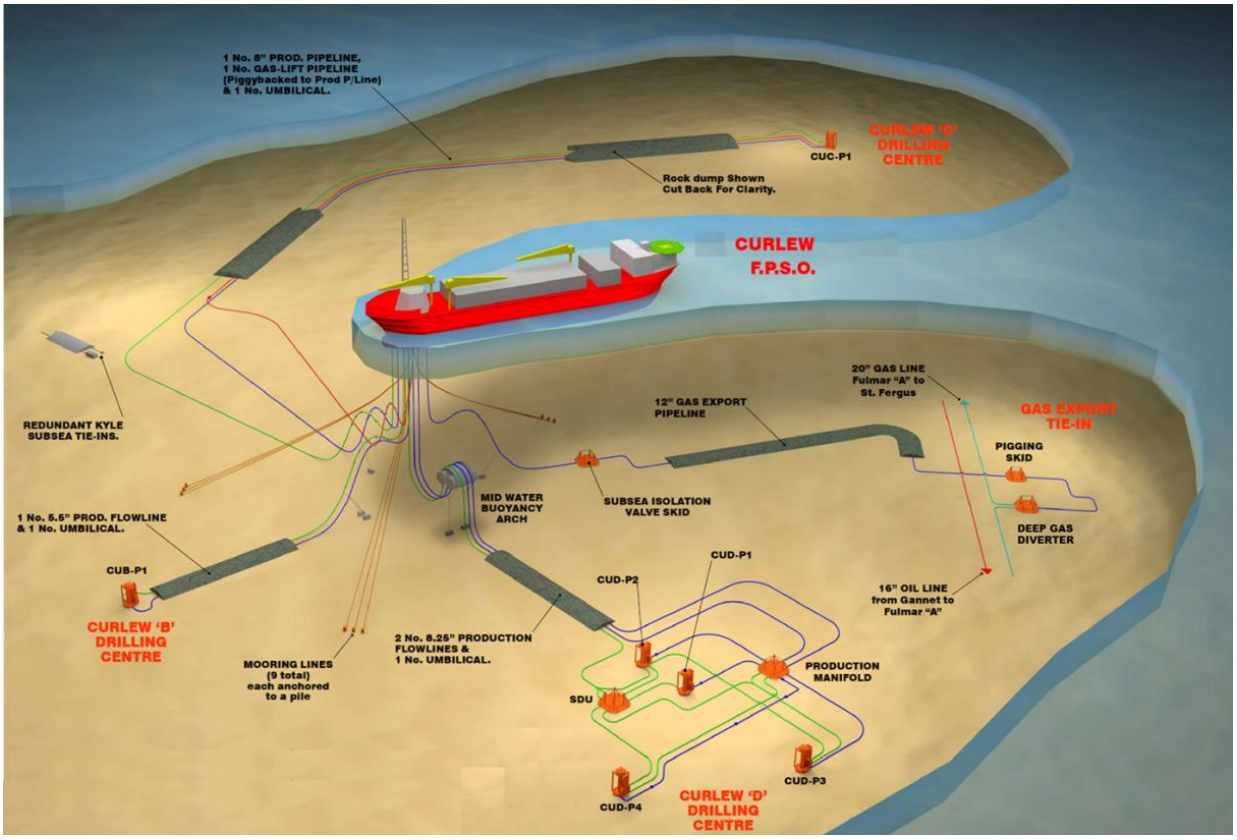
Curlew B&D and Curlew C Decommissioning Programmes



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Document Control

Approvals

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A02	Pre-consultation draft sent to BEIS for comment	**Comments incorporated**	**23/10/17**
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Contents

Terms and Abbreviations

Term	Explanation
3LPP	3 Layer Polypropylene
BEIS	Department for Business, Energy and Industrial Strategy (formerly DECC)
BT	British Telecom
BUTA	Base Umbilical Termination Arrangement
CA	Comparative Assessment
CATS	Central Area Transmission System
CNS	Central North Sea
COP	Cessation of Production
DECC	Department of Energy and Climate Change (now Department for Business, Energy and Industrial Strategy)
DFPV	Drain Flare Purge Vent
DP	Decommissioning Programme
EIA	Environmental Impact Assessment
EHC	Electro-Hydraulic control and Chemical injection
ESDV	Emergency Shut Down Valve
FGL	Fulmar Gas Line
FPAL	First Point Assessment Ltd., the Achilles scheme which identifies, evaluates and pre-qualifies suppliers for major buyers in oil and gas
FPSO	Floating Production Storage Offloading
FSM	Flow Signature Method™ Corrosion Monitoring Spool
HLV	Heavy Lift Vessel
HSSE	Health, Safety, Security and Environment
IA	Impact Assessment
JNCC	Joint Nature Conservation Committee
LSA	Low Specific Activity
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (Marine Pollution)
MCAA	Marine and Coastal Access Act
MMO	Marine Management Organisation
MPA	Marine Protected Area

MSL	Mean Seabed Level
MWA	Mid Water Arch (Buoyancy unit for Curlew D risers)
NFFO	National Federation of Fishermen's Organisation
NORM	Naturally Occurring Radioactive Material
OGA	Oil and Gas Authority
OPEP	Oil Pollution Emergency Plan
OSPAR	Oslo and Paris Convention (for the Protection of the Marine Environment of the North-East Atlantic)
P&A	Plug and Abandonment
PL	Pipeline
PLU	Pipeline Umbilical
PMF	Priority Marine Feature
PON	Petroleum Operations Notice
PP	Polypropylene
PWA	Pipeline Works Authorisation
ROV	Remotely Operated Vessel
SDU	Subsea Distribution Unit
SEPA	Scottish Environmental Protection Agency
SFF	Scottish Fishermen's Federation
SIMOPS	Simultaneous Operations
SLV	Single Lift Vessel
SOPEP	Ship Oil Pollution Emergency Plan
SSIV	Subsea Isolation Valve
Te	Metric Tonne
UKCS	United Kingdom Continental Shelf
UTA	Umbilical Termination Arrangement
WHPS	Well Head Protection Structure
WGS84	World Geodetic System 1984
WMP	Waste Management Plan

Figures and Tables

Appendices

1 EXECUTIVE SUMMARY

1.1 Combined Decommissioning Programmes

This document contains five Decommissioning Programmes (DPs), one for the Curlew B & D offshore installations, one for the Curlew C offshore installations, one covering the Curlew B & D pipelines and two covering the Curlew C pipelines, all situated on the U.K. Continental Shelf (UKCS). A combined programme for each set of the associated notices served under Section 29 of the Petroleum Act 1998 [1] is provided herein. A summary of the Section 29 notices is shown in table 1.1 below

Table 1.1 Section 29 Notice Holders Summary

	Type	Notice Holders
1	Curlew B & D - Offshore installations *Curlew FPSO and all associated subsea equipment*	Shell U.K. Limited (50%) Esso Exploration and Production UK Limited (50%)
2	Curlew B, D and Gas Export – Subsea Pipelines	Shell U.K. Limited (50%) Esso Exploration and Production UK Limited (50%)
3	Curlew C – Offshore installations *Curlew C and all associated subsea equipment*	Shell U.K. Limited (100%)
4	Curlew C – Subsea Pipelines	Shell U.K. Limited (100%)
5	Curlew C – Subsea Pipelines (re-used dynamic riser)	Shell U.K. Limited (50%) Esso Exploration and Production UK Limited (50%)

These combined DPs are submitted by the co-venturers Shell U.K. Limited, Registered Company Number: 00140141 (Shell, operator) and Esso Exploration and Production UK Limited, Registered Company Number: 00207426 (Esso) both being the recipients of the Section 29 Notices under items 1,2 and 5 and Shell under items 3 and 4 as listed in table 1.1 and throughout this document the terms 'owners', 'we', and 'our' refer to Shell and Esso as co-venturers or Shell as sole section 29 Notice holder under items 3 & 4 as the case may be.

1.2 Requirement for Decommissioning Programmes

These DPs are submitted for statutory and public consultation in compliance with relevant legislation and the Department for Business, Energy and Industrial Strategy's, (BEIS) (formerly DECC) guidelines [2]. It describes the principles of the removal activities in compliance with national and international regulations, whilst also presenting an assessment of the environmental impacts of the proposed programme.

Installations:
In accordance with the Petroleum Act 1998 [1] and the BEIS guidance notes [2], the Section 29 notice holders of the Curlew B, C and D installations/fields are applying to BEIS to obtain approval for decommissioning the Curlew Floating Production Storage and Offload (FPSO) installation and associated subsea elements and returning them to shore for recycling and disposal.

Installations are detailed in Sections 2.1.1, 2.1.2 and 2.2.1 and 2.2.2. (See also Section 8 - Partner Letters of Support). No derogation from the general rule of OSPAR Decision 98/3 [3] is required or sought.

The Department for Business, Energy and Industrial Strategy (BEIS) is responsible for considering the Curlew decommissioning programmes, pending submission of the final programmes to the Secretary of State for approval.

Pipelines:
In accordance with the Petroleum Act 1998 [1] and the BEIS guidance notes [2], the Section 29 notice holders of the Curlew B, C and D pipelines are applying to the BEIS to obtain approval for decommissioning the pipelines detailed in Sections 2.1.3 and 2.2.3 of these programmes. (See also Section 8 – Partner Letters of Support).

It should be noted that the Curlew FPSO also served the Kyle field until 2005, which is now tied back to the BANFF FPSO. The Kyle field decommissioning proposals are not part of this submission.

The schedule outlined in this document is for a 5 year decommissioning project plan due to begin in 2019.

1.3 Introduction

Shell requested Cessation of Production (CoP) on the Curlew fields including Floating Production Storage and Offloading (FPSO) facility in January 2016.

The Curlew fields are expected to reach their economic limit in Q1 2019 and there are no further developments or third-party tieback opportunities that could extend the field's life. Approval from the Oil & Gas Authority (OGA) for cessation of production has been granted from 2016, should the Curlew FPSO become uneconomic (e.g. if a significant event such as well or equipment failure occurs from which economic recovery is not possible).

Shell has agreed a provisional draft of an Exchange of Correspondence (EoC) with BEIS in July 2017, which would be updated with specific details in the event it needed to be formally submitted, to remove the Curlew FPSO ahead of these DPs approval.

The programmes contained in this document set out the decommissioning plans for the fields.

The phasing of the decommissioning activities is as follows:

- Phase 1 – Curlew FPSO removal: Flushing of pipelines and facilities, disconnection of all lines from subsea trees, disconnection of the risers and mooring lines at the FPSO allowing sail-away at the earliest convenience.
- Later Phases
    - Wells Plug & Abandonment (P&A)
    - Removal of subsea infrastructure within all Curlew field areas in accordance with the approved Decommissioning Programme.

A guard vessel will be used for the duration between Phase 1 and the later phase of subsea infrastructure removal. These later phases will be finalised with trawler sweeps and as-left surveys, as required.

1.3.1 Asset Overview

The Curlew cluster is located in Block 29/7 of the United Kingdom Continental Shelf (UKCS) in the central North Sea. It is situated 197 km SE of Aberdeen. The Curlew is a Floating Production, Storage and

Offloading vessel (FPSO) located over the Curlew reservoir. The FPSO has equipment for oil and gas processing, storage and offloading, gas processing and export and treatment of produced water. Oil from the Curlew FPSO is exported onshore via shuttle tanker, while gas is exported from the Curlew FPSO to the St. Fergus Terminal via the Fulmar pipeline.

The Curlew FPSO was originally built at the Odense Steel Shipyard in Denmark as the tanker Maersk Dorset in 1983. In 1997, The tanker was converted at A&P Tyne on the River Tyne, while the fabrication, construction and installation of the topsides was carried out by AMEC. It was deployed in the Curlew Field in 1997, where it produced first oil that arose from the phased development of the subsea Curlew B-D fields.

There are 3 subsea tie-backs to the Curlew FPSO:

- Curlew B field produced from a single well;
- Curlew C field produces from a single well (re-uses the original Kyle dynamic riser) with gas lift and associated subsea structures;
- Curlew D field produces via two production lines from four wells tied back to a production manifold together and associated subsea structures;

Gas is exported to St Fergus via a connection to the Fulmar pipeline, with associated subsea structures.

The Kyle field was tied to the FPSO back until 2005, but is currently physically disconnected and is produced over a different host. Curlew C was brought online in 2008 as a tie back to the FPSO via a production and gas lift line. Curlew B field has been shut-in since 2007. Shell acquired ownership of the FPSO in 2013.

1.3.2 Summary of Recommendations

All installations and pipeline structures will be fully removed during decommissioning, in line with the requirements of OSPAR Decision 98/3. The proposals for decommissioning pipelines and umbilicals, meanwhile, have been prepared in line with the BEIS Guidance Notes following a Comparative Assessment (CA) of feasible and credible options, which are as follows:

- Trenched and/or buried pipelines will be decommissioned *in situ* with the final sections of the pipeline above mean seabed level (MSL) removed and returned to shore for recycling or disposal. This proposal applies to the Curlew B production line (PL1450), Curlew C production line (PL1798B/2523) and gas lift line (PL2524), Curlew D production lines (PL1452, PL1453) and the gas export pipeline (PL1455). The latter is expected to further backfill naturally, though gateways created by the SFF by continuously trawling the pipeline, which “smooths” out the seabed and distributes any natural fill over the pipeline may be considered for the ability to over-trawl depending upon the outcome of final surveys. The ends of pipelines, or buried pipelines, will be remediated with rock cover, as required.
- Trenched and/or buried Curlew umbilicals (PL1451, PLU2525 & PL1454), will be decommissioned *in situ* with the ends above MSL removed and returned to shore for recycling or disposal. The ends of umbilicals, or buried umbilicals, will be remediated by rock cover, as required.
- Mooring Anchor piles will be fully removed to at least -3m below MSL and remediated by rock cover, as required. Where full removal is not feasible, BEIS will be consulted and anchor piles will be removed to an agreed depth below seabed.
- Mooring trenches will be remediated by filling with rock to just below MSL, subject to the outcome of final over-trawl surveys.

