward export to Theddlethorpe gas terminal.	Operational
ConocoPhillips (U.K.) Limited	Murdoch K	Well	Located 21.9 km NNW of Ketch.	Satellite subsea well tied back to the Murdoch installation.	Operational

DNO North Sea (ROGB) Limited	Schooner	Platform	Located 26.9 km West of Ketch.	Platform tied back to the Murdoch installation.	Operational
ConocoPhillips (U.K.) Limited	Boulton	Platform	Located 30.3 km North West of Ketch	Platform tied back to the Murdoch installation.	Operational
ConocoPhillips (U.K.) Limited	Caister	Platform	Located 17.1 km North of Ketch	Platform tied back to the Murdoch installation.	Non-Operational
ConocoPhillips (U.K.) Limited	McAdam	Well	Located 33.9 km NNW of Ketch	Satellite subsea well tied back to the Murdoch installation.	Operational
ConocoPhillips (U.K.) Limited	Boulton H	Well	Located 23.8 km North East of Ketch	Satellite subsea well tied back to the Murdoch installation via Watt.	Operational
ConocoPhillips (U.K.) Limited	Watt	Well	Located 18.7 km NNW of Ketch	Satellite subsea well tied back to the Murdoch installation.	Operational
ConocoPhillips (U.K.) Limited	Munro	Platform	Located 44.5 km NNW of Ketch	Platform tied back to the Murdoch installation via Hawksley EM and McAdam.	Operational
ConocoPhillips (U.K.) Limited	Hawksley EM	Well	Located 48.8 km NNW of Ketch	Satellite subsea well tied back to the Murdoch installation via McAdam.	Operational
ConocoPhillips (U.K.) Limited	CMS Trunk line	Pipeline	From Murdoch platform to Theddlethorpe onshore gas terminal	Gas export pipeline in close proximity to Ketch at Murdoch	Operational
ConocoPhillips (U.K.) Limited	Watt to Murdoch Pipeline	Pipeline	From Watt subsea well to Murdoch platform	Gas export pipeline in close proximity to Ketch pipelines at Murdoch	Operational
ConocoPhillips (U.K.) Limited	Caister to Murdoch Pipeline	Pipeline	From Caister platform to Murdoch	Gas export pipeline crosses under Ketch pipelines adjacent to the Murdoch platform	Operational
DNO North Sea (ROGB) Limited	Schooner Pipelines	Pipeline	From Schooner platform to Murdoch platform	Gas export and MeOH pipelines, in close proximity to Ketch pipelines at Murdoch	Operational

Impacts of Decommissioning Proposals

Decommissioning of the Ketch installation and pipelines will have no impact on adjacent facilities.

Figure 1.3: Adjacent Facilities



1.7 Industrial Implications

The project includes the following key activities:

- Well plugging & abandonment
- Pipeline severance, trenching and burial
- Removal of topsides and jacket

The above activities will need to be planned carefully to recognise synergies and efficiencies, the engineering and planning will be completed to understand the possibilities of potential integration of various activities.

A Supply Chain Action Plan (SCAP) has been produced for these decommissioning programmes in accordance with OGA guidance. The SCAP has been submitted to the OGA for approval. DNO have some pre-existing Master Service agreements with specialist contractors, which were the result of previous tender exercises. These contractors will be asked to quote for services to support the decommissioning activity in the first instance. Other specialist services will be competitively tendered or novated. Suppliers' offers will be assessed along many criteria, among which are: capacity to execute the work safely; the commercial offer and experience of carrying out this type of operation on the UKCS.

Current operational contracts for items such as environmental permitting, potential vessel sharing and logistic support will be implemented to support decommissioning activities.

Decommissioning will be undertaken in four main operational stages as described below:-

- Plugging and abandonment – A MODU / jack-up barge will attend the platform and subsea well to carry out well plugging and abandonment,
- Hydrocarbon Free Phase - Pipeline severance, removing all hydrocarbons from topside pipework / vessels and preparing the platform for heavy lift. Pipelines will be flushed before severance. Best endeavours will be undertaken to achieve 30ppm OIW (oil in water). The platform will then be left in lighthouse mode for a period of up to 4 years. During lighthouse mode the markings of the platform will be maintained in accordance with the requirements of the regulator / Trinity House using a solar powered navaid with a back-up battery. If the platform is converted to the windfarm support facility the current navigation aids will be maintained. After the platform has been made hydrocarbon free, it will be put into cold stack / lighthouse mode. No visits to the platform will be made until the dismantlement contractor arrives.
- Dismantling Phase - The successful tenderer will remove the topsides and jacket with an HLV.
- Seabed Clearance and Verification - Overtrawl surveys and a post decommissioning environmental survey will be undertaken following platform removal.

2. DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Installation: Surface Facilities

Table 2.1: Surface Facilities Information									
Name	Facility Type	Location		Topsides/Facilities		Jacket (if applicable)			
				Weight (Te)	No of modules	Weight (Te)	Number of Legs	Number of piles	Weight of piles (Te)
Ketch	Fixed steel jacket	WGS84 Decimal Degrees	54.050158° N 02.489772° E	2,179	1	1550	4	4	690
		WGS84 Degrees Minutes Seconds	54° 03' 00.57" N 02° 29' 23.18" E						

Note weight of marine growth on the jacket, which is estimated to be 109Te, is not included in the above weights. Topsides weight includes the weight of the conductors and their trees which is estimated to be 900 tonnes.

2.2 Installation: Subsea including Stabilisation Features

Table 2.2: Subsea Installations and Stabilisation Features				
Subsea installations and Stabilisation Features	Number	Size/Weight (Te)	Location(s)	Comments/ Status
Wellhead(s)	0	N/A	N/A	
Protection Frame(s)	0	N/A	N/A	
Concrete mattresses	0	N/A	N/A	
Grout bags	0	N/A	N/A	
Froned Mats	0	N/A	N/A	
Rock Dump	0	N/A	N/A	
Formwork	0	N/A	N/A	

2.3 Pipelines including Stabilisation Features

Table 2.3: Pipeline/Flowline/Umbilical Information									
Description	Pipeline Number (as per PWA)	Diameter (inches)	Length (km)	Description of Component Parts ¹	Product Conveyed ²	From – To End Points	Burial Status ³	Pipeline Status ⁴	Current Content ⁵
Export line	PL1612	18	26.900	Coated steel	Gas	Ketch Platform to Murdoch MD Platform	Laid on seabed	Operational	Hydrocarbons
Piggyback line	PL1613	3	26.900	Coated steel	MeOH	Murdoch MD Platform to Ketch Platform	Laid on seabed	Operational	MeOH

¹e.g. Concrete; Steel; umbilical; Flexible; Bundle

²e.g. Oil; Gas; Water; Chemicals

³e.g. Laid on seabed; Trenched; Trenched and Buried; Spanning

⁴e.g. Operational; Out-of-use; Interim pipeline Regime

⁵e.g. Cleaned; Flushed; Hydrocarbons and/or Chemicals in line

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Weight (Te)	Location(s)	Exposed/Buried/Condition
Mattresses on Caister / Ketch Pipeline Crossing	8	4	At Caister pipeline crossing adjacent to the Murdoch platform	Exposed (form pipeline crossing ramps)
Mattresses along Ketch Pipeline Subsea Route	52	520	At several locations along PL1612 and PL1613	Partially buried / exposed
Murdoch Platform approach mattresses	13	195.08	On PL1612 and PL1613	Partially buried
Grout bags	Approx. 32	Approx. 9.7	Form part of Caister pipeline crossing adjacent to the Murdoch platform	Exposed
Froned Mats	0	N/A	N/A	N/A
Rock Dump	0	N/A	N/A	N/A

Note: There are no umbilicals. Trench and burial is the proposed method of in-situ decommissioning for the entire length of both pipelines.

2.4 Wells

Table 2.5 Well Information			
Platform Wells	Designation 1	Status	Category of Well ^[1]
KA01 – 44/28b-K1	Development	Completed Operating	PL4-4-3
KA03 - 44/28b-K3X	Development	Shut in	PL4-4-3
KA04 – 44/28b-K4Z	Development	Shut in	PL0-4-3
KA05 – 44/28b-K5 ^[2]	Development	Shut in	PL4-4-3
KA06 – 44/28b-K6Y	Development	Shut in	PL4-4-3
KA07 – 44/28b-K7	Development	Completed Operating	PL4-4-3
KA08 – 44/28b-K8Z	Development	Completed Operating	PL4-4-3
KA09 – 44/28b-K9Y	Development	Completed Operating	PL4-4-3
KA10 – 44/28b – K10Y	Development	Shut in	PL4-4-3
Subsea Wells			
44/28b-1 For info only	Exploration	Abandoned AB3	SS-0-0-0
44/28b-2 For info only	Exploration	Abandoned AB3	SS-0-0-0
44/28b-3 For info only	Appraisal	Abandoned AB3	SS-0-0-0
44/28b-4 For info only	Appraisal	Abandoned AB3	SS-0-0-0

^[1] Category of well as per OGUK Guidelines for the suspension and abandonment of wells, Issue 5, July 2015.

