REPORT

Atlantic & Cromarty Pipelines Comparative Assessment

Prepared for: **Shell U.K. Plc.**

Prepared by: **Genesis Energies**

www.genesisenergies.com
26 Albyn Place
Aberdeen
AB10 1YL

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ABBREVIATIONS

"	Inch
~	Approximately
>	Greater than
A&C	Atlantic and Cromarty
ALARP	As Low as Reasonably Practicable
C&P	Contracting & Procurement
CA	Comparative Assessment
DoC	Depth of Cover
DoL	Depth of Lowering
DP	Decommissioning Programme
DESNZ	Department for Energy Security and Net Zero
EA	Environmental Appraisal
EIA	Environmental Impact Assessment
ENVID	Environmental Impact Identification
HIRA	Hazard Identification and Risk Assessment
ICES	International Council for Exploration of the Sea
JNCC	Joint Nature Conservation Committee
km	Kilometer
m	Meters
MEG	Mono Ethylene Glycol
NB	Nominal Bore
NCMPA	Nature Conservation Marine Protected Area
OD	Outer Diameter
OGUK	Oil and Gas UK (*now OEUK, Offshore Energies UK*)
OPRED	Offshore Petroleum Regulator for the Environment and Decommissioning
OSPAR	Oslo-Paris Agreement
PL	Pipeline

PLU	Pipeline Umbilical
PMF	Priority Marine Feature
R/A/G	Red / Amber/ Green
SACFOR	Superabundant, Abundant, Common, Frequent, Occasional and Rare
SPA	Specially Protected Area
Te	Tonnes
UHB	Upheaval Bucking
UK	United Kingdom
UK BAP	United Kingdom Biodiversity Action Plan

1.0 EXECUTIVE SUMMARY

To support Shell's resubmission of the Atlantic & Cromarty (A&C) Decommissioning Programme (DP) (Ref. 1), due to ongoing considerations for reuse of PL2029 and PL2030, only sections of these pipelines are being decommissioned (**PL2029** Ident 1 and a 60m section of Ident 2 (~100m section from tie-in flange to Atlantic Manifold) and **PL2031** Ident 4 and a 60m section of Ident 3 (~100m section from tie-in flange to Atlantic Manifold)).

Genesis were commissioned to undertake a refresh of the original Comparative Assessment (CA) (Ref. 2) and Environmental Impact Assessment (EIA) (Ref. 3) prepared in 2016 by BG Group. This approach was agreed with the Department for Energy Security and Net Zero (DESNZ) and allows Shell to progress with the decommissioning of the A&C infield infrastructure.

Following the DESNZ decommissioning guidance (Ref. 10) and Offshore Energies UK (OEUK) CA guidance (Ref. 9), the CA review process followed a six step process, Scoping, Screening, Prepare, Establish, Evaluate and Report.

The CA was based upon an assessment against five main criteria: Safety, Environmental Impact, Technical, Societal and Economic, which were further split into 13 sub-criteria. The main criteria and sub-criteria considered are listed in Table 1-1.

Table 1-1 Comparative Assessment Main and Sub-Criteria

MAIN CRITERIA		SUB-CRITERIA
Technical		Risk of major project failure
		Technical complexity & track record
Safety	**Risk During Project Execution Phase**	...to project personnel
		...to those on land
		...to other users of the sea
	From end points	...to other users of the sea
Environment		Impact of Decommissioning Operations Offshore
		Seabed Disturbances – Short Term
		Change of Habitat – Long Term
		Waste Processing
Societal		Impact on commercial fisheries
		Socio-economic impact on communities and amenities
Economic		Cost of Decommissioning & Cost for long term monitoring

The DESNZ decommissioning guidance (Ref. 10) allows for pipelines and umbilicals with similar features to be grouped together to assist with the CA process. Table 1-2 summarises the groupings considered in the CA.

Table 1-2 Comparative Assessment Pipeline Groupings

GROUP	DESCRIPTION
A	Rigid Pipelines (w/ piggybacked line) Fully Trenched and Buried.
B	Umbilicals Trenched and Natural Backfill; buried to target Depth of Lowering (DoL)/Depth of Coverage (DoC) over most of route plus intermittent rock cover along the route.
C	Umbilical Trenched and Natural Backfill; buried, but not meeting target DoL/DoC.

The DESNZ decommissioning guidance (Ref. 10) suggests that a screening exercise is conducted in advance of the CA to screen out infeasible options. All recognised subsea decommissioning options were assessed for each of the pipeline groupings and those options not considered technically feasible were screened out of further assessment in the CA.

In support of the CA refresh, a Hazard Identification and Risk Assessment (HIRA) and an Environmental Impact Identification (ENVID) were carried out to assess the safety and environmental impact of each of the options considered for each grouping. The outputs from the HIRA and ENVID were used to inform the CA for the Safety, Environmental and Societal criteria.

Each decommissioning option was assessed against each of the sub-criteria rated using a Red / Amber / Green scale in accordance with the OEUK CA guidelines, using Green to signify a most preferred scenario / lower impact, Amber to signify a moderately preferred scenario / moderate impact and Red to signify a least preferred scenario / higher impact. Only when all decommissioning options for the group were assessed were the total number of Green / Amber / Red ratings totalled to determine the most preferred decommissioning option for that pipeline grouping. The CA recommendations (i.e. most preferred decommissioning option and those options also deemed acceptable for carrying forward to Contracting & Procurement) are presented in Table 1-3.

Table 1-3 Comparative Assessment Results (Most Preferred Decommissioning Option and Acceptable Options)

GROUP	MOST PREFERRED DECOMMISSIONING OPTION	ACCEPTABLE OPTIONS[1]
A[2]	**Option 2a** Remediate *in situ* with Exposed Sections Rock Covered	**Option 2b** Remediate *in situ* with Exposed Sections Trenched and Buried **Option 2c** Remediate *in situ* with Exposed Sections Cut & Removed
B	**Option 2c** Remediate *in situ* with Exposed Sections Cut & Removed	**Option 2b** Remediate *in situ* with Exposed Sections Trenched and Buried **Option 2a** Remediate *in situ* with Exposed Sections Rock Covered
C	**Option 1a** Total Removal by Reverse Reel[3]	

[1]Note: Options that had no 'showstoppers' identified against them in the CA and are therefore deemed 'acceptable' alternatives.