1.4 Curlew B & D Fields – Decommissioning Overview

This section covers Section 29 Notices 1 and 2 from above Table 1.1. This includes Curlew B & D fields, Curlew FPSO and all associated subsea equipment plus Curlew B&D, and gas export subsea pipelines.

1.4.1 Installations

Table 1.2: Installations Being Decommissioned			
Fields:	Curlew B and Curlew D fields.	**Production Type:**	Oil, gas and condensate
Water Depth (m)	92m	**UKCS Block:**	29/7
Surface Installations			
Number	**Type**	**Topsides Weight (Te)**	**Jacket Weight (Te)**
1	FPSO with integrated topsides	24,258.6	N/A
Subsea Installations		**Number of Wells**	
Number	**Type**	**Platform**	**Subsea**
1	Manifold (inc. piles)	N/A	N/A
5	Wellheads	0	5
9	Mooring lines (inc. piles)	N/A	N/A
1	MWA (inc. base, piles and lines)	N/A	N/A
Drill Cuttings pile(s)		**Distance to meridian**	**Distance from nearest UK coastline**
Number	**Total Estimated volume (m^3)**	**km**	**km**
1	<671	73.3	204.4

1.4.2 Pipelines

Table 1.3 Pipelines being Decommissioned	
Number of Pipelines (see Table 2.3 for full details)	19
Curlew B:	
Pipelines	1
Umbilicals	1
Curlew D:	
Pipelines	6
Umbilicals	9
Gas Export:	
Pipelines	2

* Number of pipelines has been based on Unique OGA Pipeline Numbers/PWAs, to include all individual connections between all wells

1.5 Curlew C Field – Decommissioning Overview

This section covers Section 29 Notices 3, 4 and 5 from above Table 1.1. This includes Curlew C field, all associated subsea equipment plus Curlew C subsea pipelines.

1.5.1 Installations

Table 1.4: Installations Being Decommissioned			
Fields:	Curlew C field	**Production Type:**	Oil, gas and condensate
Water Depth (m)	92m	**UKCS Block:**	29/7

Subsea Installations		Number of Wells	
Number	**Type**	**Platform**	**Subsea**
1	Wellhead Protection Structure (WHPS)[1]	N/A	N/A
1	Wellhead	0	1

Drill Cuttings pile(s)		Distance to median	Distance from nearest UK coastline
Number of Piles	**Total Estimated Volume (m^3)**	**km**	**km**
0	N/A	68.4	214

Note 1. Structure is attached to subsea trees and flowbase (wellhead), and will be removed as part of wells P&A

1.5.2 Pipelines

Table 1.5 Pipelines being Decommissioned	
Number of Pipelines (see Table 2.10 for full details)	4
Curlew C:	
Pipelines	3
Umbilicals	1

* Number of pipelines has been based on unique OGA Pipeline Numbers/PWAs

1.6 Summary of Proposed Decommissioning Programmes

Table 1.6: Summary of Decommissioning Programmes		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
1. Topsides		
N/A	N/A	N/A
2. Floating Facility		
Complete removal and recycling/disposal	No further re-use opportunity identified so will be subject to recycling and disposal with the aim of maximising recycling	Topsides equipment will be drained, flushed, purged and vented offshore prior to preparation for removal. No further re-use opportunity has been identified; Where required, further cleaning will be carried out at an intermediate location or at the dismantling/ disposal site for recycling, as appropriate.
3. Subsea Installations		
Wellhead, manifold, mooring system, clump weights, MWA and WHPS will be removed	Leaves a clear seabed, removes a potential obstruction to fishing operations and maximises recycling of materials	Structures (including anchor piles) and mooring lines will be removed to at least -3m below MSL. If the anchor piles are unable to be removed to at least -3m below MSL, BEIS will be consulted and the anchor piles will be removed to an agreed depth below seabed.
4. Pipelines, Flowlines & Umbilicals		
SSIV, SDU and concrete pipework protection structures will be removed	Leaves a clear seabed, removes a potential obstruction to fishing operations	Structures will be removed and recovered to shore
Curlew FPSO to Fulmar pipeline PL1455B to be decommissioned *in situ*	The pipeline is trenched, buried and stable; Minimal seabed disturbance; reduced risk to personnel	Trenched areas with covering to remain *in situ*. Exposed ends to be cut and covered. Selected crossing gateways may be formed, if required, subject to final over-trawl survey outcomes.
Full removal of pipeline PL1455A (riser)	To remove and leave a clear seabed.	To be removed.
Partial removal of Curlew B pipeline PL1450	The static pipelines/ umbilicals are trenched, buried and stable; Minimal seabed disturbance; reduced risk to personnel.	Buried and covered sections to remain *in situ*. Exposed ends to be lowered or cut and covered. Riser and spools to be removed.
Partial removal of Curlew B umbilical PL1451		Buried and covered sections to remain *in situ*. Riser to be removed. Exposed ends to be lowered or cut and covered.
Partial removal of Curlew C pipeline PL2523.		Buried and covered sections to remain *in situ*. Spools to be removed. Exposed ends to be sealed and buried.
Partial removal of Curlew C pipeline PL2524.		Buried and covered sections to remain *in situ*. Risers and spools to be removed. Exposed ends to be lowered or cut and covered.
Full removal of Curlew C pipeline PL1798B (riser)	To remove and leave a clear seabed.	To be removed. Exposed end to be sealed prior to any cutting.
Partial removal of Curlew C umbilical PLU2525	The static umbilical is trenched, buried and stable; Minimal seabed	Buried and covered sections to remain *in situ*. Riser and jumpers to be removed. Exposed ends to be lowered or cut and covered.

	disturbance; reduced risk to personnel.	
Partial removal of Curlew D pipelines PL1452 and PL1453.	The pipelines/umbilicals are trenched, buried and stable; Minimal seabed disturbance; reduced risk to personnel.	Buried and rock covered sections to remain *in situ*. Exposed ends to be lowered or cut and buried. Riser and spools to be removed. To remove all seabed structures.
Partial removal of Curlew D umbilical PL1454		Buried and rock covered sections to remain *in situ*. Riser and jumpers to be removed. Exposed ends to be lowered or cut and buried. To remove all seabed structures.
Full removal of Curlew D well spools (PL1727, PL1728, PL2452, PL2453) and umbilical jumpers (PL1454, PL1726, PL3568, PL3569, PLU2454, PLU2454 JCDP, PLU2455, PLU2455 JCDP, PLU2455 JW3)	To remove and leave a clear seabed.	To be removed.
5. Wells		
Abandon in accordance with Oil & Gas UK Guidelines for the Suspension and Abandonment of Wells (issue 5, July 2015)	Meets OGA and HSE regulatory requirements	PON5/PETS/Marine Licence applications under the relevant regulations will be submitted in support of works carried out.
6. Drill Cuttings		
Leave in place to degrade naturally	Cuttings pile falls below both of OSPAR 2006/5 thresholds.	N/A
7. Interdependencies		
Subsea infrastructure and pipelines will be flushed and disconnected before the FPSO is disconnected and towed away. The minor drill cuttings pile for CUD P1 & P2 may be impacted by CUD P2 wellhead disconnection and/or removal but has little influence on options. The Curlew gas export pipeline (PL1455) crosses over DC14. PL1455 is trenched at this location and the crossing will be decommissioned in situ with appropriate remediation as per Table 3.6 Group 4. The Curlew gas export pipeline (PL1455) crosses over PL763 and PL208. PL763 and PL208 are surface laid pipelines and the crossings are mattressed and covered with rock. PL763 and PL208 are live lines The decommissioning of the PL1455 pipeline crossings over PL763 and PL208 will be addressed at the time of the future decommissioning of the Gannet Field pipelines (for PL763), and the Fulmar Field pipelines (for PL208). The Pigging Skid Assembly (PSA) and associated spools are currently part of the Gas Export Pipeline PWA 2/W/97. The PSA and tie-in spools between the PSA and the Fulmar Deep Gas Diverter will be transferred to the Fulmar Gas Pipeline PWA and SEGAL ownership following Cessation of Production. The PSA will be available for future tie-in opportunities. No specific opportunity has been identified at this stage for re-use.		

A HUOO form and PWAv will be submitted to the OGA to complete the transfer. There will be no change in ownership parties as part of this transfer with Shell and Exxon Mobil being 50/50 partners in both the Curlew Gas Export Pipeline and SEGAL.