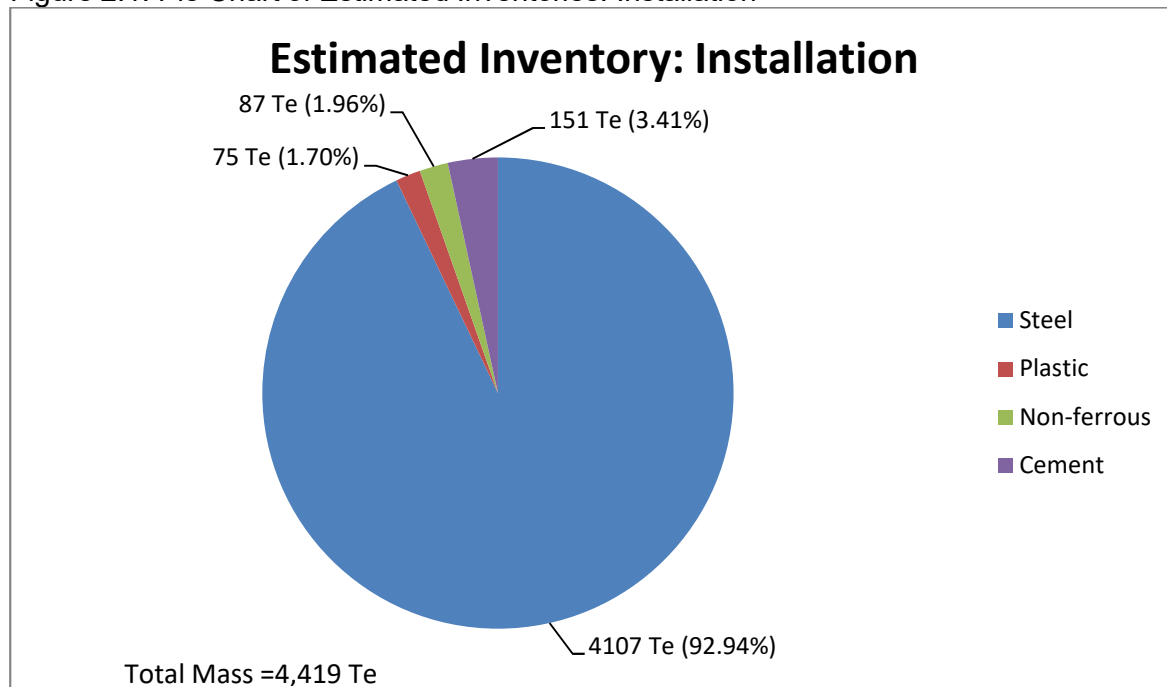
^[2] Well KA05 is a sidetrack of the original KA02 well.

2.5 Drill Cuttings

There is no evidence of drill cuttings associated with the Ketch installation in the area. Drill cuttings that were generated were skipped and shipped to shore when the wells were installed.

2.6 Inventory Estimates

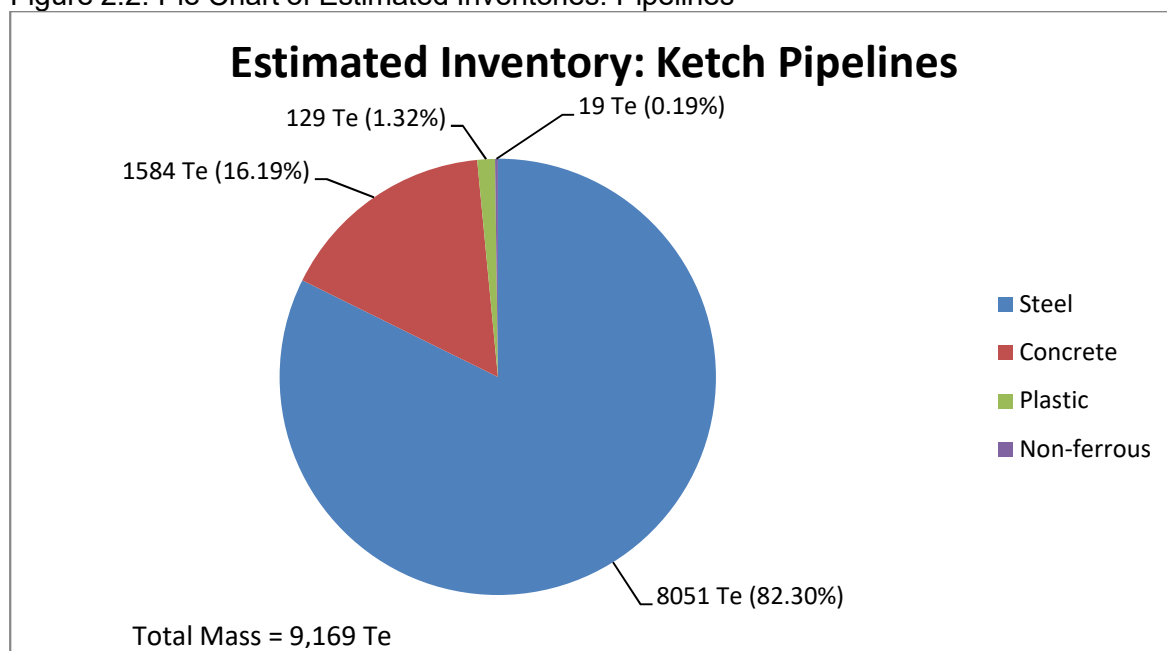
Figure 2.1: Pie Chart of Estimated Inventories: Installation



Reference the Environmental Appraisal for detailed data; NORM / Hazardous Waste - reference the supporting evidence in EA.

Note: The above figures exclude the weight of marine growth on the jacket. Marine growth is estimated to be 109Te which is 2.5% of the total mass presented in the above figure.

Figure 2.2: Pie Chart of Estimated Inventories: Pipelines



Reference the Environmental Appraisal for detailed data. NORM / Hazardous Waste - reference the supporting evidence in EA.

Note: The above figures exclude the weight of marine growth on those end sections of pipelines that are to be recovered. Marine growth is estimated to be <1% of the total mass presented in the above figure..

3. REMOVAL AND DISPOSAL METHODS

In line with the waste hierarchy, the re-use of an installation (or parts thereof) was first in the order of preferred decommissioning options for assessment.

DNO assessed options for extending the producing life of the platform, utilising it as an infrastructure hub for third party tie backs and enhanced recovery programmes, but none proved commercially viable.

DNO then went on to assess options for the relocation of the platform as a producing asset, but concluded that due to its ageing process technology and the high cost of maintaining the fabric and structural integrity of the platform, no technically viable oil and gas reuse option in another location was available.

Liaison between DNO and an offshore wind farm company regarding the feasibility of the platform being converted to an offshore windfarm support facility are currently ongoing. This option and the default option of removing the platform to shore for dismantlement and recycling will continue to be developed. A final decision regarding whether the platform is to be reused or removed and disposed of onshore will be made when the reuse feasibility studies and any reuse commercial agreements have been completed. It should be noted that the pipelines require flushing and disconnecting before any re-use option is to be commenced. Best endeavours will be taken to achieve 30ppm OIW (oil in water).

If the reuse option is selected, the well P & A (including the removal of the platform conductors) and rendering of the topsides hydrocarbon free will still be undertaken. When, at some point in the future, the reuse facility is no longer required, it will be decommissioned under the appropriate regime.

DNO have reviewed, and will continue to review, the platform's equipment inventories to assess the potential for adding to their, or their partners' existing asset portfolio, spares inventory or for resale to the open market.

Recovered material will be landed ashore for disposal by a contractor. It is not possible to forecast the wider reuse market with any accuracy or confidence this far forward. DNO will continue to track reuse market trends in order to seize reuse opportunities at the appropriate time.

The location where removed materials will be disposed of is not known at this early stage. They are generally expected to be recycled / disposed of in the UK. A final decision on the location of onshore dismantlement, disposal and recycling will be made following a commercial tendering process. If the location selected is abroad, a transfrontier shipment of waste permit will be applied for and put in place with the EA and the relevant foreign environmental / waste authority.