[2]Note: Post CA, recognising that all the Remediate in situ options were acceptable for Group A, and potential execution synergies with Group B, it was recommended that the exposed ends of Group A should also be cut and removed, with spot rock placed over the cut ends. As such the Group A recommendation in Table 1-3 applies to the mid-line exposures only.

[3]Note: Screening concluded that Full Removal by Reverse Reel was the preferred option for the 12.97km section of PLU2033 that does not meet the target >0.6m DoC/DoL.

2.0 PROJECT OVERVIEW

2.1 Field Description

To support Shell's resubmission of the Atlantic & Cromarty (A&C) Decommissioning Programme (DP) (Ref. 1), due to ongoing considerations for reuse of PL2029 and PL2030, only sections of these pipelines are being decommissioned (**PL2029** Ident 1 and a 60m section of Ident 2 (~100m section from tie-in flange to Atlantic Manifold) and **PL2031** Ident 4 and a 60m section of Ident 3 (~100m section from tie-in flange to Atlantic Manifold)).

Genesis were commissioned to undertake a refresh of the original Comparative Assessment (CA) (Ref. 2) and Environmental Impact Assessment (EIA) (Ref. 3) prepared in 2016 by BG Group. This approach was agreed with the Department for Energy Security and Net Zero (DESNZ) and allows Shell to progress with the decommissioning of the A&C infield infrastructure.

The fields lie in approximately 114 m water depth. Three production wells were completed, one well on Cromarty and two wells on Atlantic. Field infrastructure includes a subsea manifold at Atlantic to which the Atlantic wells are connected to the manifold via surface laid tie-in spools. The Cromarty field is connected to the Atlantic manifold via a 12 km - 12" in-field production flowline. Hydrate formation control at Cromarty was achieved through a 12 km - 4" MEG line piggy-backed to the in-field production line. Both lines are predominantly trenched and buried the entire route except for tie-in at each end.

Production control was via one 31.4 km hydro/electric control umbilical from the Shell Goldeneye platform to the Atlantic Manifold with umbilical jumpers installed between the Atlantic manifold and each Atlantic well. Production control was extended to the Cromarty well via a 12 km hydro/electric control umbilical from the Atlantic manifold to Cromarty. Control equipment was located on the Goldeneye platform with a satellite link to controls workstations at the St Fergus Gas Terminal. Both main umbilicals are predominantly trenched and buried the entire route except for tie-in at each end. The umbilical jumpers to the Atlantic wells are surface laid.

Atlantic & Cromarty production was co-mingled at the Atlantic manifold before transportation directly to the SAGE St. Fergus Gas Terminal via a 77.6 km 18"/16" NB production pipeline. Hydrate formation control was achieved through a 77.6 km 4" MEG pipeline piggy backed to the production pipeline from shore directly to Atlantic and then onwards through a 12 km 4" MEG pipeline to Cromarty.

The export pipeline and associated MEG line from the Atlantic manifold to the St Fergus Gas Terminal are excluded from the scope as agreed with OPRED as they may be identified for future/ alternative use. The boundary for both lines is where the tie-in flange on the pipelines which are connected by surface laid tie-in spools approximately 30m to 35m from the manifold. Figure 2-1provides a drawing of the field layout.