1.7 Field Location Including Field Layout and Adjacent Facilities

Figure 1.1: Field Location in UKCS

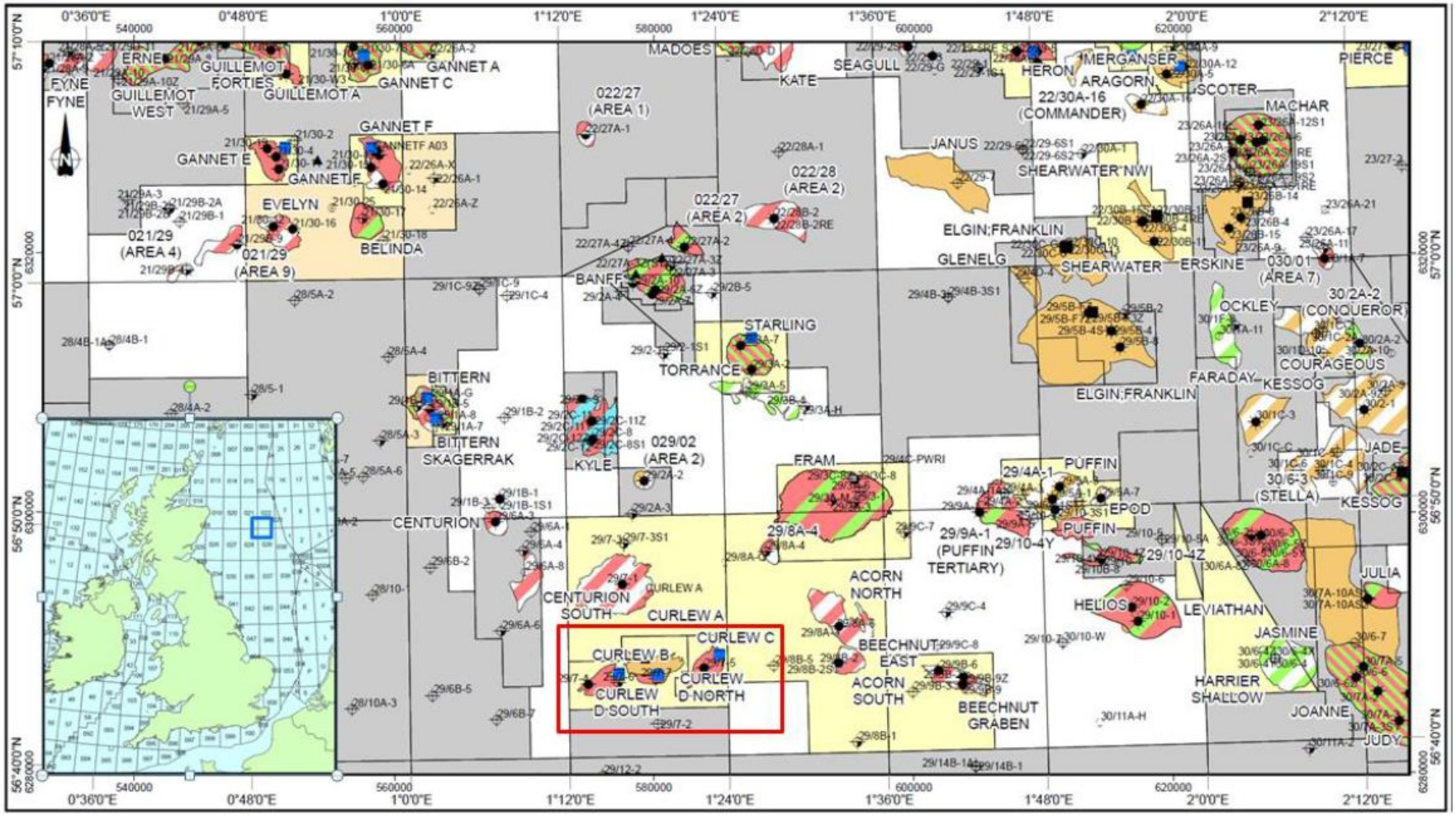


Figure 1.2: Field Layout

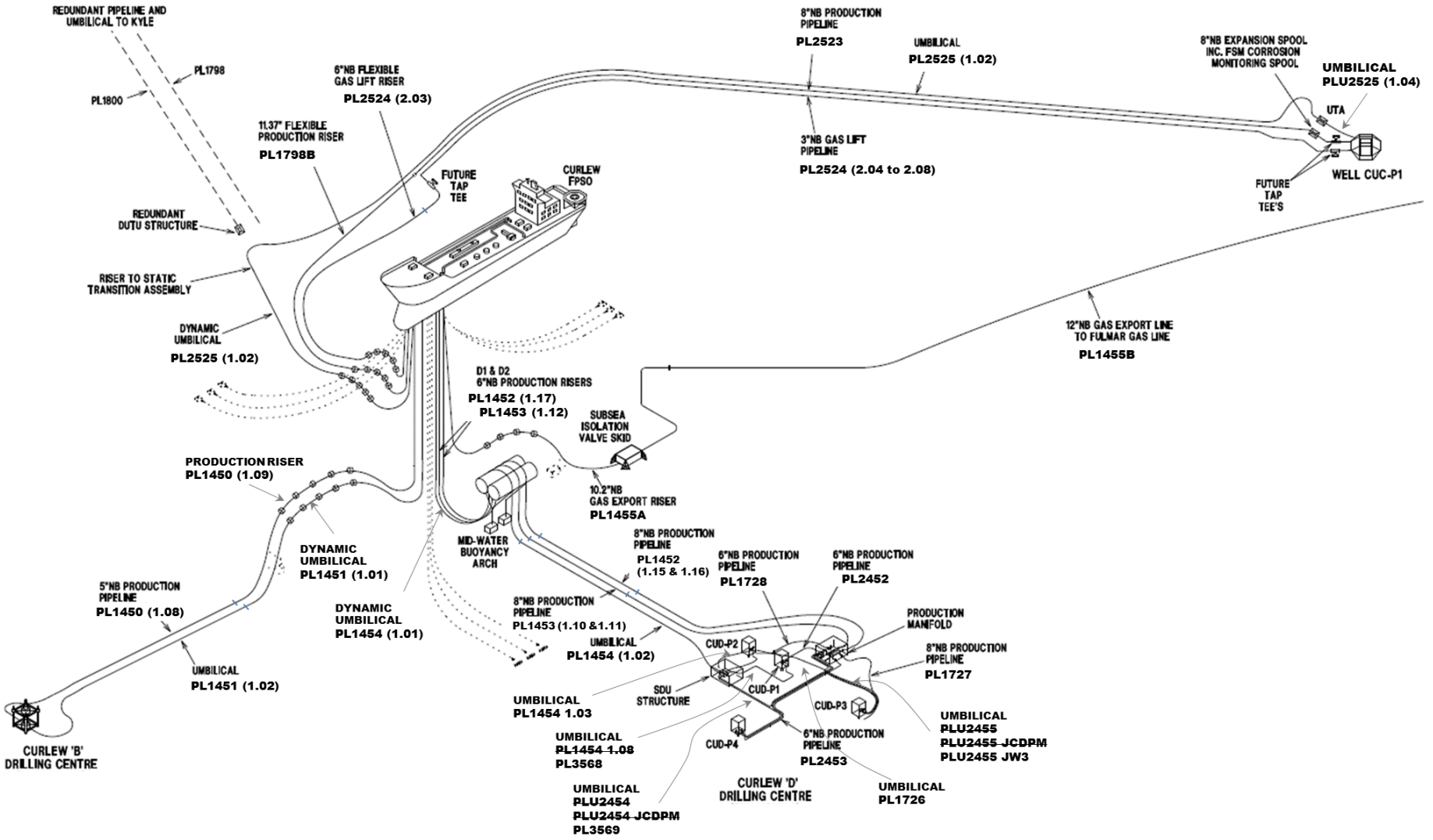
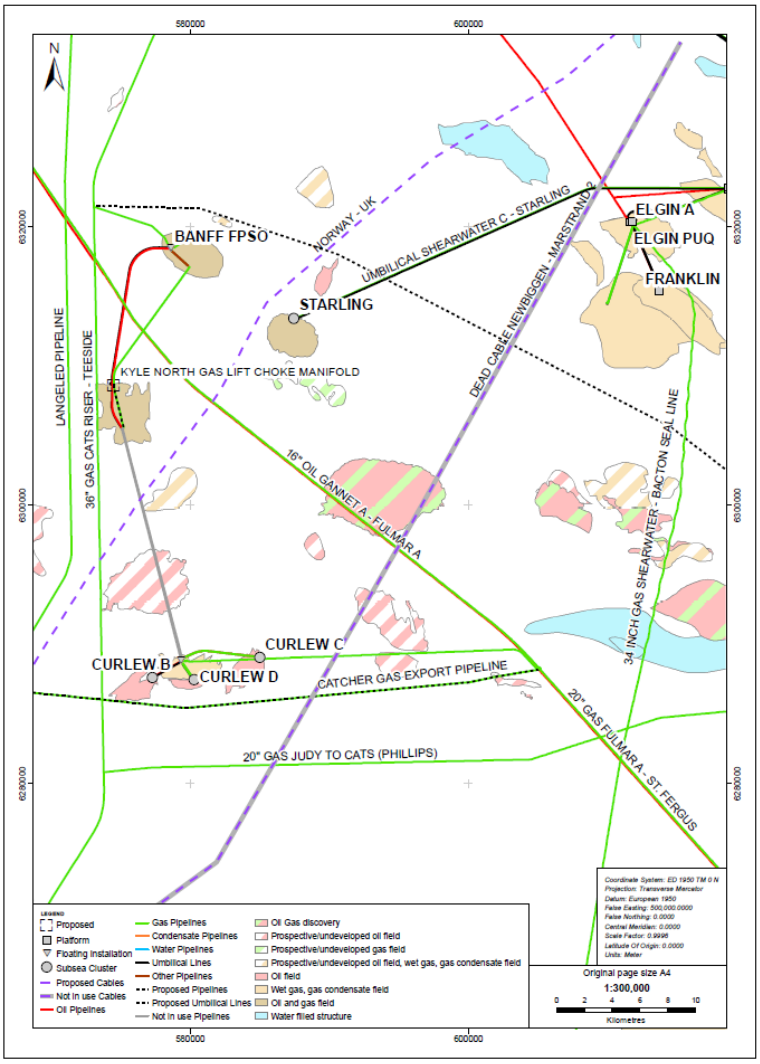


Table 1.7 Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/ Direction**	**Information**	**Status**
Shell U.K. Ltd	PL1800	Power and chemicals umbilical	0.2km N	**Umbilical to Kyle South Drill Centre** (ex Curlew FPSO). Near Curlew C gas lift & production riser bases (approx. 6m).	Inactive
Shell U.K. Ltd	PL1798	Oil, gas, water pipeline	0.3km N	**Kyle South Drill Centre pipeline** (to Curlew FPSO). Near Curlew C gas lift & production riser bases (approx. 10m).	Inactive
Shell U.K. Ltd	PL763	Oil transmission system	16.0km NE	**Gannet A – Fulmar A** 10". Crossed by Curlew Gas Export Pipeline PL1455B at 56°43.475' N, 01°42.817' E	Active
Shell U.K. Ltd	PL208	Gas transmission system	16.1km NE	**Fulmar A – St Fergus. Fulmar Gas Line (FGL)** 20". Crossed by Curlew Gas Export Pipeline PL1455B at 56°43.505' N, 01°42.884' E	Active
Premier	PL3759	Gas transmission system	3.3km W	**Catcher Gas Export Pipeline** 10". Ties in at FGL deep gas diverter FGL. Runs near Curlew Gas Export Pipeline PL1455B (approx. 60m)	Active
Antin		Gas transmission system	5.7km SW	**Central Area Transmission System (CATS) to Teesside** 36". Runs near Curlew B well head (approx. 3.5km W)	Active
Conoco Philips		Gas transmission system	7.6km E	**Judy to CATS gas export** 20". Runs near Curlew D well heads (approx. 13km S)	Active
BT and Televerket	DC14	Telecoms	9.4km S	Newbiggin – Marstrand Communication Cable. Crossed by Curlew Gas Export Pipeline PL1455B at 56°44.128' N, 01°28.616' E.	Inactive
Impacts of Decommissioning Proposals					
The Kyle South Drill Centre umbilical and pipeline are close to the Curlew C riser bases/touch down points. For the FPSO disconnection, the cut the dynamic risers and moorings will fall to the sea bed. The fall of the risers and moorings were assessed and no predicted impingement on redundant Kyle equipment was identified. The removal of the Curlew C umbilical and risers, are also not expected to impact the redundant Kyle equipment.					

See figure 1.3 for adjacent facilities. All other installations/pielines are greater than 10km away (nearest being Kyle).

Figure 1.3: Adjacent Facilities



1.8 Industrial Implications

We have looked to identify safe, efficient and cost-effective methods and procedures for various aspects of decommissioning the FPSO and facilities in the Curlew Fields. A number of contractors and consultancies have contributed to the various studies and assessments that have been prepared since 2015 to inform our plans and support our decision-making processes.

Contact was initiated, in late 2016, with the supply chain to explore decommissioning execution solutions, including:

- Inviting supply chain companies to present to the decommissioning team on their capabilities;
- D&R supply chain/market engagements including:
  - Portfolio presentation at Market Engagement introductory event held in March 2017;
  - Follow up engagement questionnaires and selective follow up “deep dives”;
- Participation in industry workgroups, events, seminars and conferences;
- Inclusion of trade organisations and enterprise bodies in supply chain consultations;
- Exploring multi-field and potentially multi-operator combined work scopes.

All procurement will be carried out in accordance with the company standards for contract and procurement. This includes the required utilisation of FPAL/Achilles for the identification of potential tenderers.

2 Description of Items to be Decommissioned

2.1 Curlew B&D Fields

2.1.1 Curlew B&D Fields Installations: Surface Facilities (FPSO)

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)
Curlew FPSO	FPSO	WGS84 Decimal	57.7348°N 1.2968°E	24,259	1	N/A	N/A	N/A	N/A
		WGS84 Degree Minute	56°44.087'N 01°17.805'E						

2.1.2 Curlew B&D Fields Installations: Subsea including Stabilisation Features

Table 2.2: Subsea Installations and Stabilisation Features					
Subsea installations including Stabilisation Features	No.	Size/ Weight (Te)	Location		Comments/Status
Curlew B wellhead	1	4.0m x 4.1m x 6.6m 49.0 (BP1)	WGS84 Decimal	56.724017ºN 01.261288ºE	The well will undergo plug and abandonment.
			WGS84 Decimal Minute	56º 43.441'N 01º 15.677'E	
Curlew D Subsea Manifold	1	8m x 6m x 4.9m 87.6	WGS84 Decimal	56.722119ºN 1.310203ºE	4 circular driven piles (0.61m dia., approx. 13.7m long; 9m depth) at 5Te each
			WGS84 Decimal Minute	56º 43.327'N 01º 18.612'E	
Curlew D wellheads	4	4.0m x 4.1m x 6.6m 49.0 (DP1)	WGS84 Decimal	56.722081ºN 01.309836ºE	All wells will undergo plug and abandonment.
			WGS84 Decimal Minute	56º 43.325'N 01º 18.590'E	
		4.0m x 4.1m x 6.6m 49.0 (DP2)	WGS84 Decimal	56.722248ºN 01.309617ºE	
			WGS84 Decimal Minute	56º 43.335'N 01º 18.577'E	
		4.0m x 4.1m x 6.6m 49.0 (DP3)	WGS84 Decimal	56.721443ºN 1.310728ºE	
			WGS84 Decimal Minute	56º 43.287'N 01º 18.644'E	
		4.0m x 4.1m x 6.6m 49.0 (DP4)	WGS84 Decimal	56.721496ºN 01.308840ºE	
			WGS84 Decimal Minute	56º 43.290'N 01º 18.530'E	

Mid Water Arch (Curlew D)	1	12m x 8.5m x 3.8m 63.8	WGS84 Decimal	58.733603ºN 01.295901ºE	Tethered by 2 chains (14Te) to 2 clump weight bases (approx. 42Te each) and 4 pin piles (triangular 2.2m x 1m x 12.3m; approx. 10m depth) @ 6.1Te each
			WGS84 Decimal Minute	58º 44.016'N 01º 17.754'E	
FPSO Mooring Anchors	9	Anchor #1 7m dia x 12.3m 108	WGS84 Decimal	56.739585ºN 01.314826ºE	Suction cans
			WGS84 Decimal Minute	56º 44.375'N 01º 18.890'E	
		Anchor #2 7m dia x 12.3m 108	WGS84 Decimal	56.738615ºN 01.315626ºE	
			WGS84 Decimal Minute	56º 44.317'N 01º 18.938'E	
		Anchor #3 7m dia x 12.3m 108	WGS84 Decimal	56.737629ºN 01.316262ºE	
			WGS84 Decimal Minute	56º 44.258'N 01º 18.976'E	
		Anchor #4 5m dia x 13.5m 54	WGS84 Decimal	56.725646ºN 01.294499ºE	
			WGS84 Decimal Minute	56º 43.539'N 01º 17.670'E	
		Anchor #5 5m dia x 13.5m 54	WGS84 Decimal	56.725715ºN 01.293063ºE	
			WGS84 Decimal Minute	56º 43.543'N 01º 17.584'E	
		Anchor #6 5m dia x 13.5m 54	WGS84 Decimal	56.725855ºN 01.291728ºE	
			WGS84 Decimal Minute	56º 43.551'N 01º 17.504'E	
		Anchor #7 5m dia x 13.5m 54	WGS84 Decimal	56.738728ºN 01.282328ºE	
			WGS84 Decimal Minute	56º 44.324'N 01º 16.940'E	
		Anchor #8 5m dia x 13.5m 54	WGS84 Decimal	56.739313ºN 01.283132ºE	
			WGS84 Decimal Minute	56º 44.359'N 01º 16.988'E	
		Anchor #9 5m dia x 13.5m 54	WGS84 Decimal	56.73989ºN 01.283953ºE	
			WGS84 Decimal Minute	56º 44.393'N 01º 17.037'E	

Anchor Lines	9	Length 3 @ 1,350m 299Te 6 @ 950m 253Te	From each anchor location – approx. 220m or 150m of studless 124mm chain, 850m or 520m of 6 strand wire, 15m of studless 145mm chain, 136m of studless 145mm double chain, approx. 125m of studless 124mm chain, to Curlew FPSO	Connected to mooring anchors and FPSO. Approx. 50 clump weights remain from original mooring chain system (approx. 7Te each).
Concrete mattresses	n/a	n/a	n/a	n/a
Grout bags	n/a	n/a	n/a	n/a
Formwork	n/a	n/a	n/a	n/a
Frond Mats	n/a	n/a	n/a	n/a
Rock Dump	n/a	n/a	n/a	n/a

See Section 2.1.3, Table 2.5 for structures associated with the subsea pipelines.