3.1 Topsides

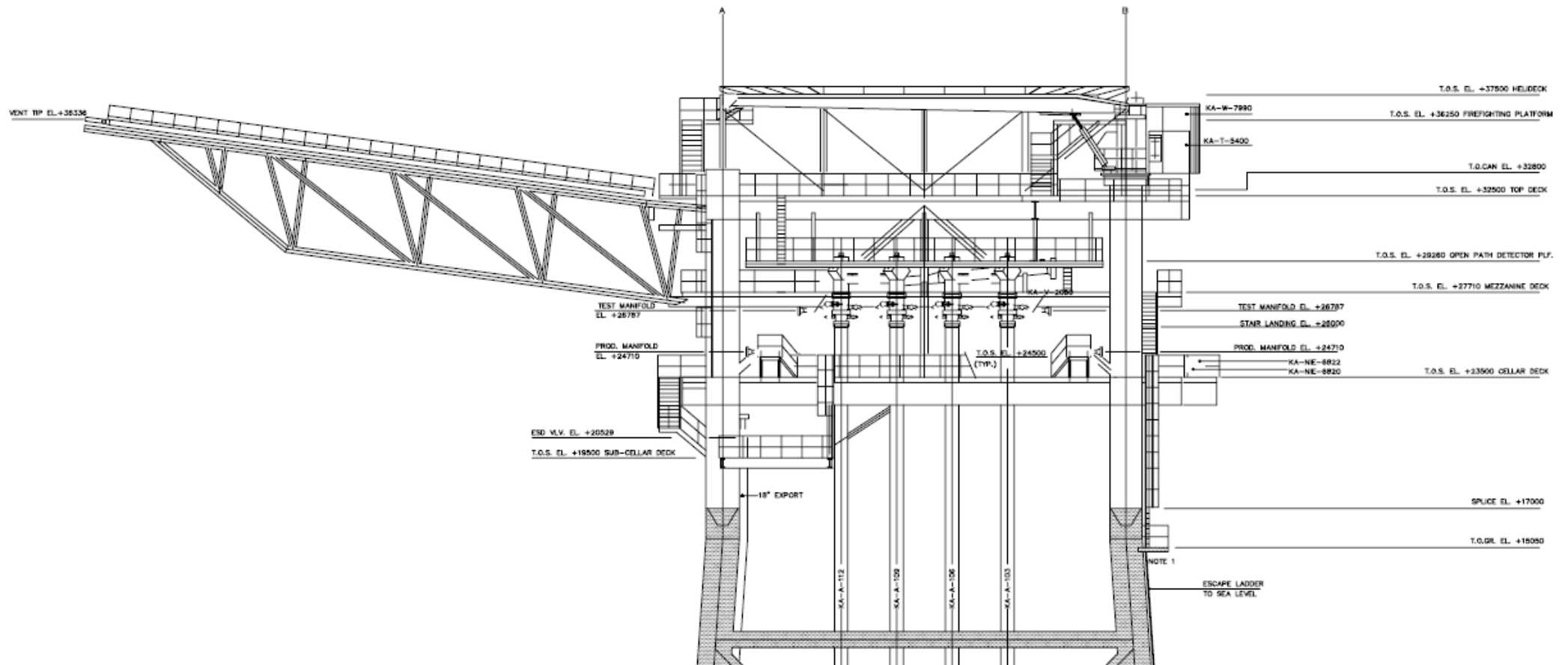
3.1.1 Topsides Decommissioning Overview

Topsides Description: The Ketch installation is a Normally Unattended Installation (NUI) in block 44/28a in the Southern North Sea.

The Ketch topside is a conventional carbon steel structure with a sub-cellar deck (+19.5m), a cellar deck (+23.5m), a mezzanine deck (+27.7m) and top deck (+32.5m). A helideck is situated above the weather deck (+37.5m). Access between platform levels is provided by ladders and stairways. There

are twelve well slots, nine of which are drilled and connected to Christmas trees, with the remaining three unused. The size of the topside is 21m x 20m x 15.5m high (including helideck).

Figure 3.1: Diagram of Ketch Topsides



Preparation/Cleaning:

Table 3.1: Cleaning of Topsides for Removal		
Waste Type	Composition of Waste	Disposal Route
Onboard hydrocarbons	Process fluids, fuels and lubricants	Flushed and drained to tote tanks for transport and appropriate disposal onshore
Other hazardous materials	NORM, and radioactive material, instruments containing heavy metals, batteries	Transported ashore for re-use/disposal by appropriate methods
Original paint coating	Lead-based paints	May give off toxic fumes/dust if flame-cutting or grinding/blasting is used so appropriate safety measures will be taken
Asbestos and ceramic fibre	Not expected	Appropriate control and management will be enforced. Transported ashore for disposal by appropriate methods

Removal Methods:

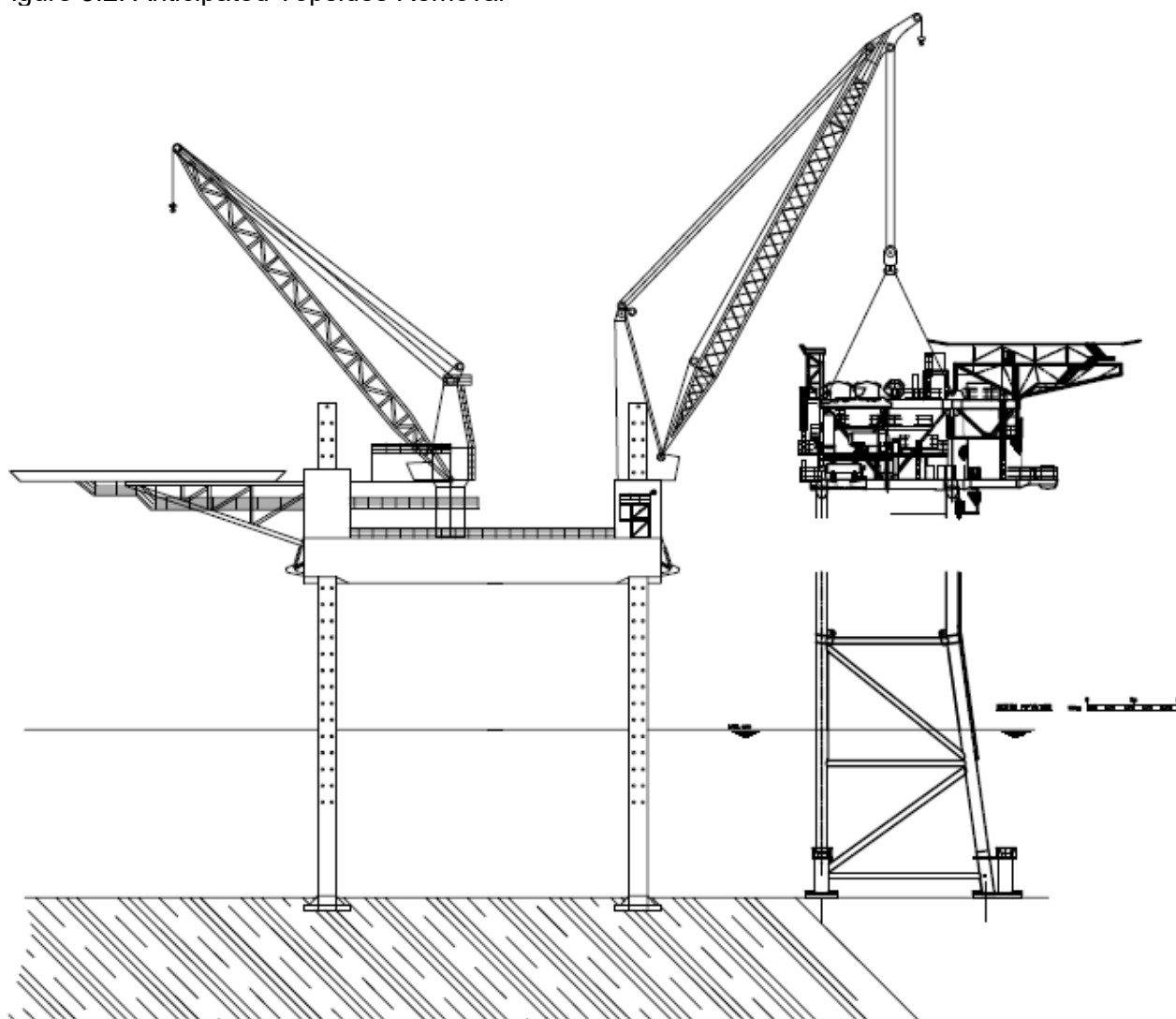
Table 3.2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) <input checked="" type="checkbox"/> 2) Mono-hull crane vessel <input checked="" type="checkbox"/> 3) SLV <input checked="" type="checkbox"/> 4) Piece small <input checked="" type="checkbox"/> 5) Other <input type="checkbox"/>	
Method	Description
Single lift removal by SLV/HLV	Removal of topsides as complete unit and transportation to shore for re-use of selected equipment, recycling, break up and/or disposal. Single lift dependant on vessel availability.
Modular removal and re-use/recycle by HLV	Removal of parts/modules of topsides for transportation and reuse in alternate location(s) and/or recycling/disposal
Offshore removal 'piece small' for onshore reuse/disposal	Removal of topsides by breaking up offshore and transporting to shore using work barge. Items will then be sorted for re-use, recycling or disposal.
Proposed removal method and disposal route	Topsides will be removed to shore and disposed of at a selected disposal yard to comply with relevant legislation and company policy. A final decision on the decommissioning method will be made following a commercial tendering process. It is likely that optimum safety/cost topsides removal solution will be single lift removal by SLV/HLV. The removal method illustrated below is based on this option – the final removal solution and methodologies will follow a detailed engineering study.

Note: Preliminary studies have indicated that the following methods are likely to be used.

Ketch Topsides Removal

It is anticipated that the Ketch platform removal method will be a reverse of the installation method. A single lift reusing the padeyes. See Figure 3.2.