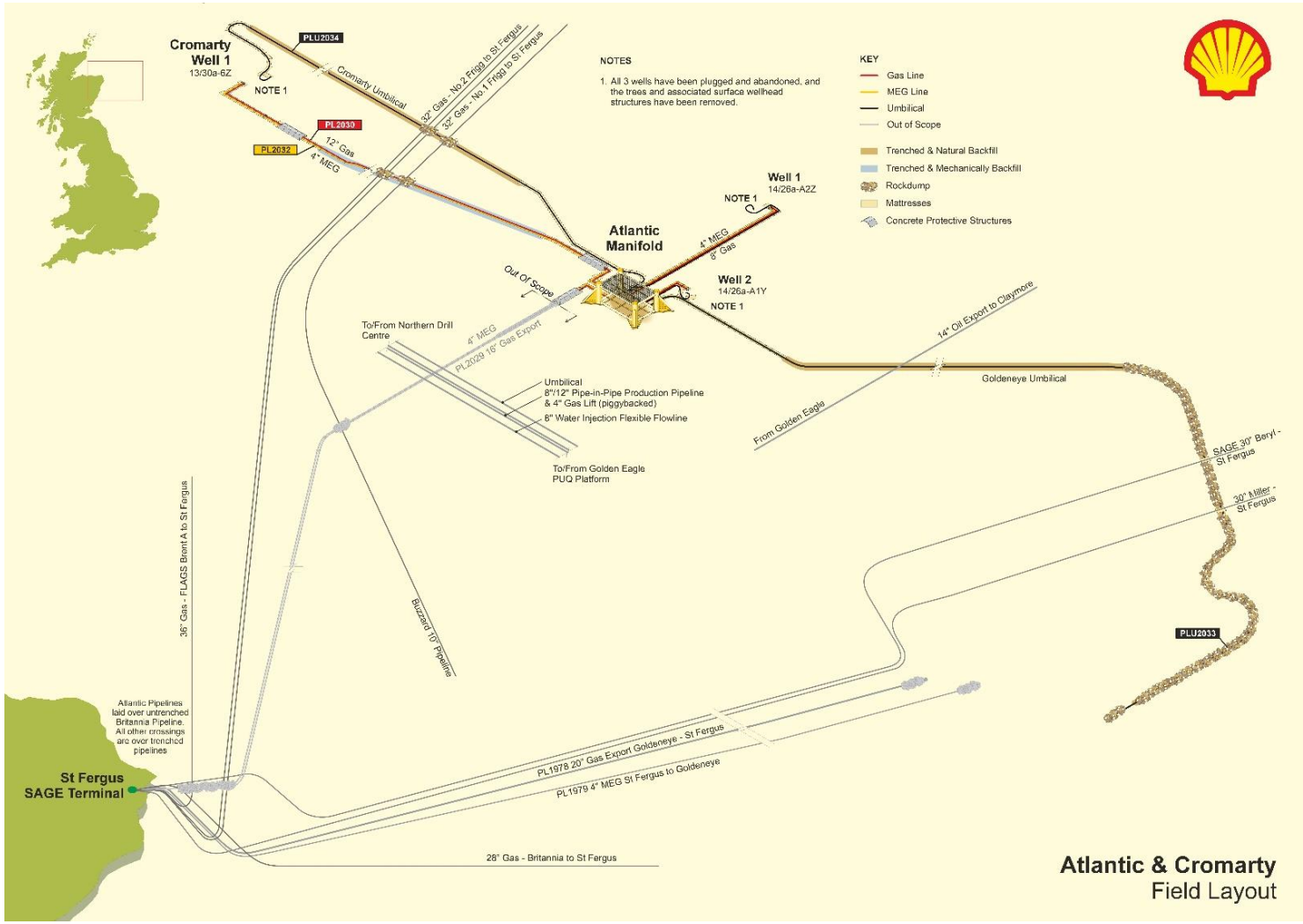

Figure 2-1 Atlantic & Cromarty Location & Field Layout

2.2 Purpose of Document

This document is intended to provide a record of the CA refresh process carried out for the A&C Subsea Pipelines and Umbilicals in support of the updated A&C DP. It furthermore describes the infrastructure to be decommissioned, the options considered, the CA methodology and findings.

2.3 Environmental & Societal Overview

A summary of the environmental and socio-economic receptors in the area is provided in Table 2-1.

Table 2-1 Summary of Environmental & Societal Receptors

ENVIRONMENTAL RECEPTOR	SUMMARY DESCRIPTION
Protected Areas	The closest protected area to the A&C fields is the Southern Trench NCMPA located *c.* 39 km to the southwest and designated for the following features: • Burrowed Mud • Minke whale • Fronts • Quaternary of Scotland • Shelf Deeps • Submarine Mass Movements There are no other protected areas within 40 km of the A&C fields.
Seabed Habitats/Species	A&C Fields The 2015 pre-decommissioning environmental survey across the A&C fields found the seabed comprised a mixed range of sediment types, from moderately well sorted sand to poorly sorted muddy sand. 'Circalottoral muddy sand' (A5.26) was found to be the dominant habitat type (Ref.12). Two species of sea pen were observed during the survey at the A&C fields; *Pennatula phosphorea and Virgularia mirabilis* with the latter being the most dominant. Results from the 2015 survey revealed that seapens, *Nephrops norvegicus* and faunal burrows were among the most common species and features identified. Both seapens and burrows were identified at the Superabundant, Abundant, Common, Frequent, Occasional and Rare (SACFOR) densities of 'frequent' or more at all investigated stations and transects during 2021 survey at the Atlantic and Golden Eagle fields. Thus, it was concluded that the overall surveyed area showed similarity to the OSPAR protected 'Seapen and burrowing megafauna community' habitat and the Scottish Priority Marine Feature (PMF) 'burrowed mud' (Ref. 13) At least one juvenile *Arctica islandica* was identified at each station, during the 2021 survey, while the 2015 survey also identified several of these PMFs around the Cromarty well and the umbilical between the Atlantic Manifold and the Goldeneye Platform. *A. islandica* is a species of conservation importance

ENVIRONMENTAL RECEPTOR	SUMMARY DESCRIPTION
	on the OSPAR list of threatened and/or declining species and is listed as a PMF in Scottish offshore waters due to its low or limited mobility (Ref. 12; 13). Camera transect data, from the 2015 survey, also showed evidence of *Sabellaria spinulosa* aggregations. These were assessed for their potential as Annex I reef habitat using JNCC guidance. Nine patches of continuous *S. spinulosa* were identified along three transects although all of these patches scored 'low' in terms of overall reefiness. Overall, review of transect data suggested that aggregations do not form a contiguous reef and it would not, therefore, be appropriate to consider the entire 'area of numerous boulders' to be *S. spinulosa* reef (Ref. 12). In terms of number of taxa and abundance of individuals, Annelida species dominated followed by Crustacea and Mollusca (Ref. 13). <u>Goldeneye Field</u> The seabed around the Goldeneye area comprises the EUNIS habitat type 'Atlantic Offshore Circalittoral Sand' (MD52). This corresponds to sand and muddy sand (Ref. 14). Around the previous Goldeneye platform location, three species of sea pen were identified during a 2022 survey; *P. phosphorea, Funiculina quadranglaris, and V. mirabilis* (Ref. 14). In addition burrow densities within the same survey area were considered to be 'Frequent' on the Superabundant, Abundant, Common, Frequent, Occasional and Rare (SACFOR) classification scale. The area around the previous Goldeneye platform location is therefore considered to be similar to the 'sea pen and burrowing megafauna communities' habitat. Juvenile *A. islandica* was also identified throughout the Goldeneye area (Ref. 14). Assessment of the adult only faunal set associated with the samples collected as part of the 2022 survey at the Goldeneye location, showed that Annelida were the most abundant taxonomic group making up 61% of total sampled individuals whilst Mollusca were the second most abundant making up 31% of the adult individuals (Ref. 14).
Fish and Shellfish	Several fish species are known to spawn in the area including (but not limited to): herring, whiting, lemon sole, Norway pout, *Nephrops*, and sandeel. Group 0 fish for a number of species have been found in the area indicating its use as a nursery ground for these species including (but not limited to): whiting, haddock, Norway pout, *Nephrops* and spurdog (Ref. 15; Ref. 16). Of the fish species identified in the area, anglerfish, blue whiting, cod, herring, ling, mackerel, Norway pout, sandeel, spurdog, and whiting are considered to be PMFs in Scotland (Ref. 17).
Marine Mammals	The Atlas of Cetacean Distribution in Northwest European Waters (Ref. 18) suggests that minke whales are the most common cetacean species in the A&C area, present throughout the majority of the year. Other species which may occur in the area include Atlantic white-sided dolphin, harbour porpoise, white-beaked dolphin and killer whale.

ENVIRONMENTAL RECEPTOR	SUMMARY DESCRIPTION
Seabirds	European Seabirds at Sea data collected over 30 years (Ref. 19), indicates the presence of a number of bird species in the area including but not limited to the northern fulmar, herring gull, common guillemot and Atlantic puffin.
Fisheries	The infield infrastructure associated with the A&C area occur within International Council for Exploration of the Sea (ICES) rectangles 45E8, 45E9 and 44E9. Pelagic, demersal and shellfish species are fished from these rectangles. Available data suggests that demersal and shellfish species dominate the landings from these ICES rectangles by weight and value. These landings equate to 0.5% (by weight) and 0.7% (by value) for 44E9, 0.3% (by weight) and 0.5% (by value) for 45E8 and 0.7% (by weight) and 0.7% (by value) for 45E9 of total UK reported landings in 2023. Trawls were the dominant gear type used throughout 44E9, 45E8 and 45E9 in 2023.