2.1.3 Curlew B&D Fields: Pipelines Including Stabilisation Features

Table 2.3: Pipeline/Flowline/Umbilical Information									
Description	Pipeline Number (as per PWA)	Diameter (inches)	Approx Length (km)	Description of Component Parts	Product Conveyed	From - To End Points	Burial Status	Pipeline Status	Current Content
Pipelines									
Gas export riser	PL1455A	12	0.5	Flexible riser, buoyancy modules	Gas	Curlew FPSO to Gas export SSIV	N/A	Operational	Hydrocarbon (gas)
Gas export pipeline	PL1455B	12	26.6	Carbon Steel (3-layer polypropylene)	Gas	From Gas export SSIV to FGL tie-in	Trenched, parts rock covered and parts natural backfill; spools on seabed; some concrete mattresses	Operational	Hydrocarbon (gas)
Curlew B Production riser	PL1450 (1.09)	5	0.3	Flexible riser, inc. buoyancy modules	Oil/gas/ produced water	Curlew B Production pipeline to Curlew FPSO	N/A	Operational	MEG/Water Mix
Curlew B Production Pipeline	PL1450 (1.08)	5.5	2.4	Flexible flowline	Oil/gas/ produced water	Curlew B wellhead to Curlew B Production Riser	Trenched and rock covered; some concrete mattresses	Operational	MEG/Water Mix
Curlew D Production Riser 1	PL1452 (1.17)	7.5	0.3	Flexible riser	Oil/gas/ produced water	Curlew D Pipeline 1 to Curlew FPSO	N/A	Operational	Hydrocarbon (well fluids)

Curlew D Production Pipeline 1	PL1452 (1.15 &.16)	8.25	1.6	Flexible flowline	Oil/gas/ produced water	Curlew D manifold to Curlew D Production Riser 1	Trenched and rock covered; some concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew D Production Riser 2	PL1453 (1.12)	7.5	0.3	Flexible riser	Oil/gas/ produced water	Curlew D Production Pipeline 2 to Curlew FPSO	N/A	Operational	Hydrocarbon (well fluids)
Curlew D Production Pipeline 2	PL1453 (1.10 & 1.11)	8.25	1.6	Flexible flowline	Oil/gas/ produced water	Curlew D manifold to Curlew D Production Riser 2	Trenched and rock covered, some concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew D production well spool DP1	PL2452	6	<0.1	Flexible pipe and Duplex hard spools (SPU)	Oil/gas/ produced water	From Curlew DP1 well Curlew D manifold	On seabed, covered by concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew D production well spool DP2	PL1728	6	<0.1	Flexible pipe and Duplex hard spools (SPU)	Oil/gas/ produced water	From Curlew DP2 well Curlew D manifold	On seabed, covered by concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew D production well spool DP3	PL1727	8	0.1	Flexible pipe and Duplex hard spools (SPU)	Oil/gas/ produced water	From Curlew DP3 well Curlew D manifold	On seabed, covered by concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew D production well spool DP4	PL2453	6	0.1	Flexible pipe and Duplex hard spools (SPU)	Oil/gas/ produced water	From Curlew DP4 well Curlew D manifold	On seabed, covered by concrete mattresses	Operational	Hydrocarbon (well fluids)

Umbilicals									
Curlew B Umbilical Riser	PL1451 (1.01)	N/A	0.3	Steel armoured electrohydraulic and chemical injection umbilical, inc. buoyancy modules	Power, signals, hydraulics and injection chemicals	Curlew FPSO to Curlew B Umbilical Static Section	N/A	Operational	Hydraulic fluid and chemicals
Curlew B Umbilical Static Section	PL1451 (1.02)	N/A	2.3	Steel armoured electrohydraulic and chemical injection umbilical,	Power, signals, hydraulics and injection chemicals	Curlew Cur B Umbilical riser to Curlew B wellhead	Trenched and rock covered, some concrete mattresses	Operational	Hydraulic fluid and chemicals
Curlew D Umbilical Dynamic Riser	PL1454 (1.01)	N/A	0.3	Steel armoured electrohydraulic and chemical injection umbilical jumper	Power, signals, hydraulics and injection chemicals	Curlew FPSO to Curlew D Umbilical Static Section	N/A	Operational	Hydraulic fluid and chemicals
Curlew D Umbilical Static Section	PL1454 (1.02)	N/A	1.7	Steel armoured electrohydraulic and chemical injection umbilical jumper	Power, signals, hydraulics and injection chemicals	Curlew D Umbilical Dynamic Riser to Curlew SDU	Trenched and rock covered, some concrete mattresses	Operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP1	PL1454 (1.08)	N/A	<0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals, hydraulics and	Adjacent to Curlew D SDU to adjacent to Curlew DP1 well	Trenched, covered by rock and concrete mattresses	Non-operational	Hydraulic fluid and chemicals

					injection chemicals				
Curlew D production well umbilical jumper DP1	PL3568	N/A	<0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Curlew D SDU to Curlew DP1 well	On seabed, covered by concrete mattresses	Operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP2	PL1454 (1.03)	N/A	<0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals, hydraulics and injection chemicals	Curlew D SDU to Curlew DP2 well	On seabed, covered by concrete mattresses	Operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP2 to DP3	PL1726	N/A	0.2	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals, hydraulics and injection chemicals	Curlew DP2 to Curlew DP3 well	On seabed, covered by concrete mattresses	Operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP3	PLU2455	N/A	0.2	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Adjacent to Curlew D SDU to adjacent to Curlew DP3 well	On seabed, covered by concrete mattresses	Non-operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP3	PLU2455 JCDPM	N/A	0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Adjacent to Curlew D SDU to adjacent to Curlew DP3 well	On seabed, covered by concrete mattresses	Non-operational	Hydraulic fluid and chemicals
Curlew D production well	PLU2455 JW3	N/A	0.2	Steel armoured electrohydraulic	Power, signals and	Curlew D SDU to Curlew DP3 well	On seabed, covered by	Operational	Hydraulic fluid and chemicals

umbilical jumper DP3				and chemical injection umbilical	injection chemicals		concrete mattresses		
Curlew D production well umbilical jumper DP4	PLU2454	N/A	0.2	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Adjacent to Curlew D SDU to adjacent to Curlew DP4 well	On seabed, covered by concrete mattresses	Non-operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP4	PLU2454 JCDPM	N/A	0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Adjacent to Curlew D SDU to adjacent to Curlew DP4 well	On seabed, covered by concrete mattresses	Non-operational	Hydraulic fluid and chemicals
Curlew D production well umbilical jumper DP4	PL3569	N/A	<0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals and injection chemicals	Curlew D SDU to Curlew DP4 well	On seabed, covered by concrete mattresses	Operational	Hydraulic fluid and chemicals

Table 2.4: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Weight (Te)	Location(s)	Exposed/Buried/Condition
Concrete mattresses	Approx. 380	5 Te each	Multiple locations throughout the field. See CA for detail [5].	Exposed on seabed surface, some partially buried. Generally good condition.
Grout bags	Approx. 1800	0.025Te	Multiple locations throughout the field	Exposed on seabed surface, some partially buried. Generally good condition.
Formwork	n/a	n/a	n/a	n/a
Frond Mats	n/a	n/a	n/a	n/a
Rock Cover	n/a	Approx. 27,000 Te	Multiple locations throughout the field	On seabed surface. Rock cover to remain *in situ*
Clump Weights	3	2 x 43 Te 1 x 21 Te	To be installed on PL1450,PL1454 and PL1455A post FPSO sail away.	Exposed. Good condition.

Table 2.5: Subsea Pipeline Structures					
Pipeline Installations/ Structures	**No.**	**Size/ Weight (Te)**	**Location**		**Comments/Status**
Gas Export Subsea Isolation Valve (SSIV)	1	15.4m x 7.6m x 2.6m 44.3	WGS84 Decimal	56.734151ºN 01.300944ºE	Gravity base structure (penetration skirt)
			WGS84 Decimal Minute	56º 44.049'N 01º 18.057'E	
Curlew D Subsea Distribution Unit (SDU)	1	10.6m x 9.1m x 2.9m 134.5	WGS84 Decimal	56.722030ºN 01.309401ºE	Gravity base structure (penetration skirt, concrete panels)
			WGS84 Decimal Minute	56º 43.322'N 01º 18.564'E	

2.1.4 Curlew B&D Fields Wells

Table 2.6 Well Information			
Subsea Wells	Designation	Status	Category of Well
BP1L	Oil Production	Plugged and Lubricated	SS-2-4-3
DP1S1	Gas/Condensate Production	Producing	SS 4-3-3
DP2	Gas/Condensate Production	Shut-In	SS-2-4-3
DP3	Oil Production	Producing	SS-4-3-3
DP4	Conductor / Surface casing only	Non-Producing	SS-0-0-3
DP4A*	Gas/Condensate Production	Shut-In	SS-2-3-3

NB All Exploration/Appraisal wells (total of 7) have all been previously abandoned
*As DP4 was never completed as a well, it has only been included here for completeness and not in the well count. Materials weights have been incorporated in the Inventory Estimates.

2.1.5 Curlew B&D Fields Drill Cuttings

Only a single cuttings pile within the definition in OSPAR Recommendation 2006/5 is present for Curlew B and D. (See Section 3.7 for further information)

Table 2.7: Drill Cuttings Pile(s) Information		
Location of Pile Centre (Latitude/Longitude)	**Seabed Area (m^2)**	**Estimated volume of cuttings (m^3)**
Centre of visible drill cuttings pile near Curlew DP2 well WGS84: 56°43.335'N 01°18.577'E	3,540	<671

2.1.6 Curlew B&D Fields Inventory Estimates

The total inventory of materials at the Curlew B & D fields is 36,669 tonnes.

30,708 tonnes of this total relates to installations (the Curlew FPSO topsides, vessel, moorings and anchors, Mid Water Arch (MWA), installations on the seabed at Curlew, the manifold and SDU at Curlew B.

6,144 tonnes of this total relates to pipelines, umbilicals and spool pieces.

The tables and pie charts which follow present estimates for the Curlew B&D inventory.

Table 2.8 Curlew B&D Material Inventory		
Material	Weight (Te)	% of total
Installations		
Carbon Steel	25,479	83.41
Stainless Steel	1,276	4.18

Table 2.8 Curlew B&D Material Inventory		
Material	Weight (Te)	% of total
Non-Ferrous Metal	880	2.88
Concrete	0	0
Plastics	121	0.40
Haz Mat/NORM	182	0.60
Other Non-Hazardous	2,608	8.54
Installations Total	**30,547**	**100**
Pipelines		
Carbon Steel	4,049	65.89
Non-Ferrous Metal	9	0.15
Concrete	1,945	31.66
Plastics	137	2.23
Haz Mat/NORM	0	0
Other Non-Hazardous	4	0.07
Pipelines Total	**6,144**	**100**

Details of wastes are given in Section 3.8 of these Decommissioning Programmes.

Produced water from the Curlew fields can form NORM scale inside storage tanks, pipework and vessels on Curlew FPSO topsides and in production pipelines. The NORM cannot be accurately quantified in the inventory at this stage, but has been estimated from previous cleaning data.