Figure 3.2: Anticipated Topsides Removal



3.2 Jacket

3.2.1 Jacket Decommissioning Overview

The jacket will be removed to shore for cleaning and disposal. The pile cuts will be made below the seabed level at such a depth to ensure that any remains are unlikely to become uncovered. Best endeavours will be made to achieve a minimum of 3.0m of burial of the remaining piles measured from mean seabed level. The means of cutting could be diamond wire, oxyacetylene, high pressure abrasive water jet cutting or laser cutting. Figure 3.3 illustrates one of the preferred removal options although the exact cutting points and removal method are subject to detailed engineering and commercial tendering. If there is a delay between jacket and the topsides removal activities, appropriate navigational aids shall be in place, as per Consent to Locate requirements.

The approximate lift weight of the jacket is 1,757 Te (jacket weight 1,550 Te plus 207 Te of piles) plus approximately 109Te of marine growth.

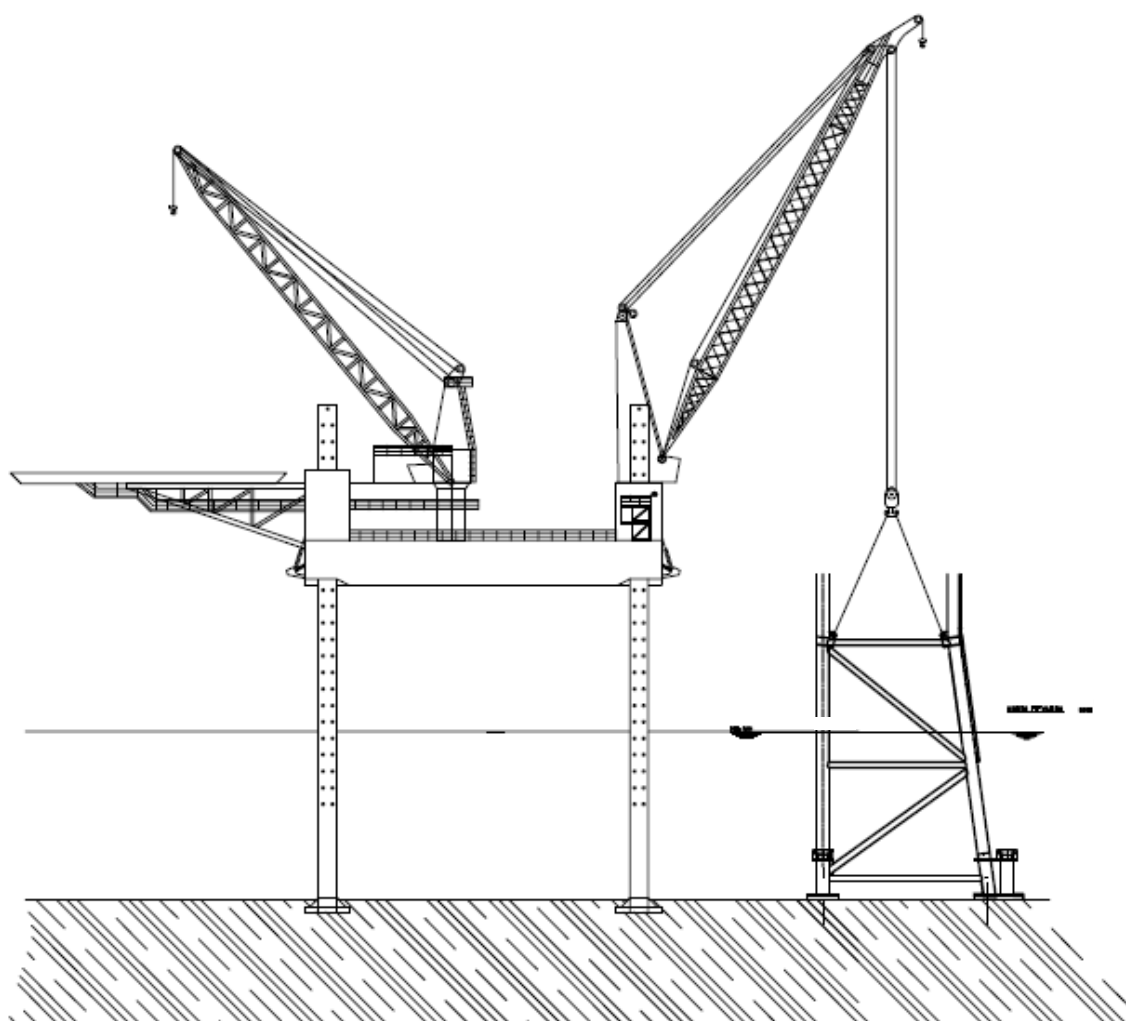
3.2.2 Jacket Removal Methods

Table 3.3: Jacket Decommissioning Methods	
1) HLV (semi-submersible crane vessel) <input checked="" type="checkbox"/> 2) Monohull crane vessel <input checked="" type="checkbox"/> 3) SLV <input checked="" type="checkbox"/> 4) Piece small <input type="checkbox"/> 5) Other – (describe briefly) <input checked="" type="checkbox"/>	
Method	Description
Onshore disposal using HLV, Monohull crane vessel or SLV	Removal of the jacket in a single (or two pieces) lift and transport ashore for break up and recycling of steel.
Onshore disposal using 'piece small'	Remove jacket in several pieces using attendant work barge and transport to shore yard.
Other	A pull on barge removal method based on a submersible barge which is submerged on one end to the seabed. The jacket will then be pulled on to the barge/vessel by winch.
Proposed removal method and disposal route	The jacket will be removed to shore and disposed of at selected disposal yard to comply with relevant legislation and company policy. The removal method illustrated in the following figures is one of the preferred options. The exact cutting points and removal methodology will follow a detailed engineering study.

Ketch Jacket Removal

It is anticipated that the Ketch jacket removal method will be a reverse of the installation method. A single lift reusing the padeyes see Figure 3.3.

Figure 3.3: Anticipated Jacket Removal Method



3.3 Subsea Installations and Stabilisation Features

There are no subsea installations.

Table 3.4: Subsea Installation and Stabilisation Features Decommissioning		
Subsea installations and stabilisation features	Option	Disposal Route (if applicable)
Wellhead(s)	N/A	N/A
Protection Frame(s)	N/A	N/A
Concrete mattresses	N/A	N/A
Grout bags	N/A	N/A
Formwork	N/A	N/A
Froned Mats	N/A	N/A
Rock Dump	N/A	N/A

3.4 Pipelines

Decommissioning Options:

Table 3.5: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline or Group (as per PWA)	Condition of the line / group (Surface laid / Trenched / Buried / Spanning)	Whole or part of pipeline / group	Decommissioning Options* considered
PL1612	Surface laid	Whole pipeline	1,2,3,4,5,6,7,8
PL1613	Surface laid	Whole pipeline	1,2,3,4,5,6,7,8

*Key to Options

- 1) Completely remove the lines by reverse installation (S or J lay);
- 2) Completely remove the lines cut and lift;
- 3) Partially remove the lines by reverse installation (S or J lay);
- 4) Partially remove by cut and lift;
- 5) Bury by trenching and backfilling with natural deposits;
- 6) Bury by rock dump;
- 7) Leave in situ – cover cut ends with biodegradable gravel / grout bags;
- 8) Leave in situ – cover cut ends with existing mattresses.

Comparative Assessment Method:

The Comparative Assessment process involved a multi-disciplinary team participating in a Comparative Assessment workshop and a preliminary Quantitative Risk Assessment (QRA) of the available decommissioning options. At the Comparative Assessment workshop, each decommissioning option has been scored against a set of assessment criteria using categories derived from BEIS guidance: 1. Safety; 2. Environmental; 3. Technical; 4. Societal; 5. Commercial. The Comparative Assessment is referenced in Section 7.

The pipelines were surface laid and were designed to self-bury however only sections of the pipelines have buried or partially self-buried.

The Comparative Assessment concluded that the exposed sections of pipelines and mattresses, that could present a snagging hazard, will need to be buried due to the risks they pose to other users of the sea and the difficulty and cost to remove them. The pipelines will be flushed, filled with seawater and disconnected at each end adjacent to the platforms. The mattresses associated with the pipelines will be risk assessed and removed. The pipelines will be trenched and buried with natural deposits. If problems are encountered removing the mattresses, BEIS will be consulted and agree on an alternative approach before any other options are executed. The remaining pipelines will be monitored as agreed with BEIS.

Outcome of Comparative Assessment:

Table 3.6: Outcomes of Comparative Assessment		
Pipeline or Group	Recommended Option*	Justification
PL1612	Option 5	(5). End sections will be removed (includes Caister pipeline crossing and associated mattresses and grout bags) and ends covered as required. The flooded pipeline will be trenched and buried with natural deposits. Monitoring will be performed to confirm pipeline remains stable and buried at a frequency to be agreed with BEIS. Mattresses to be removed.
PL1613	Option 5	(5). End sections will be removed (includes Caister pipeline crossing and associated mattresses and grout bags) and ends covered as required. The flooded pipeline will be trenched and buried with natural deposits. Monitoring will be performed to confirm pipeline remains stable and buried at a frequency to be agreed with BEIS. Mattresses to be removed.