2.4 Pipeline Definitions

2.4.1 Burial Depth

Different definitions will be used for different burial depths. The following diagram (Figure 2-2) illustrates the different burial depth definitions.

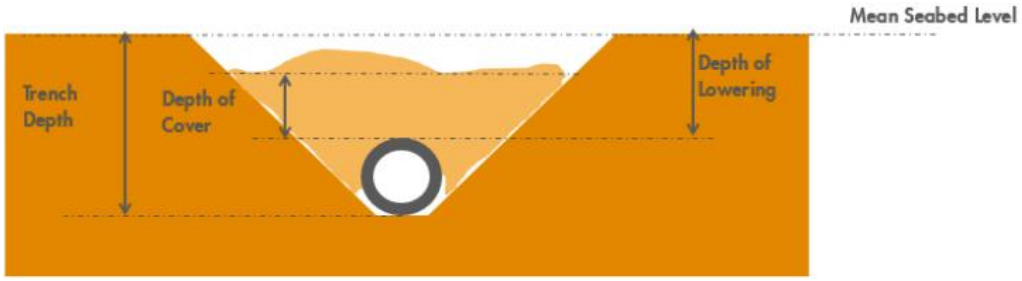

Figure 2-2 Pipeline Burial Depth Definitions

As per OPRED Guidance (Ref 10), a pipeline is deemed adequately trenched and buried (and therefore a candidate for *in-situ* decommissioning) when the top of the pipeline is to a minimum depth of 0.6m (Depth of Lowering (DoL) and Depth of Coverage (DoC).

However, in situations where lines are adequately trenched (DoL), but not buried to 0.6m or greater (DoC) then more information will be required on potential snagging risks to support the decision making.

2.4.2 Line Sections

A single pipeline/umbilical is split into 3 different sections for the purpose of this CA. The pipeline/umbilical route length, which can generally be described as the section of pipe/umbilical within its trench. The end of a pipeline/umbilical in general is the section between the trench transition (as the line comes out of a trench) and the tie-in to the structure (including spools). Finally, the spool or jumper which is the section of pipe/umbilical lain on the seabed and facilitates the tie-in to any structures. The diagram below (Figure 2-3) illustrates the differences between the different sections.

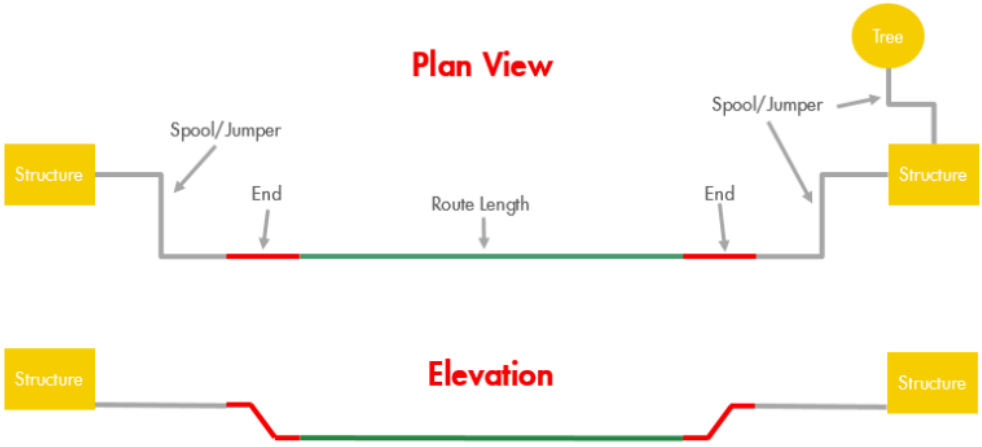

Figure 2-3 Pipeline/Umbilical Sections

3.0 OVERVIEW OF THE CA PROCESS

The A&C CA refresh has followed the recommended process to be adopted as laid out in 2015 OEUK (previously Oil and Gas UK Ltd (OGUK)) CA Guidelines (Ref. 09). Figure 3-1 is taken from OEUK Guidelines and summarises this process.