Figure 2.1: Pie Chart of Estimated Inventories (Installations)

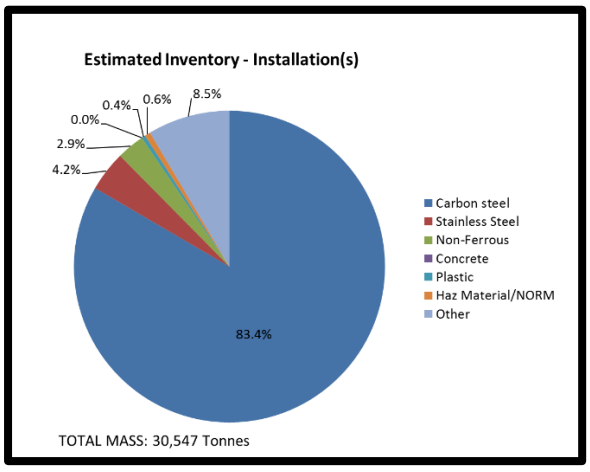
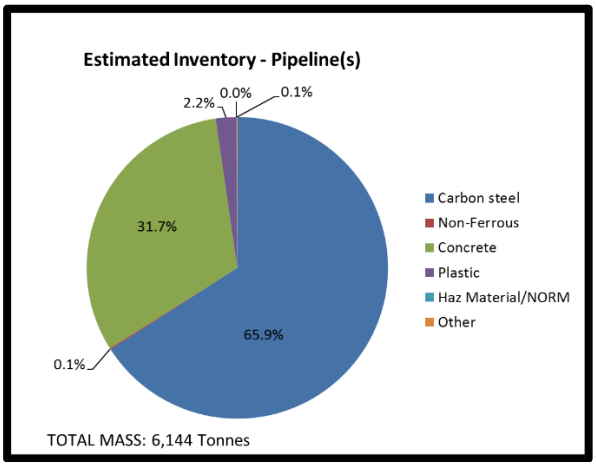


Figure 2.2: Pie Chart of Estimated Inventories (Pipelines)



2.2 Curlew C Field

2.2.1 Curlew C Field Installations: Surface Facilities

N/A

2.2.2 Curlew C Field Installations: Subsea including Stabilisation Features

Table 2.9: Subsea Installations and Stabilisation Features					
Subsea installations including Stabilisation Features	**No.**	**Size/ Weight (Te)**	**Location**		**Comments/Status**
Curlew C Wellhead Protection structure	1	6.2m x 6.2m x 7.0m 6.2	WGS84 Decimal	56.735544ºN 01.387799ºE	Structure fixed around wellhead tree and flowbase.
			WGS84 Decimal Minute	56º 44.133'N 01º 23.268'E	
Curlew C wellhead	1	3.9m x 3.9m x 5.7m 61.9	WGS84 Decimal	56.735544ºN 01.387799ºE	The well will undergo plug and abandonment.
			WGS84 Decimal Minute	56º 44.133'N 01º 23.268'E	
Concrete mattresses	n/a	n/a	n/a		n/a
Grout bags	n/a	n/a	n/a		n/a
Formwork	n/a	n/a	n/a		n/a
Frond Mats	n/a	n/a	n/a		n/a
Rock Dump	n/a	n/a	n/a		n/a

See Section 2.2.3, Table 2.12 for structures associated with the subsea pipelines.

2.2.3 Curlew C Field: Pipelines Including Stabilisation Features

Table 2.10: Pipeline/Flowline/Umbilical Information									
Description	Pipeline Number (as per PWA)	Diameter (inches)	Approx Length (km)	Description of Component Parts	Product Conveyed	From - To End Points	Burial Status	Pipeline Status	Current Content
Pipelines									
Curlew C Production Riser	PL1798B	12	0.3	Flexible riser, buoyancy modules	Oil/gas/ produced water	Curlew C Production pipeline to Curlew FPSO	N/A, some concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew C Production pipeline	PL2523	8	5.7	Carbon Steel (5-layer polypropylene)	Oil/gas/ produced water	Curlew C wellhead to Curlew C Production Riser	Trenched and rock covered; spools on seabed; some concrete mattresses	Operational	Hydrocarbon (well fluids)
Curlew C gas lift riser	PL2524 (2.03)	6	0.4	Flexible riser, buoyancy modules	Lift gas	Curlew FPSO to Curlew C gas lift pipeline	N /A,	Operational	Hydrocarbon (lift gas)
Curlew C gas lift pipeline	PL2524 (2.04 to 2.08)	3	5.7	Carbon Steel (3-layer polypropylene)	Lift gas	Curlew C gas lift riser to Curlew C wellhead	Trenched and rock covered; spools on seabed; some concrete mattresses	Operational	Hydrocarbon (lift gas)
Umbilicals									
Curlew C Umbilical	PLU2525 (1.02)	N/A	6.3	Steel armoured electrohydraulic and chemical injection umbilical,	Power, signals, hydraulics and	Curlew FPSO to Curlew C jumper	N/A for dynamic length; sections trenched and rock covered; on seabed prior to	Operational	Hydraulic fluid and chemicals

				inc. buoyancy modules	injection chemicals		jumper UTA; some concrete mattresses		
Curlew C Well Controls Jumper	PLU2525 (1.04)	N/A	<0.1	Steel armoured electrohydraulic and chemical injection umbilical	Power, signals, hydraulics and injection chemicals	Curlew C Umbilical to Curlew C wellhead	Trenched and rock covered; some concrete mattresses	Operational	Hydraulic fluid and chemicals

Table 2.11: Subsea Pipeline Stabilisation Features

Stabilisation Feature	Total Number	Weight (Te)	Location(s)	Exposed/Buried/Condition
Concrete mattresses	Approx. 100	5 Te each	Multiple locations throughout the field. See CA for detail [5].	Exposed on seabed surface, some partially buried. Generally good condition.
Grout bags	Approx. 1200	0.025 Te each	Multiple locations throughout the field	Exposed on seabed surface, some partially buried. Generally good condition.
Formwork	n/a	n/a	n/a	n/a
Frond Mats	n/a	n/a	n/a	n/a
Rock Cover	n/a	Approx. 33,300 Te	Multiple locations throughout the field	On seabed surface.
Clump Weights	3	1 x 43 Te 2 x 21 Te	To be installed on PL1798B, PL2524 and PLU2525 post FPSO sail away.	Exposed. Good condition.

Table 2.12: Subsea Pipeline Structures					
Pipeline Installations/ Structures	**No.**	**Size/ Weight (Te)**	**Location**		**Comments/Status**
Curlew C structures	2	8m x 4m x 2.3m 48 (FSM™ Protective Cover)	WGS84 Decimal	56.735692ºN 01.387710ºE	Gravity base structure protecting the pipeline to spool-piece tie-ins
			WGS84 Decimal Minute	56º 44.142'N 01º 23.263'E	
		5m x 4m x 4m 48 (BUTA Protective Cover)	WGS84 Decimal	56.735725ºN 1.387948ºE	Gravity base structure protecting the UTA (umbilical to jumper tie-in)
			WGS84 Decimal Minute	56º 44.144'N 01º 23.276'E	

2.2.4 Curlew C Field Wells

Table 2.13 Well Information			
Subsea Wells	Designation	Status	Category of Well
CP1 S1	Oil Production	Producing	SS 2-4-3

2.2.5 Curlew C Field Drill Cuttings

Any oil based muds used in drilling the single well were contained and shipped back to shore. Hence nothing present that would constitute a cuttings piles within the definition in OSPAR Recommendation 2006/5.

2.2.6 C Field Inventory Estimates

The total inventory of materials at the Curlew C fields is 1,470 tonnes.

113 tonnes of this total relates to installations on the seabed at Curlew and wellhead protection structure at Curlew C

1,357 tonnes of this total relates to pipelines, umbilicals and spool pieces.

The tables and pie charts which follow present estimates for the Curlew C inventory.

Table 2.14 Curlew C Material Inventory		
Material	Weight (Te)	% of total
Installations		
Carbon Steel	108	96.2
Non-Ferrous Metal	<1	0.9
Concrete	0	0
Plastics	<1	0.9
Haz Mat/NORM	0	0
Other Non-Hazardous	2	2.0
Installations Total	**113**	**100**
Pipelines		
Carbon Steel	659	48.6
Non-Ferrous Metal	<2	0.1
Concrete	639	47.1
Plastics	31	2.3
Haz Mat/NORM	0	0
Other Non-Hazardous	26	1.9
Pipelines Total	**1,357**	**100**

Details of wastes are given in Section 3.8 of these Decommissioning Programmes.

Figure 2.3: Pie Chart of Estimated Inventories (Installations)

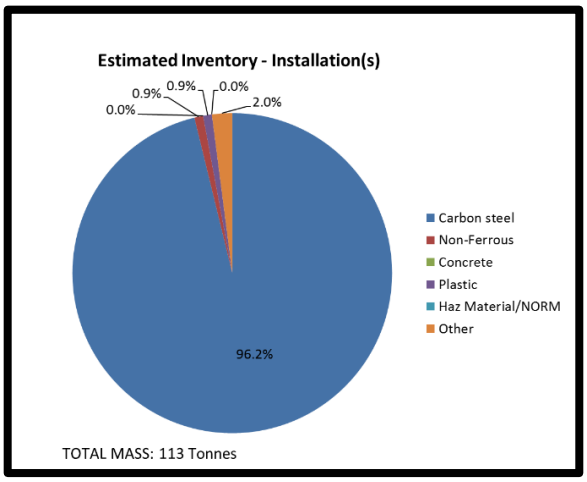
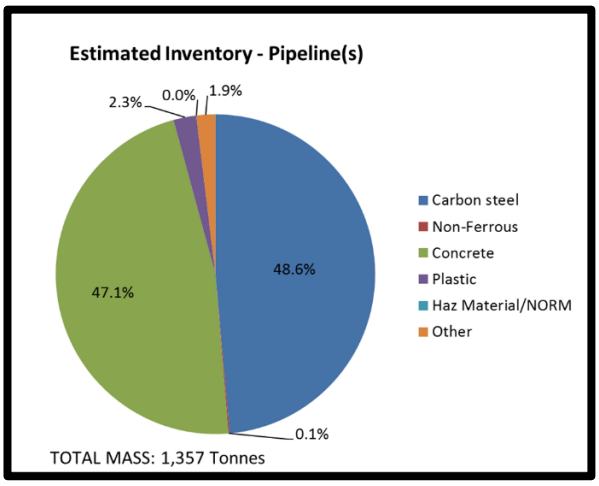


Figure 2.4: Pie Chart of Estimated Inventories (Pipelines)



3 REMOVAL AND DISPOSAL METHODS

The Curlew decommissioning project will follow a waste management hierarchy that optimises the re-use and recycling of waste and aims to minimise waste disposal in accordance with the highest standards of applicable law. The risks associated with waste will be assessed before removal to shore and opportunities to re-use the waste for the same or other purposes or, failing that, to recycle or recover materials will be identified. Waste will be characterised, classified, segregated, stored and transported according to appropriate regulatory requirements.

When removed from the seabed, the equipment will be transported to a decommissioning contractor's onshore yard, where different types of material will be segregated with a view to optimising re-use and recycling.

The decommissioning contractor for subsea and/or the FPSO may look for opportunities to re-use equipment, machinery or component parts, either as spares or for them to be refurbished through their normal channels. Given the age of the assets, it is anticipated there may be limited commercial interest.

The decommissioning contractor's established arrangements with recycling companies will facilitate optimisation of the quantity of materials that can be sent for recycling. A project Waste Management Plan (WMP), incorporating a Ship Recycling Plan, will be implemented that tracks waste materials through to the recycling endpoint. It is estimated that, excluding marine growth, that more than 97% of recovered materials from the Curlew development could be re-used or recycled.

Materials for which no re-use or recycling options are available will be tracked through to final disposal.

3.1 Topsides

The Curlew FPSO will be towed from the field to the selected cleaning/decommissioning location. Prior to tow from the field the topside process systems will be flushed. Following conditioning of the topsides systems, the risers and mooring chains will be disconnected, releasing the FPSO.

Topsides Description: The Curlew FPSO is a converted tanker which supports the production, export, storage and utility systems required to handle well fluids. The main deck has a length of 236.2m, and a breadth or 39.93m and the FPSO sits in approx. 90m water depth.

The turret is located at the bow of the FPSO, including the flare tower. The process modules sit on the main deck. The accommodation and helideck is located at the stern end.

Figure 3.1: Curlew Topsides

Table 3.1: Cleaning of Topsides for Removal		
Waste Type	**Composition of Waste**	**Disposal Route**
On-board hydrocarbons	Process fluids, fuels and lubricants	Drained and transported ashore for re-use/disposal
Other hazardous materials	NORM, LSA Scale, any radioactive material, instruments containing heavy metals, batteries	Transported ashore for re-use/disposal by appropriate methods. See FPSO Inventory of Hazardous Materials [7]
Asbestos and Ceramic Fibre		Appropriate control and management will be enforced

Table 3.2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) ☐ 2) Monohull crane vessel ☐ 3) SLV ☐ 4) Piece small ☐ 5) Other ☑	
Method	**Description**
Proposed removal method and disposal route	The Curlew FPSO will be released from its moorings with all risers flushed clean and disconnected. The FPSO will be towed to recycling yard for further cleaning and recycling. An interim cleaning berth may be utilised should the final recycling yard not be able to handle the removal and handling of the NORM. All necessary permits and consents transfrontier shipments of waste, as required, will be in place prior to leaving U.K. waters.

3.2 Jacket

There are no jackets associated with the Curlew B, C, or D fields.