3.5 Pipeline Stabilisation Features

Table 3.7: Pipeline Stabilisation Features			
Stabilisation feature(s)	Number	Option	Disposal Route (if applicable)
Concrete Mattresses (Murdoch approach & Caister Crossing)	21	1	Transported ashore for re-use/disposal by appropriate methods
Concrete Mattresses along main route	52	1	Transported ashore for re-use/disposal by appropriate methods
Grout bags	Approx. 32 (Caister pipeline crossing)	1	Transported ashore for re-use/disposal by appropriate methods
Formwork	0	N/A	N/A.
Froned Mats	0	N/A	N/A
Rock Dump	0	N/A	N/A

*Key to Options

- 1) Completely remove the mattresses;
- 2) Partially remove the mattresses;
- 3) Bury by self-burial and / or trenching and backfilling with natural deposits;
- 4) Bury by rock / gravel dump;
- 5) Leave in situ. (subject to a survey to determine over trawlability)

If problems are encountered when mattresses are being removed (for example mattress ropes failing during lifting). BEIS will be consulted and an alternative approach agreed before any other options are executed.

3.6 Wells

Table 3.8: Well Plug and Abandonment
The wells which remain to be abandoned, as listed in Section 2.4 (Table 2.5) will be plugged and abandoned in accordance with Oil and Gas UK Guidelines for the suspension and abandonment of wells and a PON 5 will be submitted. A Master Application Template (MAT) and the supporting Subsidiary Application Template (SAT) application will be submitted in support of any such work that is to be carried out.

3.7 Drill Cuttings

Table 3.9: Drill Cuttings Decommissioning Options				
How many drill cutting piles are present?		None, removed to shore when wells were drilled		
Tick Options examined				
Remove and re-inject	Leave in place		Cover	
Relocate on seabed	Removed and treated onshore ✓		NA	
Other				
Review of Pile Characteristics			Pile 1	Pile 2
How has the cutting piles been screened (desktop exercise)			N/A	N/A
Dates of Sampling			N/A	N/A
Sampling to be included in pre-decommissioning survey			N/A	N/A
Does it fall below both OSPAR thresholds?			Y	Y
Will the drill cuttings pile have to be displaced in order to remove the jacket			N	N
What quantity (m³) will have to be displaced/removed			0m³	0m³
Will the drill cuttings pile have to be removed in order to remove any pipelines			N	N
What quantity (m³) will have to be displaced/removed			0m³	0m³
Have you carried out a Comparative Assessment of options for the Cuttings Pile?			N	N

Comparative Assessment Method

A comparative assessment was not carried out because drill cuttings were removed to shore when the wells were drilled and no drill cuttings piles were identified during the pre-decommissioning environmental survey.

3.8 Waste Streams

Table 3.10: Waste Stream Management Methods	
Waste Stream	Removal and Disposal method
Bulk liquids	Removed from vessels and discharged to tote tanks for transport and appropriate disposal onshore. Vessels, pipework and sumps will be drained prior to removal to shore and shipped in accordance with maritime transportation guidelines. Package filtration equipment for disposal of liquids to sea may be utilised and relevant permits will be sought for such operations.
Marine growth	Removed offshore /onshore. Disposed of according to guidelines.
NORM/LSA Scale	Tests for NORM/LSA will occur offshore and onshore. NORM will be dealt / disposed with according to guidelines and company policies under the appropriate permit.
Asbestos	Tests for asbestos will occur offshore and will be dealt/disposed with according to guidelines and company policies. Ketch topside is not expected to have any asbestos.
Other hazardous wastes	The inventory of hazardous materials will show how DNO will manage risks and prevent spills offshore. Detailed survey for other hazardous wastes will be undertaken offshore and will be dealt / disposed with according to guidelines and company policies.
Onshore Dismantling sites	Appropriate licensed sites will be selected. The chosen facility must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver innovative recycling options.

Table 3.11 Inventory Disposition			
	Total Inventory Tonnage (Te)	Planned tonnage to shore (Te)	Planned left in situ (Te)
Installations	4,419	3,936	483 (piles)
Pipelines	9,169	200	8,969

Note weights exclude weight of marine growth. Installations total tonnage and planned tonnage to shore includes the weights of the conductors and trees.

Table 3.12 Proposed Fate of Ketch Infrastructure Materials		
Infrastructure	Recommended decommissioning option	Destination
Jacket	Complete removal (one or two lifts dependant on the vessel selected by a commercial tendering process) piles less than 3.0m below seabed level to remain.	100% Recycling
Topside	Full removal * (single lift)	>98% Reuse or Recycle <2% Landfill / Incineration
Export Pipeline and MEG Pipeline	Decommission in situ and remove pipeline ends by cut and lift	>99% Decommission in situ <1% Recycling
Stabilisation Material	Removal	99% Reuse or recycle <1% Landfill

*Dependent on contract awarded

4 ENVIRONMENTAL APPRAISAL

4.1 Environmental Sensitivities (Summary)

Table 4.1: Environmental Sensitivities	
Environmental Receptor	Main Features
Conservation Interests	<p>The northernmost part of the project area, where the export pipelines join the Murdoch Platform, enters the Dogger Bank SAC and MPA which is located approximately 24.3 kilometres northwest of the Ketch NUI. The Dogger Bank SAC/SCI and MPA is designated due to the vast expanse of Annex I shallow sandbank habitat in less than 20 metres water depth (JNCC, 2015a). All of the 60m of both pipelines that are scheduled for removal (with mattresses) at the Murdoch end are within the Dogger Bank SAC and the SNS cSAC.</p> <p>The Southern North Sea cSAC and MPA, located approximately 12 kilometres north of the Schooner NUI, falls within the decommissioning project area due to the presence of the export pipelines at the Murdoch platform end which just encroach on the site. The Southern North Sea cSAC and MPA has been identified as an area of importance for the Annex II species, harbour porpoise and has been put forward to the EU for formal designation. Furthermore, the recommended conservation zone Markham's Triangle is located 24 kilometres southwest of the Ketch NUI and the North Norfolk Sandbanks and Saturn Reef SAC/SCI are located approximately 42 kilometres south-west of the Ketch NUI. The North Norfolk Sandbanks and Saturn Reef SAC/SCI and MPA is designated due to the presence of Annex I shallow sandbank habitat, typical marine fauna which inhabit sandbanks are; polychaete worms, amphipods and small clams which burrow within the sediment and hermit crabs, seastar, brittlestars and flatfish (plaice and sole) on the seabed (JNCC, 2015a) and also due to the presence of the Saturn Reef (also an Annex I habitat). A large number of nationally designated sites are also present along this section of the coast and include SSSIs selected for geological interest or presence of special plants, terrestrial invertebrates, breeding seabirds or breeding waterfowl and National Nature Reserves (NNRs) which contain examples of some of the most important ecosystems in Britain, including sand dune, shingle, saltmarsh, mudflat and wet grassland.</p>

Table 4.1: Environmental Sensitivities – cont'd

Environmental Receptor	Main Features
Benthic Communities	<p>Colonial epifauna are inclusive of encrusting epifauna which are generally recorded in high counts or as presence/absence. For the Schooner survey they were only represented by the cnidaria species, <i>Clytia hemisphaerica</i> and <i>Anthoathecata</i>, and the bryozoan <i>Triticella flava</i>. For the Ketch EBS they include three anemones, Actiniaria, <i>Cerianthus lloydii</i> and Edwardsiidae. Colonial epifauna were only represented by the cnidarian species, <i>Clytia hemisphaerica</i>, <i>Anthoathecata</i>, <i>Astrohiza</i>, and <i>Lovenella clausa</i>. Annelids, crustaceans and molluscs were found to dominate the infauna at almost all of the Ketch and Schooner survey stations.</p> <p>Three main habitats were identified during the Ketch and Schooner surveys: Fine-medium sand, muddy sand, and rippled sand with sporadic shell and pebble fragments, Observed fauna within the Ketch and Schooner muddy sand habitats included: Annelida (<i>Ophiodromus flexuosus</i> and <i>Aphrodita aculeata</i>), Chordata (<i>Callionymus lyra</i> and <i>Gadiformes</i> sp.), and Arthropoda (Paguridae sp.). Associated fauna within the areas of mixed sediment included: Sand eels (Ammodytidae sp.), Echinodermata (<i>Astropecten irregularis</i>), Arthropoda (<i>Liocarcinus depurator</i>), Annelida (Serpulidae sp.) and Cnidaria (<i>Alcyonium digitatum</i>) (Only present in the Schooner survey area).</p>
Fish and Fisheries	<p>Fish species known to use the project area for spawning are: mackerel, plaice, herring, sole, sprat, <i>Nephrops</i>, whiting, cod and sandeel, in addition the following species use the site as a nursery: mackerel, herring, sprat, <i>Nephrops</i>, Whiting, Spurdog, Tope, Cod, Blue Whiting, Ling, european hake, anglerfish and sandeel. In a survey conducted by CEFAS, twenty-six species of Elasmobranch were identified and recorded throughout the North Sea and surrounding waters. Of these, only the spurdog (<i>Squalus acanthias</i>), tope shark (<i>Galeorhinus galeus</i>), starry smooth hound (<i>Mustelus asterias</i>), and starry ray (<i>Amblyraja radiata</i>) may be present within the general vicinity of the Schooner and Ketch NUIs (Ellis et al., 2004). Commercial fishing activity within the vicinity of the project area is generally low with peak moderate activity in August and September; however, data was undisclosed from December to April (Scottish Government, 2016). The project area lies with ICES rectangle 37F2. Landings are predominantly demersal species making up 77.17 per cent of catches, followed by shellfish (22.79 per cent) and pelagic making up approximately 0.05 per cent of catches (Scottish Government, 2016). The most common gear types observed in the region were trawls.</p>