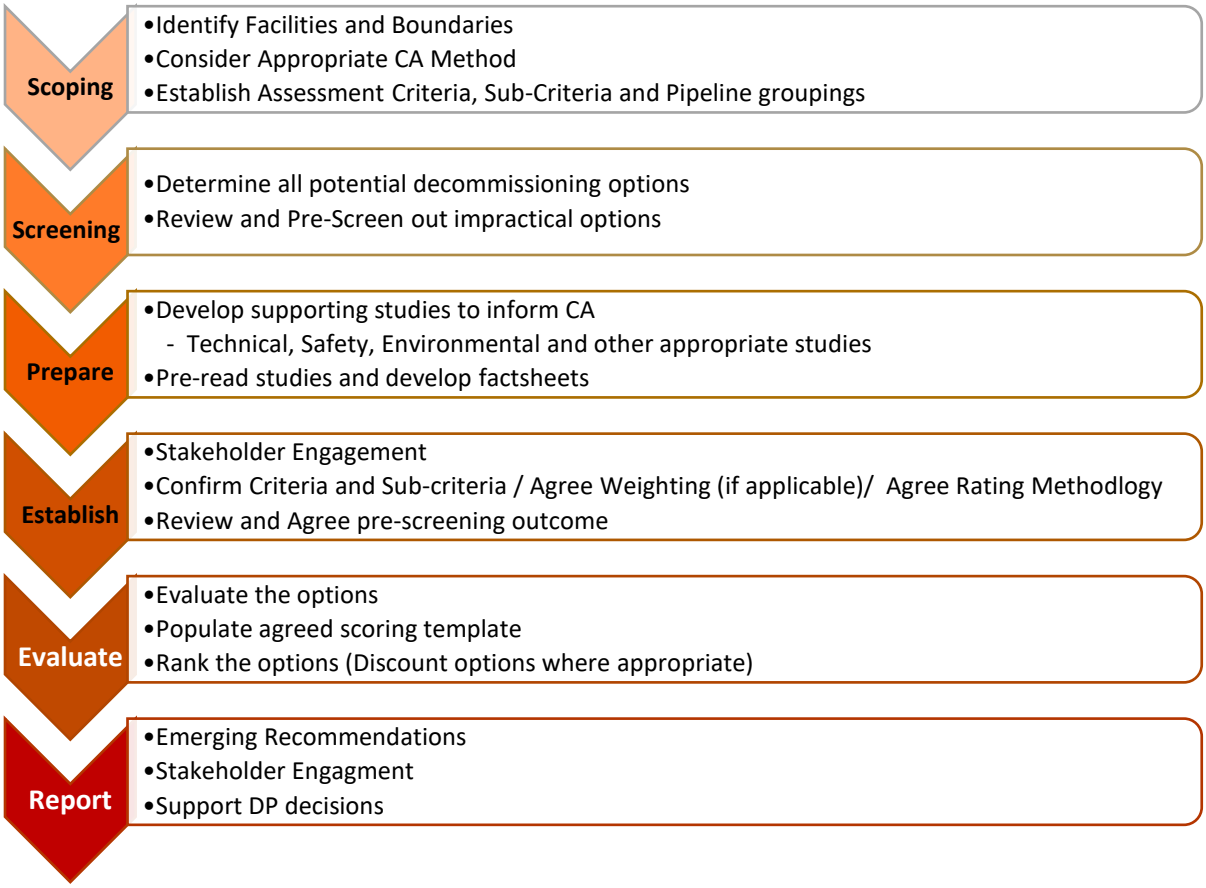

Figure 3-1 CA Process Flowchart

4.0 SCOPING

4.1 Inclusions, Exclusions and Boundaries for CA

4.1.1 Inclusions and Boundaries

This CA covers the infield subsea pipelines and umbilicals only as all other infield infrastructure e.g. spools and manifold (as described in the DP and EA) will be recovered.

4.1.1.1 Pipelines

The following pipelines are included in the CA:

- *PL2030* Cromarty Production Pipeline.
- *PL2032* Cromarty MEG Line (piggybacked to PL2030).

4.1.1.2 Umbilicals

The following umbilicals are included in the CA:

- *PLU2033* Goldeneye to Atlantic Manifold Umbilical.
- *PLU2034* Atlantic Manifold to Cromarty Well Umbilical.

4.1.2 Exclusions

As agreed with DESNZ, due to ongoing considerations for reuse of PL2029 and PL2030, only sections of these pipelines are being decommissioned (**PL2029** Ident 1 and a 60m section of Ident 2 (~100m section from tie-in flange to Atlantic Manifold) and **PL2031** Ident 4 and a 60m section of Ident 3 (~100m section from tie-in flange to Atlantic Manifold)). The rest of these two lines are excluded from the scope and will be the subject of a separate, future DP.

In compliance with DESNZ's Decommissioning Guidance (Ref. 10), the following are expected to be removed, returned onshore for recycling/disposal and have therefore been excluded from the CA:

- Exposed small diameter pipelines, including spools, flexible flowlines and umbilicals.
- All exposed stabilisation/protective features such as mattresses, grout bags, or the concrete tunnels which have been installed to protect pipelines or other infrastructure during their operational life.
- The Atlantic Manifold subsea installation.

4.2 Evaluation Method

For the A&C CA, Evaluation Method A as defined in the OEUK Guidelines (Ref. 09) was selected. This involves the use of the RED / AMBER / GREEN (R/A/G) evaluation method which is a common approach and is regularly used for most pipeline CAs.

Under this Evaluation Method, colour coding, rather than numerical coding, will represent the relative preference of the options with respect to the criteria to be considered as shown in Table 4-1.

Colour code decisions will be supported by transparent narrative to ensure the decision making process is clearly documented and understood.

Table 4-1 Evaluation Method A – Comparative Impact

PERFORMANCE	COMPARATIVE IMPACT		
Most Preferred		Lower Impact	(Green)
		Moderate Impact	(Amber)
Least Preferred		Higher Impact	(Red)
No Preference		Not SignificantlyDifferent[1]	(Grey)

1. DESNZ's Decommissioning Guidance (Ref. 10) identifies that "*The preferred option should be selected by focusing on the matters where the impacts of the options are significantly different*". Therefore, where there is no significant difference between the options the sub-criterion across the options should be colour coded grey.

4.3 Assessment Criteria and Sub-Criteria

Assessment criteria provide a framework for comparing options. The main criteria considered were as per OEUK Guidelines (Ref. 09):

- Technical Feasibility.
- Safety.
- Environmental.
- Societal.
- Economic Risk.

For ease of analysis and recognising the main criteria cover a wide spectrum of specific issues, the main criteria were divided into sub-criteria.

The sub-criteria for this CA were largely aligned to the examples of sub-criteria provided in the OEUK Guidelines (Ref. 09).

The individual sub-criteria used are shown in Table 4-2.

Table 4-2 Main Criteria and Sub-criteria Adopted in the CA Evaluation

MAIN CRITERIA		SUB-CRITERIA
Technical		Risk of major project failure
		Technical complexity & track record
Safety	**Risk During Project Execution Phase**	...to project personnel
		...to those on land
		...to other users of the sea
	From end points	...to other users of the sea
Environment		Impact of Decommissioning Operations Offshore
		Seabed Disturbances – Short Term
		Change of Habitat – Long Term
		Waste Processing
Societal		Impact on commercial fisheries
		Socio-economic impact on communities and amenities
Economic		Cost of Decommissioning & Cost for long term monitoring

4.4 Pipeline Groupings

The DESNZ Decommissioning Guidance Notes (Ref. 10) and OEUK CA Guidelines (Ref 09) both acknowledge that, where there are several pipelines in the field that are being decommissioned at the same time, it may be appropriate to group similar pipelines together and to carry out a combined CA.

Grouping streamlines the process for the project team and the subsequent review cycle by others (including the regulator).

As described in Section 4.1.1.1, there are only two pipelines included in the refreshed CA: PL2030 and PL2032. Since PL2032 is piggybacked to PL2030, they were considered in a single group for the A&C pipelines:

- ***Group A***, *PL2030 / PL2032* Rigid Pipelines Piggybacked which are fully Trenched and Buried[1].