Table 3.3: Jacket Decommissioning Methods			
1) HLV (semi-submersible crane vessel) ☐		2) Monohull crane vessel ☐	
3) SLV ☐	4) Piece small ☐	5) Other – ☑	
Method	**Description**		
N/A	N/A		

3.3 Subsea Installations and Stabilisation Features

Table 3.4: Subsea Installations and Stabilisation Features			
Subsea installations and stabilisation features	**Number**	**Option**	**Disposal Route (if applicable)**
Gas export riser SSIV[1]	1	Full recovery	Return to shore for recycling
Manifold and SDU[1] structures at Curlew D drill centre	2	Full recovery	Return to shore for recycling
Curlew C pipeline and umbilical, including protection structures[1]	2	Full recovery	Return to shore for recycling
Curlew B&D, C trees including protection frames	6	Full recovery	Return to shore for recycling
MWA Buoyancy Unit	1	Full recovery	Return to shore for recycling
Mooring System (inc Anchor piles)	9	Full recovery	Return to shore for recycling
Concrete mattresses	n/a		
Grout bags	n/a		
Formwork	n/a		
Frond Mats	n/a		
Rock Dump	n/a		

Notes

1. SSIV, SDU and Curlew C protection structures are subsea structures relating to Pipeline systems, however are included here for completeness.
2. Full recovery of the anchor piles will be attempted. Should this prove unsafe or unfeasible, BEIS will be consulted and anchor piles will be removed to an agreed depth below seabed.

3.4 Pipelines

Decommissioning Options:

Dynamic sections of pipelines, and any associated pipeline structures, are to be fully removed to leave a clear seabed in-line with OSPAR, so were not part of the comparative assessment.

The following options for decommissioning were considered (see also Tables 2.3 and 2.10 for more information on current status) in the Comparative Assessment review:

***Key to Options:**

1) Remove - reverse reeling
2) Remove - Reverse S lay
3) Trench and bury
4) Remedial removal
5) Remedial trenching
6) Partial Removal – cut and lift
7) Leave in place
8) Remove - cut & lift
9) Remedial rock-dump
10) Backfill trench - rock
11) Backfill trench - natural

Table 3.5: Pipeline or Pipeline Groups Decommissioning Options

Pipeline/ group	Condition of line/group	Whole or part of pipeline/group	Decommissioning options considered
GROUP 1: Curlew B – PL1450, PL1451	Trenched and buried	Whole	1, 2, 5, 6, 7, 8, 9, 11
GROUP 2: Curlew C – PL2523, PL2524, PLU2525	Trenched and buried	Whole	1, 2, 6, 7, 8, 9, 10
GROUP 3: Curlew D – PL1452, PL1453, PL1454	Trenched and buried	Part	1, 2, 5, 6, 7, 8, 9, 11
GROUP 4a: Gas Export – PL1455B Section 1	Trenched and buried	Part	1, 2, 5, 6, 7, 8, 9, 10, 11
GROUP 4b: Gas Export – PL1455B Section 2	Trenched	Part	1, 2, 5, 6, 7, 8, 9, 10, 11
GROUP 5: Pipeline/ Umbilical Ends- PL1455B, PL2523, PL2524 PLU2525	In close proximity to rock cover or covered by rock	Part	3, 4, 5, 6, 7, 9
GROUP 6: Pipeline/Umbilical Ends- PL1452, PL1450, PL1453, PL1455B, PL1451, PL1454,	Not in close proximity to rock cover or not covered by rock	Part	3, 4, 6, 7, 9
GROUP 7: Spools- PL1455B, PL2523, PL2524 PLU2525	In close proximity to rock cover or covered by rock	Part	5, 7, 8, 9

GROUP 8: Spools- PL1454, PL1455B, PL1726, PL1727, PL1728, PL2452, PL2453, PL3568, PL3569, PLU2454, PLU2454 JCDP, PLU2455, PLU2455 JCDP, PLU2455 JW3	Not in close proximity to rock cover or not covered by rock	Part (PL1454, PL1455B) Whole (all other listed)	5, 7, 8, 9

Comparative Assessment Method:

Decommissioning options were assessed in line with the requirements of the BEIS Guidance Notes [2] and largely adopted the guidance provided in Appendix A of the Oil & Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes, Issue 1, as required. A specific CA Procedure [5] was produced which tailored the assessment criteria to the particular circumstances of the project.

Screening workshops were held to ensure the required information was available for the CA and that relevant studies were available. The CA workshop was held with relevant external stakeholders and consultants to ensure a robust assessment was completed.

The assessments were arranged by unique geographical and technical conditions. Options were scored according to pre-agreed qualitative and quantitative scales provided in the CA Procedure [6].

Outcome of Comparative Assessment:

The results of the CA workshop have been issued to stakeholders, with feedback being sought prior to the final recommendations being issued as the Comparative Assessment Report in support of this document.

Table 3.6: Outcomes of Comparative Assessment

Pipeline or Group	Recommended Option*	Justification
GROUP 1: Curlew B Pipelines and Umbilicals	Leave *in situ* and remediate as required.	The CA concluded that this option is the safest and the most acceptable for the environment and has a low technical risk.
GROUP 3: Curlew D Pipelines and Umbilicals	Leave *in situ* and remediate as required.	The CA concluded that this option has the lowest risk to personnel; the best track record and lowest cost, whilst the project and legacy risk to other users of the sea and the environment are acceptable.
GROUP 2: Curlew C Pipelines & Umbilical	Leave *in situ.*	The CA concluded that this option is the safest and the most acceptable for the environment and has a low technical risk.
GROUP 4: Curlew Gas Export Pipelines	Leave *in situ.* Pipeline gateways	The CA concluded that this option has the lowest risk to personnel; the best track record and lowest cost,

	to be provided, if required.	whilst the project and legacy risk to other users of the sea and the environment are acceptable.
GROUP 5: Pipeline/ Umbilical Ends in close proximity to rock cover or covered by rock	Leave *in situ* with exposed ends cut or lowered, then covered.	The CA concluded that this option has the lowest risk to personnel and the residual risk to other users of the sea is acceptable.
GROUP 6: Pipeline/ Umbilical Ends not in close proximity or covered by rock	Leave in situ with exposed ends cut or lowered, then covered to MSL.	The CA concluded that this option has the lowest risk to personnel; lowest environmental risks and lowest cost, whilst the legacy risk to other users of the sea is acceptable.
GROUP 7 & 8: Spools	Full removal	The CA concluded total removal as per BEIS Guidance Notes.

3.5 Pipeline Stabilisation Feature(s)

Table 3.7: Pipeline Stabilisation Features

Stabilisation feature(s)	Number	Option	Disposal Route (if applicable)
Concrete mattresses	Approx. 480	Full recovery	To shore for recycling [1]
Grout bags	Approx. 3,000[2]	Full recovery	To shore for recycling [2]
Rock cover (Te)	Approx. 60,300 [3]	Leave *in situ*	n/a

Notes

1. It is intended that all mattresses will be removed to shore; however, in the event of practical difficulties (e.g. poor integrity or fully covered with rock), BEIS will be consulted.
2. The exact distribution of grout bags (rock covered or exposed) is not known, however it is intended that all exposed bags will be recovered to shore.
3. This is the existing rock that is estimated as being present at time of CoP.

3.6 Wells

Table 3.8: Well Plug and Abandonment

The wells which remain to be abandoned, as listed in Section 2.1.4 (Table 2.6) and Section 2.2.4 (Table 2.13) will be plugged and abandoned in accordance with Oil and Gas UK Guidelines for the suspension and abandonment of wells.

A PON5/PON15/MCAA Application will be submitted in support of any such work to be carried out.

3.7 Drill Cuttings

Cuttings with Oil Based Muds (OBM) from Curlew BP1, DP1 and DP2 that were generated when drilling the 12.25" and 8.5" sections in 1996/7 were discharged to sea, as was permitted under the regulations at the time. For Curlew CP1, DP3, DP4 and DP4A any drill cuttings with OBM were shipped back onshore for treatment and disposal when they were drilled in 1999 onwards. The regulations concerning subsea drilling permitted the discharge of OBM cuttings to sea until the start of 2001 for OBM and Synthetic / low toxicity OBM cuttings.

Samples from the cuttings pile were taken in July 2016 as part of the Pre-decommissioning Survey scope and analysed. The results of the analysis have informed the decision.

Table 3.9 Drill Cuttings Decommissioning Options	
How many drill cuttings piles are present?	1
Tick options examined: ☐Remove and re-inject ☑Leave in place ☐Cover ☐Relocate on seabed ☐Remove and treat onshore ☐Remove and treat offshore ☐Other	
Review of Pile characteristics	**Pile 1**
How has the cuttings pile been screened? Actual samples taken?	Yes
Dates of sampling	July 2016
Sampling included in pre-decommissioning survey?	Yes
Does it fall below both OSPAR thresholds?	Yes
Will the drill cuttings pile have to be displaced in order to remove the jacket?	No. The cuttings are at well DP2, approx. 30m metres from other subsea structures/ installations. Therefore, only DP2 wellhead to be removed with minimal disturbance of the cuttings.
What quantity (m^3) would have to be displaced/removed?	N/A. Drill cuttings pile will remain *in situ*.
Will the drill cuttings pile have to be displaced in order to remove any pipelines?	Not displaced, however local spool pieces removal associated with well DP2 will create minor disturbance.
What quantity (m^3) would have to be displaced/removed?	N/A
Have you carried out a Comparative Assessment of options for the Cuttings Pile?	No

3.8 Waste Streams

Table 3.10: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal Method**
Bulk liquids	Subsea systems are flushed with seawater and returned to the FPSO. Vessels, pipework and sumps will be drained prior to removal from location. If line cleaning, tank washings and process wastes cannot be discharged within consents on location they will be transported to, and offloaded at, a licensed onshore facility for treatment. Further cleaning and decontamination that may be required will take place onshore prior to recycling / re-use.
Marine growth	Some marine growth is likely to detach itself from the FPSO during tow. For subsea equipment, marine growth is likely to dry out and detach itself while it is in transit. Marine growth that remains attached to the subsea equipment and/or FPSO after load-in to the onshore dismantling site will be removed. It will be disposed of in accordance with the regulations in force at the site following the site operator's licences and procedures (e.g. decommissioning yards Waste Management Plan or Ship Recycling Plan)
NORM/LSA Scale	Any storage tanks, pipework and vessels at Curlew that have contained produced water may be NORM contaminated. Shell may partially remove pipework from the Curlew topsides in preparation for recycling. This would be carried out under an appropriate permit with testing to identify NORM. Shell will apply for appropriate permits to cut, remove and transport potentially NORM contaminated spools and subsea equipment, with testing to identify NORM. The topsides' integrated deck process equipment and all potentially NORM contaminated material will be brought onshore to a yard that is licensed to receive and handle NORM waste and it will subsequently be disposed of under appropriate permit.
Asbestos	The main vessel was built as a tanker in 1983, and converted to the Curlew FPSO in 1997, when the use of asbestos was being phased out. There is record of asbestos being used for Curlew FPSO, and its use for items such as gaskets may also have occurred. Shell has completed a Hazardous Material Inventory [7] survey (including Asbestos) which will be re-verified after CoP. Any asbestos will be contained appropriately during decommissioning work onshore (as part of decommissioning yards Waste Management Plan or Ship Recycling Plan) and taken for disposal.
Other hazardous wastes	Shell has completed a Hazardous Material Inventory survey [7] which will be re-verified after CoP. Hazardous wastes will be recovered to shore and disposed of under appropriate permit.
Onshore Dismantling sites	Selection of an onshore dismantling site will be made on the basis of a commercial tender, taking account of the required water depth for the FPSO to the quayside and HSE criteria. Screening, followed by site audits have been performed and Shell will only consider sites that are licenced to receive the types and quantities of materials identified in the Materials Inventory. Candidate sites must demonstrate a proven track record of waste stream management and disposal throughout the deconstruction process. The dismantling site operator will have established arrangements with facilities that recycle steel, copper, aluminium and other materials.

The Section 29 Notice Holders' Waste Management Strategy for the Curlew decommissioning project is based on the waste hierarchy (avoid, re-use, recycle, recover energy, dispose) underpinned by the commitment to comply with legal requirements.

Table 3.11 Inventory Disposition			
	Total Inventory Tonnage	Planned tonnage to shore	Planned left *in situ*
Installations			
Curlew FPSO and B&D Installations	30,547	30,237	310
Curlew C Installations	113	73	40
Installations Total	**30,660**	**30,310**	**350**
Pipelines			
Curlew B&D (inc. Gas Export)	6,144	3,056	3,088
Curlew C	1,357	932	425
Pipelines Total	**7,501**	**3,988**	**3,513**

Table 3.11 above details the split of materials that are planned to be decommissioned in-situ and those planned to be recovered to shore. Of the total of materials in the Curlew Field developments, it can be seen that approximately 90% of the inventory tonnage are planned to be recovered. The remaining 10% of the inventory tonnage is proposed to be decommissioned in situ. For the inventory that is to be left in situ, it actually accounts for only pipelines and umbilicals which are currently trenched and buried, as well as several structure piles. Wellheads will be cut approx. 3m below the MSL.

The Waste Management Plan estimates that more than 97% of the wastes and materials arising from the decommissioning works could be reusable and/or recyclable.

1,928te (wet) of marine growth is listed as 'Other Non-Hazardous' material. Most of this weight represents water. Some marine growth will dry out in transit and onshore, so a much smaller dry weight of biological waste will require disposal. It is likely that the marine growth will be disposed of by land-farming or to landfill.