Table 4.1: Environmental Sensitivities – cont'd

Environmental Receptor	Main Features
Marine Mammals	<p>Cetaceans previously sighted within the project area which include which include Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>) (ICUN conservation status: Least Concern), harbour porpoise (<i>Phocoena phocoena</i>) (ICUN conservation status: Least Concern) and minke whale (<i>Balaenoptera acutorostrata</i>) (ICUN conservation status: Least Concern).. Pinnipeds such as Grey seal (<i>Halichoerus grypus</i>) and harbour seals (<i>Phoca vitulina</i>) are both resident in UK waters and are listed under Annex II of the EU Habitats Directive. Harbour seals are not normally found foraging more than 60 kilometres from shore (DECC OESEA2, 2011). Grey seal pupping generally occurs in October, with moulting occurring between February and March (DECC OESEA2, 2011). During this period, grey seals will be found either onshore or on foraging trips in the vicinity of their haul-out site. The project area is located 130 kilometres from the coast so it is highly unlikely that these species may be encountered in the vicinity of the decommissioning operations.</p>
Seabirds	<p>Seabird distribution and abundance in the SNS varies throughout the year, with offshore areas in general, containing peak numbers of birds following the breeding season and through winter (DECC, 2016). Only a small number of the seabird species breeding in the UK are not listed in Mitchell et al. (2004) as breeding within Regional Sea 2 where the project is located (for example Manx Shearwater, Storm Petrel, Leach's Storm Petrel, Arctic Skua, Great Skua and Black Guillemot). The North Norfolk Coast SPA site, located approximately 160 km south west from the project area qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting populations of European importance of the following species listed on Annex I of the Directive during the breeding season: for the presence of Common Tern (<i>Sterna hirundo</i>), Little Tern (<i>Sterna albifrons</i>), Mediterranean Gull (<i>Larus melanocephalus</i>), Roseate Tern (<i>Sterna dougallii</i>) and Sandwich Tern (<i>Sterna sandvicensis</i>) (JNCC, 2001). The most common species of seabird found in the area include: Herring gull (<i>Larus argentatus</i>), Great black-backed gull (<i>Larus marinus</i>), Sabine's gull (<i>Xema sabini</i>), Kittiwake (<i>Rissa tridactyla</i>), Guillemot (<i>Uria aalge</i>), Fulmar (<i>Fulmarus glacialis</i>) and Gannet (<i>Morus bassanus</i>) (UKDMAP, 1998). Seabird vulnerability to oil is considered extremely high during July for all Blocks and during December for Block 44/21 and Block 44/26 within the project area (Certain <i>et al.</i>, 2015).</p>

Table 4.1: Environmental Sensitivities – cont'd	
Environmental Receptor	Main Features
Onshore industries	Major communities within this include Hull (a commercial and passenger port, with ro-ro ferry services to Belgium and the Netherlands) and Grimsby (the main port of the Humber, particularly important for commercial fishing landings). Data shows that shipping densities in this area are moderate, with highest activity in the summer months (DECC 2009 and Oil and Gas Authority 2016). Popular seaside resorts along this stretch of the coast include Whitby, Filey and Scarborough which are all popular for their bathing beaches (DECC 2009). The tourism industry is not likely to be impacted by normal offshore oil and gas operations but leisure activities could be threatened in the event of a major accidental spill approaching the coast, however this is unlikely given the coast is approximately 130 kilometers from the project area.
Other Users of the Sea	Oil and gas activity within the project area is moderate compared to other blocks to the north east. The project area contains the Ketch gas fields, and the pipeline from Topaz to Schooner, Blocks 44/26, 44/27 and 44/28 all overlap with a military exercise area (<i>Oil & Gas Authority, 2017</i>). As a result, these blocks are considered to be an area of concern to the Ministry of Defence (<i>Oil & Gas Authority, 2017</i>). There are currently no operational wind farm sites located in the vicinity of the project area. However, seven Round 3 wind farms were proposed, two are currently at the pre-planning application stage (Hornsea Project three and Hornsea Project four) and five (Hornsea Project Two, Creyke Beck A and B (Dogger Bank), Teeside A and B (Dogger Bank)) are now consented. The Hornsea Project Two and the wind farms located on the Dogger Bank are located less than 10 kilometers south and 25 kilometers north of the project area respectively (<i>The Crown Estate, 2017</i>). There are three chartered wrecks in the project area, the closest lying approximately 1 kilometre to the northwest of the Schooner NUI (Hydrographer of the Navy, 2008).
Atmosphere	The local atmosphere will be influenced by atmospheric emissions from combustion activities associated with vessel movements and deconstruct activities during decommissioning operations. It is expected that these emissions will be localised to the project area, will rapidly disperse to non-detectable levels and will have negligible impacts on the health of personnel aboard vessels.

4.2 Potential Environmental Impacts and their Management

The Environmental Appraisal provides a review of the key features of the environment in the proposed Ketch Decommissioning Programmes Area in block 44/28a in the southern North Sea (SNS).

A key consideration when planning and finalising the decommissioning of the Ketch installation and pipelines is a clear understanding of the surrounding sensitive environmental receptors. In order to understand the potential for the project activities to interact with these environmental receptors, so that appropriate controls can be adopted to mitigate negative impacts, an environmental appraisal has been undertaken which involved the risk assessment of interactions between the project and the environment.

Environmental Impact Appraisal Summary:

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
Topside Removal	Atmospheric emissions	<ul style="list-style-type: none"> All engines, generators on the vessels will be well maintained and correctly operated to ensure that they are working efficiently to minimise energy use and gaseous emissions. Vessels will be audited as part of selection and pre-mobilisation. Vessel operations will be minimised where practical, with work programmes planned to optimise vessel time in the field.
	Underwater noise	<ul style="list-style-type: none"> Management measures will be put in place to reduce the impact on sensitive receptors including Annex II and Annex IV marine mammals, fish and impacts on harbour porpoise. This includes use of marine mammal observers for example (see JNCC guidance).
	Liquid waste / discharge	<ul style="list-style-type: none"> Decommissioning of topsides planned to avoid / minimise liquid waste discharges. Subsea pipelines flushed and cleaned to 30ppm (OIW) prior to them being cut subsea. The WIA application in PETS to document the previous annuli contents which may be discharged during abandonment. Liquid waste discharges subject to Chemical Permit approval process. Liquid waste / marine discharges involving reservoir hydrocarbons will be subject to the requirements of the OPPC.
	Solid waste	<ul style="list-style-type: none"> Materials are reused and recycled where possible. Compliance with UK waste legislation and duty of care. Use designated licensed sites only. Permits and traceable chain of custody for waste management, shipment, treatment and onshore disposal. Waste Management Plan will be implemented. Overview to be provided in accordance with section 5.4.1.1 of the EA.
	Other users of the sea	<ul style="list-style-type: none"> Cutting and lifting operations will occur within the Ketch platform 500 m exclusion zone. The Ketch pipelines including their cut ends will be naturally buried, if the ends do not remain buried grout bags will be used as a contingency. A vessel corridor approach will be used. UK Hydrographical Office and Kingfisher will be informed of all activities. A post decommissioning debris survey will be conducted.

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
	Accidental hydrocarbon release	<ul style="list-style-type: none"> Hydrocarbon inventories are to be removed from the topsides prior to commencing removal operations. Ketch Decommissioning Oil Pollution Emergency Plan (OPEP) and Communications and Interface Plan will be in place. DNO have UKCS membership with Oil Spill Response (OSRL) for Tier 2/3 incidents.
	Dropped object(s)	<ul style="list-style-type: none"> A post decommissioning debris survey will be conducted and debris recovered in line with BEIS regulations. Adhere to lifting and handling procedures and use of certified equipment for lifting. Retrieve items of debris from the seabed after operations, in compliance with relevant legislation.
Jacket Removal	Atmospheric emissions	<ul style="list-style-type: none"> All engines, generators on the vessels will be well maintained and correctly operated to ensure that they are working efficiently to minimise energy use and gaseous emissions. Vessels will be audited as part of selection and pre-mobilisation. Vessel operations will be minimised where practical, with work programmes planned to optimise vessel time in the field.
	Underwater noise	<ul style="list-style-type: none"> The use of explosives is a contingency option if both internal and external cutting of the piles fails. The measures presented in the JNCC guidelines for minimising the risk of injury to marine mammals from using explosives including MMOs, a PAM system, pre-detonation search and the inclusion of a ten minute 'soft start' procedure will be adhered to. Management measures will be put in place to reduce the impact on sensitive receptors including Annex II and Annex IV marine mammals, fish and impacts on harbour porpoise. This includes use of marine mammal observers for example (see JNCC guidance). Underwater cutting could be a potential source of sound, the operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible. An MMO/ PAM operator will be on-board the vessel during cutting operations, should the need be required
	Seabed impacts	<ul style="list-style-type: none"> The decommissioning operations will be carefully designed and executed so as to minimise the area of seabed that will be disturbed. The introduction of new material to the marine environment is to be avoided or minimised throughout the proposed operations.