[1]Note: In addition to the typical pipeline sections/exposures at the line ends described in Section 2.4.2, the Pipelines in Group A, will have midline exposures at a number of locations where 49 mattresses are to be recovered that were originally placed to mitigate upheaval buckling when the lines were operational, which equates to ~ 560m in length.

Since the burial status of the two umbilicals differs (Ref. 07), with 12.97 km) of PLU2033 not meeting target Depth of Cover (DoC)/Depth of Lowering (DoL) (i.e. < 0.6m) the decision was taken to split the umbilicals for evaluation into two separate groups [1]:

- ***Group B***, *PLU2034 & 18.27km of PLU2033*. Trenched with Natural Backfill; buried to target DoC/DoL over most of route plus intermittent rock cover along the route.
- ***Group C***, 12.97km of *PLU2033*. Trenched with Natural Backfill; buried, but not meeting target DoC/DoL.

Pipeline groupings are shown in Table 4-3.

[1] The original 2016 CA Report (Ref. 02) assessed only one 'umbilicals group' which contained both PLU2033 Goldeneye to Atlantic manifold umbilical and PLU2024 Cromarty well to Atlantic manifold umbilical.

Table 4-3 Pipeline Groups - Length, Weight, Burial Status & <0.6 m DoC Length

GROUP ID	COMPONENT / AS-LAID CONDITION	GROUPINGS	LENGTH (KM)	WEIGHT (TE)	BURIAL STATUS[1]	<0.6M DOC LENGTH (M)
A	Rigid Pipelines Piggy-backed: Fully Trenched and Buried (3 rock covered crossings)	**PL2030** – 12" Infield Gas Production from Cromarty Tree to Atlantic Manifold (323.9mm OD)	11.780	1318.3[2]	Trenched and mechanically backfilled with average[1] 1.32m DOC, with additional 4.3km rock cover along the route. 49 Mattresses for UHB Mitigation due to lines being partially exposed, when the mattresses are removed, ~560m total exposure is possible. Note this is not one ~560m single exposure but several areas of individual exposures which are within ~50m of each other.	200m (pipeline trench transition across both ends) 560m (due to mattress removal midline)
		PL2032 – 4" Infield MEG from Atlantic manifold to Cromarty Tree (114.3mm OD) piggy backed to PL2030	11.780	129.7[3]		
B	Umbilical Trenched and Natural backfill (Intermittent rock cover along the route and at crossings)	**PLU2034** – Atlantic to Cromarty Tree Power/ Control / Chemical injection umbilical (90.2mm OD)	11.970	161.6	Trenched and naturally backfilling with average[1] 0.81m DOC, increased DoC between 2011 and 2023 surveys, approx. 3,300te of rock cover along the route	*3,600m where DoC is 0.48 m, however DoL >0.6 m.*
		PLU2033[4] – Goldeneye to Atlantic Manifold Power/ Control / Chemical Injection Umbilical (90.2mm) OD	4.527 (KP0.00-KP4.527)	61.2	Trenched and naturally backfilling with average[1] 0.89m DOC, increased between 2011 and 2023 surveys, approx. 3,115te of rock cover along the section.	*115 m (at Atlantic tie in)*
			13.747 (KP17.5-KP31.247	185.8	Trenched and naturally backfilling with average[1] 0.76m DOC, increased between 2011 and 2023 surveys, approx. 1,582te of rock cover along the section.	
C	Umbilical Trenched and Natural backfill (Intermittent rock cover along route)	**PLU2033[4]** – Goldeneye to Atlantic Manifold Power/ Control / Chemical injection umbilical (90.2mm OD)	12.970 (KP4.527-KP17.5)	175.3	Trenched and naturally backfilling with average[1] 0.44m DOC, increased between 2011 and 2023 surveys, approx. 1,904te of rock cover along the section.	*12,970m where DoC <0.6 m, and DoL ranges between 0.2-0.5 m.*

Notes:
1. Average burial depths are calculated including exposed lengths, concrete mattresses / tunnels and rock cover.
2. PL2030 weight includes coating and anodes.
3. PL2032 weight includes coating but has no anodes.
4. Length of static umbilical PLU2033 was originally 31,290m, however, 43m was removed and the exposed end was rock covered (146Te) at Goldeneye when the platform was decommissioned, for purposes of DP the new length is 31,247m.

5.0 SCREENING

DESNZ Decommissioning Guidance (Ref. 10), and the OEUK Guidelines (Ref. 09) recommend that a screening exercise is completed on all potential decommissioning options to create a shortened list to be carried into the CA.

The set of options should include at least one full removal option which is a standard regulatory requirement and provides a baseline option for CA.

A summary of the screening and options carried forward to the CA is provided in Table 5-1.[2]

[2] The decommissioning options identified in the 2016 CA (Ref. 02) were reviewed to confirm they were still relevant to the revised scope boundaries, and to consider any potential changes due to new or improved technologies.

Table 5-1 Summary of Screened Options

GROUP	PL / PLU TYPE & AS-LAID CONDITION	1. TOTAL REMOVAL BY:			2. REMEDIATE *IN SITU* WITH EXPOSED SECTIONS:		
		a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed
A	PL2030/ PL2032 Rigid Pipelines Piggy-backed: Fully Trenched and Buried (3 rock covered crossings)	✗ Screened Out[1]	✗ Screened Out[1]	✓	✓	✓	✓
B	PLU2034 & 18.27 km of PLU2033 Trenched and Natural backfill - buried to target DoC/DoL over most of route. (Intermittent rock cover along the route and at crossings)	✓	✗ Screened Out[1]	✗ Screened Out[1]	✓	✓	✓
C	12.97 km of PLU2033 Trenched and Natural backfill - buried but not meeting target DoC/DoL(rock cover at crossings)	Note 2 ✓	✗ Screened Out[1]	✗ Screened Out[1]	✗ Screened Out	✗ Screened Out	*N/A*

[1]Note: As per OPRED Guidelines, the best/most compelling full removal option was carried through from screening to the CA. For Group A - rigid buried piggybacked pipelines, the technical uncertainty due to integrity ruled out options 1a) and 1b). For Groups B and C, whilst all full removal options are technically achievable, the associated durations (with linked implications on safety risk offshore and the environment) as well as significant cost increases ruled out options 1b) and 1c). The retention of reverse reeling reflects the high level of confidence in this approach, and suitability of the lines for reeling.