4 ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Environmental Sensitivities

Table 4.1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
Conservation interests	The Curlew area is not located within or in proximity to a designated protected site. The nearest conservation areas include the Fulmar MCZ located 15km southeast of gas export pipeline and 35km from the Curlew cluster, and the East Gannet and Montrose Fields NCMPA located 20km north of the Curlew cluster and 27 km northeast from export pipeline.
Seabed	The seabed sediment around the Curlew area is relatively uniform and consists predominantly of very fine sand. The polychaete *Paramphinome jeffreysii* is the most abundant taxa, with other dominant taxa including the polychaetes *Galathowenia oculata*, *Spiophanes kroyeri*, *Spiophanes bombyx* and the bivalves *Axinulus croulinensis* and *Adontorhina similis*. Based on the abundant fauna and the sediment size the Curlew area can represent the EUNIS biotope '*Paramphinome jeffreysii, Thyasira spp.* and *Amphiura filiformis* in offshore circalittoral sandy mud' (A5.376). The area is classed as an OSPAR threatened and / or declining habitat 'Seapen and burrowing megafauna communities', based on megafaunal burrows and/or seapens, particularly *Pennatula phosphorea*, observed throughout the area. Juveniles of Ocean Quahog (*Arctica inslandica*) are present in the Curlew location, however no adult specimens have been observed in a recent pre-decommissioning survey in 2016. The cold-water coral *Lophelia pertusa* was not observed on the hull of the FPSO, neither on the Curlew D manifold.
Fish	The Curlew cluster lies within spawning grounds for cod (*Gadus morhua*; January to April), lemon sole (*Microstomus kitt*; April to September), mackerel (*Scomber scombrus*; May to August), sand eels (*Ammodytidae spp.;* November to January) and Norway pout (*Trisopterus esmarkii*; January to April) (Coull et al., 1998; Ellis et al., 2010). The area is also used as nursery grounds for anglerfish (*Lophius piscatorius*), blue whiting (*Micromesistius poutassou*), cod, European hake (Merluccius merluccius), haddock (*Melanogrammus aeglefinus*), herring (*Clupea harengus*), Norway pout, ling (*Molva molva*), mackerel, plaice (*Pleuronectes platessa*), sand eels, spurdog (*Squalus acanthias*) and whiting (*Merlangius merlangus*) (Aires et al., 2014; Coull et al., 1998; Ellis et al., 2010).
Fisheries	The Curlew cluster is in the ICES rectangle 42F1, where fishing effort (days) is generally higher than in the neighbouring rectangles, however it is still relatively low in comparison to other ICES rectangles within the UKCS.

	Based on available data for 2011-2015, the average effort is 202 days per year, while fish landing is estimated at an annual average of £668K and 133 tonnes. The AIS data for 1-year period from August 2015 and July 2016 identified that 64% of the fishing vessels recorded in the vicinity of Curlew were demersal trawlers and 29% other types of trawlers (pair, pelagic and twin). Seiners accounted for 6%, with potters and gill netters making up the remainder (Anatec, 2016).
Marine Mammals	JNCC Cetacean Atlas suggests the harbour porpoise, white-beaked dolphin, Atlantic white-sided dolphin and minke whale may occur at high abundance in the vicinity of the Curlew Field (mainly between May and September months). Harbour porpoises are protected under Annex II of the Habitats Directive and all four species are listed as Priority Marine Feature (PMF). Low numbers of common dolphin and pilot whale may be also present in the nearby vicinity. Harbour seals are unlikely to occur in the vicinity of the Curlew field, while grey seals might be present at very low densities. Both grey and harbour seals are Annex II species, also listed on the U.K.'s PMF list.
Birds	Species present at Curlew location include, but are not limited to, fulmar, gannet, shag, black headed gull, herring gull, great skua, kittiwake, guillemot, razorbill and puffin. The seabird sensitivity and vulnerability to oil pollution in Blocks 29/7, 29/8 and 29/9, where the Curlew cluster and export pipeline are located, and in surrounding blocks, is classified as very low for the majority of the year, increasing to medium in June for Block 29/9 and very high in one of the surrounding blocks in September.
Onshore Communities	The FPSO and subsea installations will be taken to licenced recycling yards, which might be located in the vicinity of onshore communities. The potential effects could include noise, odour, light pollution, inflow of additional workers, etc. Shell is in process of selecting a recycling yard for the FPSO and therefore potential environmental and social receptors are not yet identified. The evaluation and selection process of licensed dismantling yards will take into account potential sensitivities and Shell will ensure that recycling activities will not have a detrimental effect. This process will ensure that a selected yard meets, as a minimum, the requirements of the IMO Hong Kong Convention for safe and environmentally sound recycling of ships. Only licensed yards with sufficient management system for waste, safety and environment (including communities) will be selected. Shell will engage approved waste management contractors to handle, store, recycle and dispose of all waste generated by the decommissioning activities.
Other Users of the Sea	Shipping traffic is low in the vicinity of Blocks 29/07 and 29/08 and moderate in the vicinity of Block 29/09. This activity is mainly attributed to vessels servicing the oil and gas infrastructure in the area. There are several oil and gas developments close to the Curlew cluster and gas export pipeline route, closest being the Banff FPSO, located approximately 30km north of the Curlew FPSO.

	There are currently no renewable energy developments or extraction activities in the vicinity of the Curlew field. There are no recorded military training or disposal sites located within Blocks 29/7, 29/8 and 29/9, with the closest military practice area located 115km west from Curlew cluster. No dangerous wrecks or designated sites of archaeological interest occur in the Blocks of Interest or in the surrounding area. However, there are two potential non-dangerous or undesignated wrecks within the Blocks of Interest. One in Block 29/7a approximately 900 m from the FPSO which is unidentified but has some associated floating debris attached and one in Block 29/8b, approximately 300 m North of the export line which is potentially a submarine.
Atmosphere	Curlew Air Dispersion Modelling supporting the Pollution Prevention and Control Permit for the operations at the Curlew FPSO, PPC/21 (Shell, 2016) concluded that atmospheric emissions, i.e. NO_2, SO_2 and CO, from the major combustion equipment and flaring on the FPSO is low and at concentration not harmful to human health in the area around the FPSO.

4.2 Potential Environmental Impacts and their Management

Environmental Impact Assessment Summary

Overview:
Shell has carried out the Environmental Impact Assessment (EIA) process for the Curlew Field Decommissioning project with support from an independent consultant. Full results of the EIA are documented in the Impact Assessment Report that supports this Decommissioning Program.

Potential impacts arising from proposed decommissioning activities have been identified and assessed. Mitigations and controls have been agreed to be applied during the execution phase of the project to reduce these impacts.

In summary, based on the results of the EIA and agreed mitigations, it can be concluded that the proposed activities are not expected to result in significant environmental and social impacts. Table 4.2 provide high level overview of key environmental impacts associated with the main activities related to the decommissioning of the Curlew Fields and how they will be managed.

The small drill cuttings pile at Curlew will be left to degrade by natural processes as the pile falls below both of OSPAR Recommendation 2006/5 thresholds.

Table 4.2: Environmental Impact Management		
Activity	**Main Impacts**	**Management of the Impacts**
FPSO Removal and Decommissioning	**Atmospheric Emissions:** associated with DFPV process of the topside system and towing of the FPSO.	DFPV will be of fixed limited volume of inventory to be flared and vented; towing vessels will comply with MARPOL 73/78 Annex VI on air pollution. See IA Report.
	Discharges to Sea: the topside systems will be drained and flushed prior to the FPSO removal; these fluids will contain hydrocarbons and certain production chemicals. These fluids will be routed to slops tanks to be then discharged overboard within allowable consents. In result, there will be planned discharges of hydrocarbon and chemical contaminated fluids to sea.	Discharges of the contaminated fluids and their potential impacts will be assessed and subject to appropriate permits' approval
	Waste Generation: The FPSO will be taken to a cleaning and/or dismantling yard, where the entire structure will be cleaned and recycled resulting in non-hazardous, hazardous and radioactive waste streams being generated.	Waste Management Plan (WMP) and specific Ship Recycling Plan Shell has carried out an assessment of potential dismantling yards; Only licensed yard capable of handling expected waste streams, with appropriate permits in place will be selected; Yard will be compliant with the IMO Hong Kong Convention that requires adequate management of waste during the recycling process of a ship. See IA report.
	Impacts to Onshore Communities: Dismantling activities at a recycling yard may result in social impacts such as noise and vibration, light and visual disturbance, odour/ nuisance, dynamics of an influx migrant workers, heavy traffic and dust, and air/water/soil pollution/quality issues (particularly from management of hazardous substances and accidental events).	Shell has audited and assessed potential dismantling yards, which evaluated social and community health issues that may arise during recycling activities, and their management by a yard. See IA report.
	Invasive Species: Marine growth is present on the FPSO hull. The transit of the FPSO to a dismantling location may result in potential introduction of the invasive species, depending on the location of the yard. Additionally, the ballast water of the towing vessels and	Management of ballast water of the FPSO and the towing vessels will be carried out in accordance to IMO Ballast Water Treatment Convention. Desk top assessment of the potential risk of introducing invasive species is being carried out by Shell and IA contractor team. See IA Report.

	of the FPSO will be exchange in transit also resulting in potential introduction of non-native species.	
	Accidental Events: During the transit of the FPSO, there is a potential for losing either the FPSO or one or more of the towing vessels. Although the likelihood of such events is very low, the consequences may include beaching of a vessel, collision with other sea users, and an uncontrolled release to water.	The FPSO will be towed by at least two vessels; Tow study to potential locations have been undertaken considering weather and its seasonal variation, the FPSO structural design, optimal speed, traffic, etc.; Reduction of the FPSO chemical liquid inventory to as low as practical; tow vessel assurance; Design of the Curlew vessel with double side and tanks in the centre of the boat; tow procedure and plan specific for the transit of the FPSO to a selected yard will be generated; Ship Oil Pollution Emergency Plan (SOPEP) in place
	Accidental Events: Snagging risk to fishing from a submerged hazard after disconnection and removal of the FPSO, and prior to subsea installation removal.	An SFF guard vessel will remain on station during risk period.
	Seabed Disturbance: Disconnection of the FPSO will result in the dynamic risers and mooring lines to fall to the seabed. This may have an impact on species and habitats within the vicinity of decommissioning.	The impact will be localised and short term. See Section 7 of the Environmental Statement IA Report for more details.
Decommissioning of Subsea Structures	**Discharges to sea:** Prior to removal of the FPSO, the subsea infrastructure will be flushed with seawater to the FPSO, where it will be discharged overboard within consent if possible. Some cores in the umbilical are blocked and cannot be flushed. When the umbilical cores are cut and disconnected, their contents will be released to sea overtime.	The subsea system will be flushed to an agreed safe level of hydrocarbons. Majority of chemicals in the umbilical's cores will be displaced and cleaned and subject to Permit approval Unavoidable releases have been assessed as posing no significant impact on the marine environment and are subject to Permit approval. See IA Report.
	Atmospheric Emissions: during the preparation and removal of subsea infrastructure additional vessels will be used in the field. This will result in increased atmospheric emissions.	Supporting vessels will comply with MARPOL 73/78 Annex VI on air pollution. See IA Report.
	Underwater Noise: cutting and disconnection of the subsea infrastructure will result in elevated underwater noise arising from	Activities will be of short-term. See IA Report.

	use of cutting tool and additional vessels operating in the field simultaneously (all with DP system).	
	Accidental Events: during the preparation and decommissioning of the subsea elements of the Curlew Field there is a potential for uncontrolled releases to water from supporting vessels and the infrastructure; there is also a risk of dropped objects during lifting and removal of the structures, including concrete mattresses.	Infrastructure will be flushed to remove bulk content of chemicals and hydrocarbons leaving seawater in the system; no live pipelines at Curlew during disconnection; SIMOPS of planned activities; Oil Response Plan in place. See IA report.
Decommissioning Pipelines	**Seabed Disturbance:** Removal of sections of pipelines and umbilicals will involve dredging, rock placement and overtrawl trials; potential temporary laydown on the seabed will result in disturbance to seabed, which in turn will lead to habitat alteration and potential loss (i.e. introduction of anthropogenic hard substrate in a soft sediment), and changes in species composition (particularly loss of seapens and burrowing megafaunas).	Optimisation of the rock volume required; Area of disturbance will be localised and limited to targeted section of pipelines. See Section 7 of the IA report for more details.
	Discharges to Sea: Curlew C production pipeline is proposed to be decommissioned in situ and may contain wax. The components of the wax such as trapped hydrocarbons and heavy metals, may also be released to the water over time as the pipeline deteriorates.	An impact assessment of the potential wax deposits and other trapped components showed to have no significant impacts. To further minimize releases to the marine environment, the Curlew C pipeline will be plugged on both side prior to its decommissioning. See IA Report.
Decommissioning of the Mooring System	**Seabed Disturbance:** the full removal of the anchor piles will result in seabed disturbance. If the full removal is unsuccessful, the alternative solution, will also result in seabed disturbance and changes to the habitat type (i.e. introduction of anthropogenic hard substrate in a soft sediment) and species composition, particularly loss of seapens and burrowing megafaunas. The remediation of the mooring trenches with rock and smoothing the area with chain mats will result in seabed disturbance, alteration and loss of habitats and species.	In the event that the anchor piles cannot be completely removed to at least -3m below MSL, they will be removed to an agreed depth below seabed; the excavation area will be minimised and localised rock placement will minimise volume of rock. The trenches will be filled with rock up to below MSL to allow natural sediment characteristic for the area to re-distribute in the trenches. This will minimize rock surface area and increase chances of re-establishment of the soft sediment and associated with them habitats (seapens and burrows megafauna). See Section 7 of the IA report for more details.