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
		<ul style="list-style-type: none"> • If anchored vessels are required to be used an anchor management plan will be implemented. • The vessels involved will position themselves directly over each item before lifting so that the item can be lifted vertically as far as possible, to avoid dragging on the seabed and therefore minimise the area of seabed disturbed. • The entire jacket and jacket piles, to -3.0m below seabed, will be removed utilising a method of internal cutting that minimises seabed impacts. • Rock / gravel stabilisation deposits are not envisaged to be required if a jack-up vessel is selected to remove the platform. This also applies to the drilling rig that carries out P & A of the platform wells and removal of the conductors (refer to WIA application). • Refer to section 5 of the EA for details of the estimated impacts that various methods of removing the jacket and subsea installations will have on the seabed.
	Other users of the sea	<ul style="list-style-type: none"> • Cutting and lifting operations will occur within the Ketch platform 500 m exclusion zone. • The markings of the platforms will be maintained in accordance with the CtL and the requirements of the regulators until the platforms removal. • A vessel corridor approach will be used. UK Hydrographical Office and Kingfisher will be informed of all activities. • A post decommissioning debris survey will be conducted.
	Damage or loss of fishing gear	<ul style="list-style-type: none"> • A post decommissioning debris survey will be conducted. • Over trawl survey performed to confirm over trawlability. (This only applies to areas outside the Dogger Bank SAC and cSAC). • Locations of any remaining footprint of the structure will be accurately mapped and information disseminated via the Hydrographic Office and Kingfisher notification system.
	Solid waste	<ul style="list-style-type: none"> • Materials are reused and recycled where possible. • Compliance with UK waste legislation and duty of care. • Use of designated licensed sites only. • Permits and traceable chain of custody for waste management, shipment, treatment and onshore disposal. • Waste Management Plan will be implemented

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
	Accidental hydrocarbon release	<ul style="list-style-type: none"> Ketch Decommissioning Oil Pollution Emergency Plan (OPEP) and Communications and Interface Plan will be in place. DNO have UKCS membership with Oil Spill Response (OSRL) for Tier 2/3 incidents. Material changes to the safety case will be made to cover the decommissioning and dismantlement of the platform. Liquid waste / marine discharges involving reservoir hydrocarbons will be subject to the requirements of the OPPC.
	Dropped object(s)	<ul style="list-style-type: none"> Adhere to lifting and handling procedures and use of certified equipment for lifting. Retrieve items of debris from the seabed after operations, in compliance with relevant legislation. A post decommissioning debris survey will be conducted.
Decommissioning Pipelines (left in situ, ends removed)	Atmospheric emissions	<ul style="list-style-type: none"> All engines, generators on the vessels will be well maintained and correctly operated to ensure that they are working efficiently to minimise energy use and gaseous emissions. Vessels will be audited as part of selection and pre-mobilisation. Vessel operations will be minimised where practical, with work programmes planned to optimise vessel time in the field.
	Underwater noise	<ul style="list-style-type: none"> Management measures will be put in place to reduce the impact on sensitive receptors including Annex II and Annex IV marine mammals, fish and impacts on harbour porpoise. This includes use of marine mammal observers for example (see JNCC guidance).
	Seabed impacts	<ul style="list-style-type: none"> Operations to remove the pipeline ends will be carefully designed and executed so as to minimise disturbance to the seabed within the SAC. Any new material introduced will be minimised and will be carefully placed using a suitable vessel. The resulting profile will be over-trawlable. Pipeline disconnects to be carried out in advance of platform removal whilst 500m safety zone is in place. Pipeline ends to be recovered with mattresses. Cut pipeline ends will be buried with natural deposits. In the event that the ends do not remain naturally buried they will be covered with biodegradable grout bags to give a smooth snag free profile and ensure the ends remain buried. DNO will apply for a Marine Licence to cover the potential disturbance of the seabed. DNO will ensure that disturbance is kept to a minimum during the operations.

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
		<ul style="list-style-type: none"> Pipeline cutting and lifting activities to be undertaken in the Murdoch platform 500m exclusion zone, will be carried out by ConocoPhillips on behalf of DNO and be covered by ConocoPhillips risk assessments.
	Marine discharges	<ul style="list-style-type: none"> The pipelines will be flushed prior to cutting of the pipeline ends. Best endeavours will be taken to achieve 30ppm OIW. Pipeline ends will be buried preventing snagging by fishing nets and the direct release of pipeline contents into the marine environment. A chemical risk assessment will be undertaken and operations permitted under the Offshore Chemicals Regulations 2002 (as amended). Liquid waste / marine discharges involving reservoir hydrocarbons will be subject to the requirements of the OPPC.
	Other users of the sea	<ul style="list-style-type: none"> A vessel corridor approach will be used. UK Hydrographical Office and Kingfisher will be informed of all activities. A post decommissioning debris survey will be conducted. Collision Risk Management Plan developed and implemented. Pipeline cutting and lifting activities to be undertaken in the Murdoch platform 500m exclusion zone, will be carried out by ConocoPhillips on behalf of DNO and be covered by ConocoPhillips risk assessments. A cumulative assessment has been undertaken of other oil and gas / windfarm activities in the immediate vicinity at the time of decommissioning. Ketch decommissioning will have negligible impact on these activities (i.e. Hornsea 1 & 2 & potentially Hornsea 3) and vice versa. The pipelines including their cut ends are to be naturally buried. Biodegradable grout bags will be used as a contingency to bury pipeline ends in the event that they do not remain buried.
	Damage or loss of fishing gear	<ul style="list-style-type: none"> A post decommissioning debris survey will be conducted. Locations of any remaining footprint of the pipelines will be accurately mapped and information disseminated via the Hydrographic Office and Kingfisher notification system.
	Accidental hydrocarbon release	<ul style="list-style-type: none"> Ketch Decommissioning Oil Pollution Emergency Plan (OPEP) and Communications and Interface Plan will be in place. DNO have UKCS membership with Oil Spill Response (OSRL) for Tier 2/3 incidents. Liquid waste / marine discharges involving reservoir hydrocarbons will be subject to the requirements of the OPPC.

Table 4.2 Environmental Impact Appraisal Summary – cont'd

Activity	Main Impacts	Management
	Dropped object(s)	<ul style="list-style-type: none"> • A post decommissioning debris survey will be conducted. • Adhere to lifting and handling procedures and use of certified equipment for lifting. • Retrieve items of debris from the seabed after operations, in compliance with relevant legislation.
Decommissioning Pipelines' Stabilisation Features	<ul style="list-style-type: none"> • Potential snagging hazards to other users of the sea. • Long term degradation of pipeline and release of degraded material to the environment 	<ul style="list-style-type: none"> • Pipelines decommissioned in situ will continue to be shown on Navigational charts. • Stabilisation features associated with pipelines will be removed. • Side scan sonar (SSS) and multi-beam echo sounder (MBES) will be used to determine overtrawlability within the Dogger Bank SAC and SNS cSaC as opposed to carrying out an overtrawl, to avoid any further physical disturbance in these protected marine sites. • Pipelines will be flushed to remove mobile hydrocarbons prior to commencement of decommissioning activities. • Locations of any remaining infrastructure will be accurately mapped and information disseminated via the UK Hydrographic Office and Kingfisher notification system. • An agreed monitoring programme and remediation will be proposed and highlight any potential snagging risk post decommissioning.
	Solid waste	<ul style="list-style-type: none"> • Solid waste will be produced from the full removal of the pipeline stabilisation features. • Materials are reused and recycled where possible. • Compliance with UK waste legislation and duty of care. • Use of designated licensed sites only. • Permits and traceable chain of custody for waste management, shipment, treatment and onshore disposal. • Waste Management Plan will be implemented

5 INTERESTED PARTY CONSULTATIONS

Consultations Summary:

(This section will be updated when the consultation phase is completed).