[2]Note: Screening concluded that Full Removal by Reverse Reel was the preferred option for the 12.97 km section of PLU2033 that does not meet the target >0.6m DoC/DoL.

6.0 PREPARE

6.1 Technical

To ensure robust evidence was available to support the CA refresh evaluation, significant preparation by data gathering, reviewing drawings, inspection reports, survey reports and operating history has been completed. In addition, updated technical studies have been completed to accurately determine the quantity, specification, physical layout, status and predicted behaviour of the facilities to be decommissioned, including:

- Material Inventory (Ref. 05).
- Pipeline Status and Historical Review (Ref. 07).
- A&C Gap Analysis (Ref. 04).

Technical Data Sheets for the remaining Groups after Screening, (A and B) were prepared based on these reports.

A summary of the Technical Data Sheets used to inform the CA are included in Appendix A – Technical Data Sheets.

6.1.1 Safety Risk Assessment / Environmental Impact Identification

Hazard Identification and Risk Assessment (HIRA) and an Environmental Impacts Identification (ENVID) desktop exercises (Ref. 06) were undertaken to inform the CA refresh. The objectives of the exercises were to:

- Identify activities that have the potential to give rise to safety, health, societal and environmental consequences.

The activities associated with each decommissioning option under consideration for each pipeline group were assessed separately which enabled the specific safety, societal and environmental related risks of each option to be identified.

The HIRA and ENVID processes involved structured approaches, in line with general industry practice. The methodology adopted and the results from both exercises can be found in the HIRA/ENVID Report (Ref. 06).

The results of the HIRA informed the ratings applied to the relevant safety sub-criteria during the CA. The results of the ENVID informed the ratings applied to the relevant environmental and societal sub-criteria during the CA.

A summary of the HIRA and ENVID results are provided in Appendix B & Appendix C respectively.

7.0 ESTABLISH

7.1 Stakeholder Engagement

Consulting with stakeholders is an important part of the CA process. It allows any concerns or issues which stakeholders may have, to be communicated and addressed.

Building on the stakeholder engagement originally undertaken in 2016, and as part of the informal stakeholder engagement process Shell issued a Scoping Report (Ref. 11), in May 2024, to a number of stakeholders.

The Scoping Report (Ref. 11) provided an overview of the A&C fields, the proposed decommissioning activities and an overview of the impacts to be assessed in the EA. Recipients were invited to comment with respect to any concerns they may have. Comments received on the Scoping Report are summarised in the A&C EA.

The formal statutory and public consultation process will be triggered by the submission of the consultation draft of the DP and supporting documents (including this CA report) to DESNZ. As the project progresses, further consultation will be undertaken as appropriate, and in response to any comments received during public consultation. Any comments received during Public Consultation will be recorded within the DP.

7.2 Confirm Criteria, Sub-Criteria & Weightings

The selected criteria/sub-criteria are described in Section 4.3.

A qualitative R/A/G approach to rating performance of each decommissioning option and across each of the sub-criteria was adopted, therefore neither numerical scoring nor application of weightings to criteria is required during the evaluation (i.e., all sub-criteria evaluated were given equal weighting). Therefore, the more sub-criteria allocated to a main criterion, the greater the influence that main criterion will have on the outcome of the CA.

7.3 Review and Agree Pre-Screening Outcome

The pre-screening results were agreed amongst the project team ahead of the CA Evaluation.

8.0 EVALUATE

The CA refresh was a desktop exercise, undertaken by a multidiscipline Genesis team (Decommissioning, Subsea, Safety and Environmental/Societal) with subsequent review and alignment sessions with the Shell team.

8.1 Evaluation Workshop Tools

A Ratings Guide Table (see Appendix D – CA Ratings Guide Table) for each sub-criterion used in the CA refresh was prepared to assist in the application of R/A/G rating against each sub-criterion. These ratings tables were used as guides to generate discussion and provide direction on potential differentiators.

8.1.1 Evaluation / Rating Workbook

Project specific evaluation/rating workbooks were prepared reflecting the criteria and sub-criteria to be assessed against the specific decommissioning options for the remaining two groups being evaluated.

The workbooks were populated with relevant narrative justifying the reasoning behind the rating of each sub-criterion against each decommissioning option.

The workbooks provided in Appendix E – CA Evaluation Workbook document the evidence and justification for the recommended decommissioning option recorded in this Report.

8.1.2 Decommissioning Data Sheets

Decommissioning data sheets were prepared (see Appendix A – Technical Data Sheets Appendix B – HIRA Data Sheets and Appendix C - ENVID Data Sheets) which present a summary of the results of the supporting studies and informed the re-evaluation during the review.

8.1.3 Mechanics of Option Rating

Each pipeline group was assessed, by:

1) Taking each sub-criterion in turn and assessing across each decommissioning option. This ensured a true comparison of the options for each sub-criterion.
2) Narrative was added to record the decision making process.
3) Steps (1) and (2) were repeated for each sub-criterion in turn until all sub-criteria were assessed for all decommissioning options.
4) Tallying of the results was not completed until each criterion had been assessed and rated individually. This avoided the possibility of summation results influencing ratings across subsequent criteria.
5) Once all criteria were completed a summary page was collated and viewed to determine the overall ranking for each decommissioning option:
    a) The decommissioning option with the highest number of sub criteria rated as RED was considered the least preferred option.

b) The decommissioning option with the least number of sub criteria rated as RED and the greatest number of sub criteria rated GREEN, was considered the most preferred option.

c) Other options were ranked in order, based on relative numbers of RED and AMBER and GREEN rankings for the sub-criteria.

It is acknowledged that this approach to rating and ranking of the decommissioning options will be considered subjective, however this approach has previously been accepted and understood by both DESNZ and typical stakeholders for pipeline systems CAs.

8.1.3.1 Sensitivity Analysis

Recognising that the results inevitably incorporate various subjective forecasts and judgements, sensitivity analysis was used to understand how robust the results were to changes in the elicited scoring, providing confidence in the assessment.