Decommissioning Stabilisation Features	**Seabed Disturbance:** removal of grout bags and mattresses will disturb the sediment, resulting in resuspension of sediment in the water column, which may affect certain species.	The activity will be temporary and short in time; sediment is expected to resettle relatively quickly after disturbance.
	Waste Generation: Recovered material will be classed as waste and will have to be properly managed.	A suitable company for proper management of mattresses will be contracted, with aim of recycling / reusing this type of the material. The disposal site will be complaint with relevant legislations.
Decommissioning Drill Cuttings	**Discharges to Sea:** Over-trawl trials and removal of the subsea infrastructure are likely to disturb some of the drill cuttings deposits present across the three Curlew fields. This will result in discharges of chemicals and hydrocarbons to the water column. Fishing interaction with the drill cuttings decommissioned in situ could occur. This will result in discharges of chemicals and hydrocarbons to the water column and could impact the fishing gear / catch.	Assessments have confirmed drill cuttings to fall below the OSPAR Recommendation 2006/5 thresholds. Disturbance will be temporary and limited in area. Drill cutting locations will be communicated to other users of the sea. See IA report.

5 INTERESTED PARTY CONSULTATIONS

Pre-Engagement Summary

Pre-engagement with stakeholders commenced in early 2016 with discussions held with statutory advisor and regulatory bodies. These covered the proposed FPSO disconnection, the infrastructure flushing scopes and the scope of the pre-decommissioning environmental baseline surveys. Ongoing introductory engagements and meetings with statutory consultees were progressed including consultation on the Scoping Report for the Impact Assessment (IA). Other meetings have taken place, as required, with regulatory authorities and others (e.g. OGA Decom, SEPA, JNCC, Marine Scotland, BEIS Environmental Management Team, SFF). The information on the project and progress of the Impact Assessment process was also issued to several Non-Governmental Organisations.

A comparative assessment workshop was held in August 2017 to consult and engage key stakeholders through the decisions to be made. From the workshop, the summary meeting notes were circulated to the attendees and comments, where received, were taken account of.

Consultations Summary

Table 5.1 Summary of Stakeholder Comments		
Points raised during statutory and public consultations		
Stakeholder	**Comment**	**Response**
National Federation of Fishermen's Organisations	No comments received	n/a
Scottish Fishermen's Federation (SFF)	No comments received	n/a
Northern Ireland Fish Producers Organisation (NIFPO)	No comments received	n/a
Global Marine Systems Limited (GMS)	No comments received	n/a
Public	No comments received	n/a

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

Members of the Project Management team have been appointed to manage suitable sub-contractors for the disconnection and removal activities. Standard company 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 Central North Sea to secure schedule and cost efficiencies. The process of consents and the consultations required as part of this process have commenced and will be fully managed and monitored. In the event of any changes in the detail of the offshore removal programme being required, these would be discussed and agreed with BEIS in advance.

6.2 Post-Decommissioning Debris Clearance and Verification

A post decommissioning debris survey will be carried out within all 500m safety zones and a 100m corridor along each existing pipeline and umbilical routes (50m either side).

Any significant oil and gas related seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods.

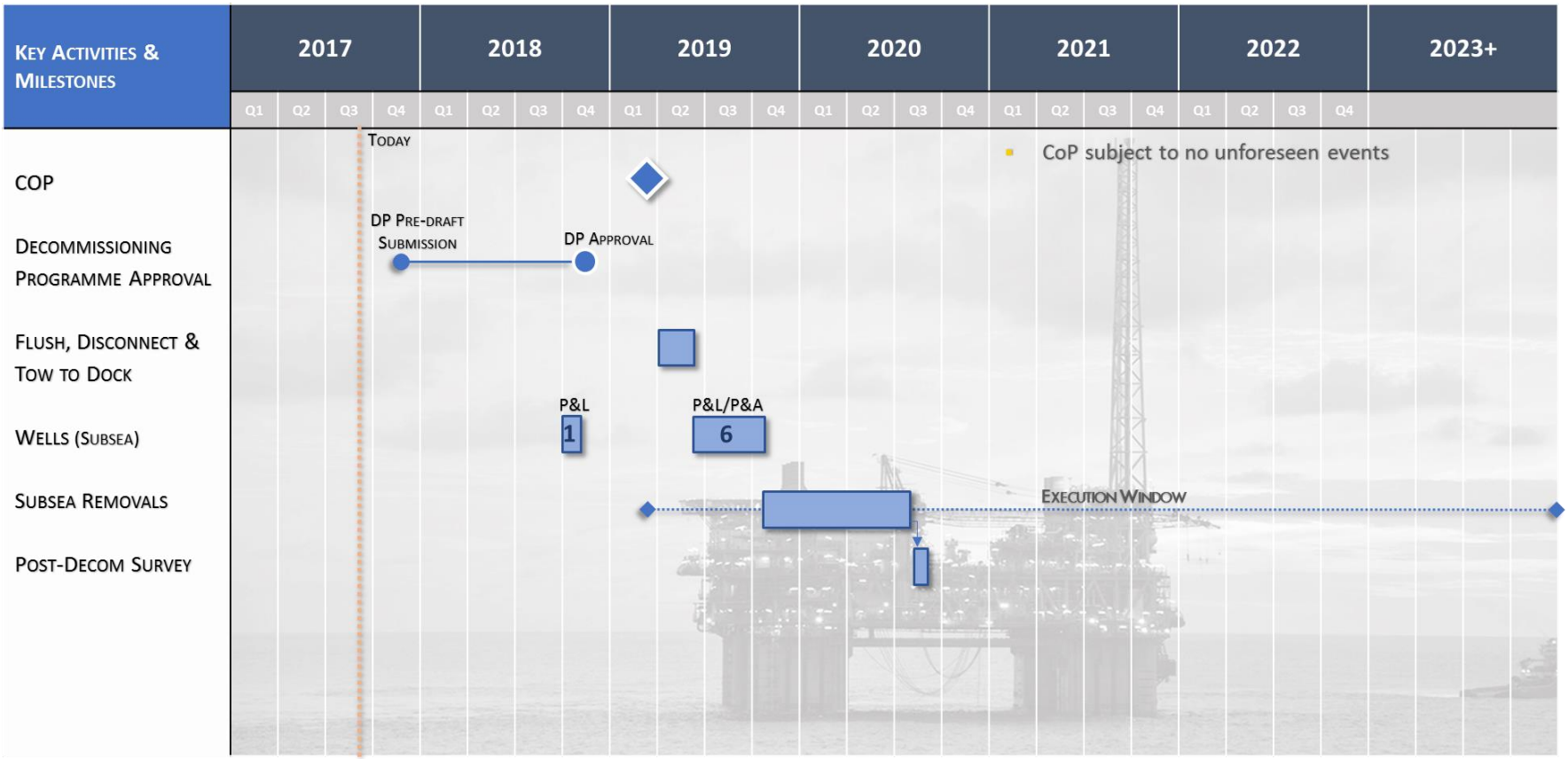
Verification of seabed clearance will be provided by an independent party and submitted to BEIS. A copy of the seabed clearance certificate will also be submitted to the Seabed Data Centre (Offshore Installations) at the United Kingdom Hydrographic Office.

Areas where oil based mud drill cuttings may exist will be excluded, where practical, from the scope of any over-trawling trials to avoid deliberate disturbance. Any debris removal within the cuttings pile will be conducted by ROV and Shell propose to notify other users of the sea the location of any remaining drill cuttings deposits as required.

Verification of the safe seabed state for other users of the sea will be obtained by over-trawl trials in areas of decommissioning activities or any buried items that will remain in situ, including remediated mooring trenches.

6.3 Schedule

Figure 6.1: Gantt Chart of Project Plan



6.4 Costs

An overall cost estimate has been provided to BEIS in confidence, following UK Oil and Gas Guidelines on Decommissioning Cost Estimation in-line with OGUK Work Breakdown Structure (WBS) Guidelines.

Table 6.1 – Provisional Decommissioning Programmes - Costs	
Item	**Estimated Cost (£m)**
FPSO - Preparation/Removal and Disposal	Provided to BEIS in confidence
Pipelines Decommissioning	
Subsea Installations and Stabilisation Features	
Well Abandonment	
Continuing Liability – Future Pipeline and Environmental Survey Requirements	

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 twelve months of the completion of the offshore decommissioning scope) including debris removal and independent verification of seabed clearance and the first post-decommissioning environmental and pipeline surveys.

6.6 Post-Decommissioning Liability, Monitoring and Evaluation

A post-decommissioning environmental seabed survey centred on the sites of subsea installations and pipeline/umbilical corridors will be carried out. The survey will focus on any chemical and physical disturbances of the decommissioning activities compared with the pre-decommissioning survey. Results of this survey will be available once the work is complete, with a copy forwarded to BEIS. All pipeline routes and structure sites will be the subject of geo-physical surveys when decommissioning activity has concluded. After the summary of the surveys has been sent to BEIS and reviewed, a post-monitoring survey regime will be agreed.

The parties to the approved Decommissioning Programmes will be the contact points for any third-party claims arising from damage caused by any remaining infrastructure under the approved Curlew Decommissioning Programmes. All the pipelines which are proposed to be left in place remain the property and responsibility of the owners, even if they were to exit the UKCS.

7 SUPPORTING DOCUMENTS

Table 7.1: Supporting Documents		
Ref	*Document Number*	*Title*
[1]	Chapter 17	The Petroleum Act 1998
[2]	n/a	BEIS GUIDANCE NOTES Decommissioning of Offshore Oil and Gas Installations and Pipelines May 2018
[3]	OSPAR Decision 98/3	OSPAR Decision on the Disposal of Disused Offshore Installations
[4]	CDP-PT-S-HE-0702-00003	Environmental Impact Assessment
[5]	CDP-PT-S-LA-3323-00005	Curlew Decommissioning Comparative Assessment
[6]	EOFL-PT-INT-D-00004	Comparative Assessment Methodology
[7]	CDP-PT-S-AA-7180-00002	Inventory of Hazardous Material

These documents are available as follows:

1. At the Shell website: https://www.shell.co.uk/sustainability/curlew.html
2. By email from: SUKEP-Shell-Decommissioning-Correspondence@shell.com
3. For inspection during the statutory and public consultation period (18th June to 18th July 2018) at Shell U.K. Limited, 1 Altens Farm Road, Nigg, Aberdeen, AB12 3FY.

8 PARTNER LETTERS OF SUPPORT

ExxonMobil

Esso Exploration and Production UK Limited
Union Plaza
1 Union Wynd
Aberdeen
AB10 1SL
+44 (0)1224 651924

Department for Business, Energy and Industrial Strategy
Offshore Decommissioning Unit
AB1 Building, 3rd Floor
Crimon Place
Aberdeen
AB10 1BJ

1st March 2019

Dear Sir or Madam,

Section 29 Notice Petroleum Act 1998 – Curlew Field Decommissioning Programme

Further to your letter dated 4th September 2013 regarding the abandonment of the offshore installation including the FPSO in the Curlew Field, this letter confirms that Shell U.K. Limited as Curlew Field Operator is authorised to submit a decommissioning programme for approval as directed by the Secretary of State on behalf of the current equity holders.

Esso Exploration and Production UK Limited (as a Section 29 Notice Holder) confirms its support for the proposals detailed in the Curlew Decommissioning Programme which the Curlew Field Operator, Shell U.K. Limited, will submitted for final approval in March 2019.

Yours sincerely,

Luke Mathews
Joint Interest Project Advisor

For and on behalf of Esso Exploration and Production UK Limited

Registered in England
Number: 00207426
Registered Office:
Ermyn House, Ermyn Way
Leatherhead, Surrey KT22 8UX

APPENDIX 1 – PUBLIC NOTICE - EXAMPLE

Example of Public Notice
PUBLIC NOTICE
The Petroleum Act 1998
Curlew Decommissioning Programmes
On Monday 18 June 2018, Shell U.K. Limited submitted, for the consideration of the Secretary of State for Business, Energy and Industrial Strategy, draft Decommissioning Programmes for the Curlew Field facilities, associated pipelines, manifolds and wellheads, in accordance with the provisions of the Petroleum Act 1998.
It is a requirement of the Act that interested parties be consulted on such decommissioning proposals. The items/facilities covered by the Decommissioning Programmes are:

1.The Curlew FPSO
2.Associated Curlew Field subsea infrastructure

Shell U.K. Limited hereby gives notice that the Curlew Decommissioning Programmes can be viewed online at website https://www.shell.co.uk/sustainability/curlew.html
Alternatively, a digital copy of the programmes can be requested, or a hard copy inspected at the following location on Tuesday morning or Thursday afternoon:

Shell U.K. Limited
1 Altens Farm Road
Nigg
Aberdeen
AB12 3FY

Contact: Rob Jansen, Head of Projects, Decommissioning Strategy
E-Mail: SUKEP-Shell-Decommissioning-Correspondence@shell.com

Representations regarding the Curlew Decommissioning Programmes should be submitted in writing to Shell U.K. Limited marked for the attention of Rob Jansen at the above address where they should be received by the consultation closing date, Wednesday 18 July, and should state the grounds upon which any representations are being made.

Monday 18 June 2018

Rob Jansen
Head of Projects, Decommissioning Strategy
Shell U.K. Limited
1 Altens Farm Road
Nigg
Aberdeen
AB12 3FY

APPENDIX 2 – CORRESPONDENCE WITH STATUTORY CONSULTEES

No correspondence received.