Table 5.1 Summary of Consultee Comments		
Who	Comment	Response
INFORMAL CONSULTATIONS		
BEIS	Meetings with OPRED on 13 th November 2017 and 26 th February 2018, 24 th May 2018 and 10 th July 2018.	Guidance provided regarding the scope and content of the DP
JNCC	The Preliminary Environmental Scoping report was sent to the EA on 16 th April 2018.	JNCC letter reference OIA 5264 dated 14 th May 2018
NFFO	DNO's Fishing Liaison Officer (FLO) liaised with the NFFO on 27 th April 2018.	FLO's summary note of meeting with NFFO dated 10 th May 2018.
EA	The EA are likely to be the waste authority, they were consulted on 26 th February 2018.	Guidance provided with regard to disposal in the UK and transfrontier shipment of waste.
OGA	The OGA were consulted at the SCAPs workshops at the OGA's London office on 7 th March 2018 and at meetings in Aberdeen on 30 th May 2018 and 21 st June 2018.	Guidance received regarding SCAPs and ongoing liaison with the OGA.
STATUTORY CONSULTATIONS		
NFFO	None	N/A
SFF	None	N/A
NIFPO	None	N/A
Global Marine Systems	None	N/A
Public	None	N/A

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A DNO Project Management team has been appointed to manage suitable sub-contractors for the removal of the Ketch installation. DNO standard procedures for operational control and hazard identification and management will be used. Where possible the work will be coordinated with other decommissioning operations in the SNS. DNO will monitor and track the progress of consents and the consultations required as part of this process. Any changes in detail to the offshore removal programme will be discussed and agreed with BEIS. Petrofac are the designated duty holder and they will be involved in all offshore work conducted.

6.2 Post-Decommissioning Debris Clearance and Verification

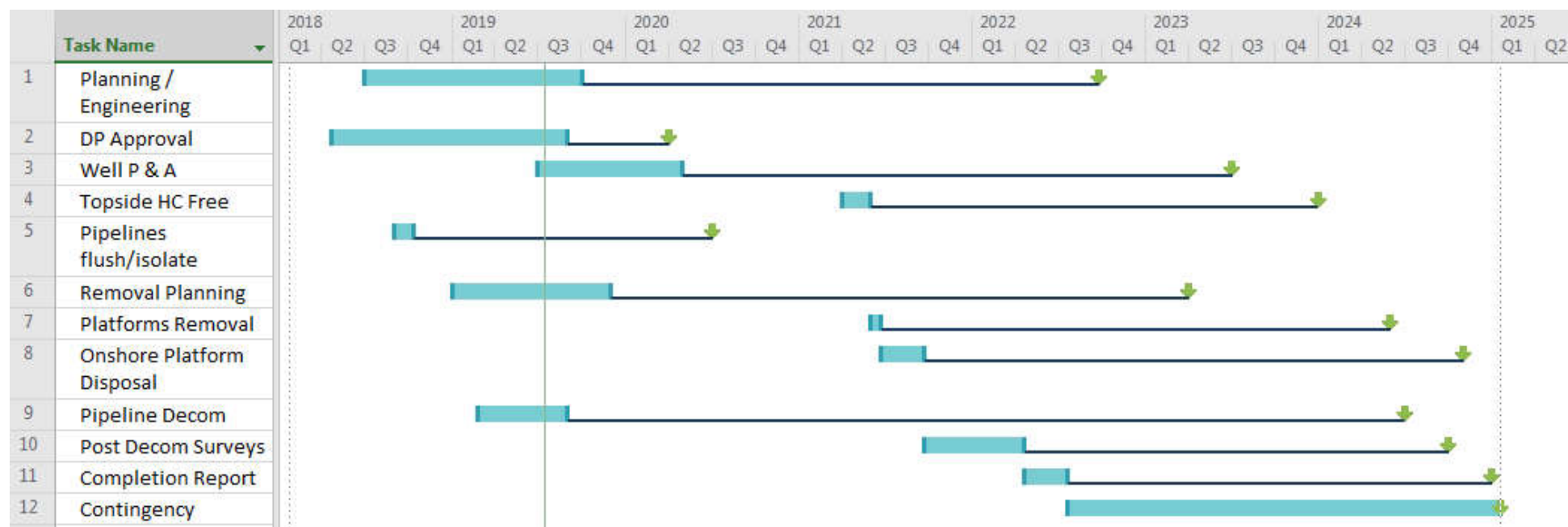
A post decommissioning site survey will be carried out in 500m radius of the Ketch installation site. Oil and gas seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained. Whilst the worst-case seabed disturbance from overtrawl has been assessed, it is recognised that some of the decommissioning activities are occurring in the Dogger Bank SAC/SCI and MPA protected site, therefore different methods of determining debris clearance and snag risk may be required. The methods used will therefore be discussed and finalised with the regulator. This will be followed by a statement of clearance to all relevant governmental departments and non-governmental organisations.

6.3 Schedule

Project Plan:

DNO intend to progress the decommissioning of Ketch in stages. The intent is to perform activities on Ketch platform so that a Hydrocarbon free status can first be achieved. DNO would then look to complete the removal of the topside and jacket within the project timeframe as declared in Section 1.2 but at such time that would be most efficient and cost effective to the project. The schedule indicates the earliest and latest dates the heavy lift removal is estimated to take place.

Figure 6.1: Gantt chart of Project Plan



The availability of the MODU / jack-up barge for the well P&A; a heavy lift vessel for the lift; and favourable weather windows drive the completion dates of the overall project.

The coloured bars in the Gantt chart indicate the earliest start and duration of an activity. The black lines indicate the maximum window that activity can be undertaken in.

Wells will be monitored as if they were producing until they have been independently verified as being plugged and abandoned.

6.4 Costs

Costs will be submitted separately to OPRED.

6.5 Close Out

In accordance with the BEIS Guidelines, a close out report will be submitted to BEIS explaining any variations, from the Decommissioning Programmes, normally within 12 months of the completion of the offshore decommissioning scope, (note this is currently subject to the time taken for the laboratories to process the environmental samples) including debris removal and independent verification of seabed clearance and the post-decommissioning environmental survey. In the close out report, the company responsible for the subsequent management of on-going residual liabilities for any infrastructure left in-situ will be detailed. That company will also be the contact point for any third party claims arising from damage caused by any remains from the Ketch decommissioning programme. The pipelines and pipeline stabilisation features remain the property and responsibility of the licensees.

6.6 Post-Decommissioning Monitoring and Evaluation

A post decommissioning environmental seabed survey will be carried out around the 500m zone of the Ketch installation. The survey will focus on chemical and physical disturbances of the decommissioning area and be compared with the pre-decommissioning survey, which has been carried out before decommissioning commenced. Results of this survey will be forwarded to BEIS. The pipeline routes will be the subject of surveys when decommissioning activity has concluded. The surveys include the 100m corridor along the pipeline routes. Best endeavours will be undertaken to achieve a minimum burial of 0.6m, or deeper if equipment allows. Side scan sonar (SSS) and multi-beam echo sounder (MBES) will be used to determine overtrawlability within the Dogger Bank SAC and SNS cSaC as opposed to carrying out an overtrawl, to avoid any further physical disturbance. Following burial of entire pipeline, a survey will be undertaken to confirm the pipelines burial depth. This will then be added to the pipeline profile graphs. After the surveys have been sent to BEIS and reviewed, the post-decommissioning monitoring regime will be discussed and agreed with BEIS. Typically a minimum of one post decommissioning environmental survey and two pipeline surveys to check for any issues are expected.

6.7 Residual Liability

DNO recognises that they will continue to retain ownership of, and residual liability for all decommissioned items allowed to remain in place through acceptance of the results of the comparative assessment process in Section 3. DNO undertakes;

- to contact OPRED in advance, in the event that any parties to the programmes will no longer have a presence in the UK, to provide the details of the organisation or individual who will act in their place;
- to notify OPRED of any organisation/individual that will engage with OPRED on future legacy and liability matters;
- to notify OPRED of any organisation/individual that will be the contact point for any future third party claims for damage caused by pipelines left in place;
- to ensure that any alternative organisation/individual will have appropriate authority for and knowledge of the DPs, to engage with OPRED;
- to ensure that any alternative organisation/individual will have access to appropriate funding to carry out any actions relating to the residual legacy and liability as outlined in the approved DPs.

7. **SUPPORTING DOCUMENTS**

Table 7.1: Supporting Documents	
Document Number	Title
1	Ketch Environmental Appraisal
2	Ketch Pipelines Comparative Assessment Report
3	Geoxyz. 2018. Pre-decommissioning Environmental Baseline and Debris Survey Campaign Report

8. PARTNER LETTERS OF SUPPORT

Tullow Oil SK Limited

9, Chiswick Park, 566 Chiswick High Road, London, W4 5XT
Tel: +44 (0)203 249 9000 Fax: +44 (0)203 249 8801



Ref: TÖ/R/S&K-10

29 July 2019

Offshore Petroleum Regulator for Environment & Decommissioning (OPRED)
Department of Business Energy & Industrial Strategy (BEIS)
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ

F.A.O Decommissioning Manager

Dear Sir / Madam,

Ketch Decommissioning Programme

We, Tullow Oil SK Limited, confirm that we authorise DNO North Sea (ROGB) Limited (formerly known as Faroe Petroleum (ROGB) Limited) ("**DNO**") to submit on our behalf the final Decommissioning Programme for the Ketch facilities.

We support the proposals detailed in the Decommissioning Programme (Doc No. SCKE-FPROGB-O-TA-0002 Rev: 08) submitted by **DNO** as required by section 29 of the Petroleum Act 1998.

Your faithfully

For and on behalf of **Tullow Oil SK Limited**

Signed: 

Name: KEVIN STASSIE

Title: DIRECTOR

APPENDIX 2 – SURVEY BURIAL PROFILES