Two sensitivity analyses were identified:

Economic Sensitivity

The DESNZ Guidance Notes Decommissioning of Offshore Oil and Gas Installations and Pipelines, November 2018, Annexe A - A guide to Comparative Assessments provides the following guidance *"…. Proportionality must also be considered but it is unlikely that cost will be accepted as the main driver unless all other matters show no significant difference…."*

To demonstrate that the rating results from the evaluation of the cost of the decommissioning options has not had an undue influence on the ranking of the decommissioning options, the economic risk sub-criteria is discounted under this sensitivity analysis for each pipeline group.

9.0 REPORT

This section provides a summary of the ranking for each decommissioning option under consideration and for the remaining two pipeline groups. Options ranked 1st being the most preferred option and options ranked 2nd, 3rd and 4th and 5th, being poorer performing options compared to the most preferred option.

A full set of the evaluation worksheets is provided in Appendix E – CA Evaluation Workbook and a summary of the results for each group is provided in Sections 9.1 and 9.2.

9.1 Group A, PL2030/PL2032: Rigid Pipelines Piggybacked Fully Trenched & Buried

The CA outputs for Group A are shown in Table 9-1 detailing the ranking of each option, the R/A/G rating count, and the final recommendation for decommissioning of Pipeline Group A.

Table 9-1 Group A, PL2030/PL2032: R/A/G Ranking and CA Recommendation

Decommissioning Option[1]	1. Total Removal by:	2. Remediate *in situ* with exposed sections:		
	c) Cut & lift	a) Rock Covered	b) Trenched & Buried	c) Cut & Removed
Ranking	4th (*Discounted*)	1st =	1st =	3rd
Rating Count	Red = 1	Red = 0	Red = 0	Red = 0
	Amber = 6	Amber = 2	Amber = 1	Amber = 3
	Green = 2	Green = 7	Green = 8	Green = 6
	Not Significantly Different = 4	Not Significantly Different = 4	Not Significantly Different = 4	Not Significantly Different = 4
Recommendation	The evaluation ratings across the three remediate *in situ* options 2a), 2b) and 2c) were not significantly different. However, it is recommended that Option 2a) (Exposed Sections Rock Covered) is the Most Preferred Option. This conclusion reflects: • The uncertainty for trenching/technical success for option 2b) along the section that could not be adequately trenched previously, which would then have subsequent implications against the other criteria rankings (e.g. other users of the sea) should trenching not be successful, drove the overall preference for option 2a). • That for option 2c) (Exposed Sections Cut and Removed), the cut ends will require spot rock coverage, and that due to the **mid-line** cut ends spacing and SFF rock berm guidance, that the rock quantity would be similar to option 2a), but with the additional operations/activities associated with the removal of the cut lines (see Section 9.1.1 for further details). Recognising the lack of significant difference between all three **remediate in situ options,** 2a), 2b) and 2c)**, all** are deemed acceptable for use and could be carried forward to C&P tendering, with Shell free to select any of the three options based on feedback from the market and potential synergies with other scopes.			

	Post CA, potential execution synergies with Group B (Section 9.2) were identified, and it was recommended that the exposed ends of Group A should also be cut and removed, with spot rock placed over the cut ends. As such the Group A recommendation Exposed Sections Rock Covered applies to the mid-line exposures only. DESNZ will be informed by Shell on the overall strategy. It is recommended that Option 1c (Total Removal by Cut and Lift) be discounted. This was driven by a Higher Impact (Red) ranking related to Cost and Moderate Impact (Amber) ratings for Risk during Project Execution (onshore/offshore and to other users), Seabed Disturbance (short term) and Risk of Major Project Failure and Technical Complexity when compared to Options 2a, 2b and 2c.

[1]Options 1a Total Removal by Reverse Reeling and 1b Total Removal by Reverse S-lay were both screened out in pre-screening (see Table 5-1).

9.1.1 UHB Mattresses Recovery and Potential Exposures

As a mitigation for upheaval buckling, 49 concrete mattresses were installed over the top of PL2030 and PL2032 during the field's operating life. All 49 mattresses are to be recovered.

When 33 of the 49 mattresses are recovered, sections of PL2030/PL2032 (which had been covered) will either become exposed or will have insufficient DoC. The recovery of the other 16 mattresses will not expose the lines or result in the lines having an insufficient DoC.

The resulting exposures/insufficient DoC associated with the 33 mattresses to be recovered are spread across ten locations between KP 1.25 and KP 5.2. Of those ten locations, seven of them are within close proximity to each other such that any remedial rock cover would be within 50m of the next location in line.

The Scottish Fishermen's Federation (SFF) advises that, for safety reasons, it would be advisable to 'link' rock berms which are in series along the same pipeline where berms are close to one another (~50m). Following that advice, linking the seven locations that are within close proximity to each other creates a singular section equivalent to 537m (KP 2.046 to KP 2.583). There are three additional locations which are isolated and would be remediated individually, meaning the total length of pipeline requiring remediation is ~560m.

When comparing Option 2a (Exposed Sections Rock Covered) and Option 2c (Exposed Sections Cut and Removed), it is important to note that Option 2c will have spot rock placed on the cut ends, and as such (recognising the aforementioned requirement to link rock berms in close proximity to each other) would not significantly reduce the requirement for remedial rock.

9.1.2 Sensitivity Analysis

One sensitivity case (as summarised in Table 9.3) was undertaken to test the results.

9.1.2.1 Economic

The sensitivity test involved removing the Economic Criteria (Decommissioning Cost) from the assessment to reflect the regulatory guidance and stakeholder feedback that cost should not be the main driver unless all other matters show no significant difference.

The removal of Economic Criteria did not alter the rankings.

9.2 Group B, Umbilicals (PLU2034 & 18.27 km of PLU2033): Trenched & Self-Burying / Partially Rock Covered

The CA outputs for Group B are shown in Table 9-2, detailing the ranking of each option, the R/A/G rating count, and the final recommendation for decommissioning of Pipeline Group B.

For Group B exposed sections to be remediated under options 2a), 2b)and 2c) are assumed to just be the exposures at the trench transitions the ends of umbilical route (0.4km total exposed length) Not the section of umbilical PLU2034 along the route where a DoL is greater than 0.6m and DoC is ~0.48m i.e. 3.39km section of umbilical between KP 8.47 and KP11.85 which is naturally backfilling. This is aligned with other pipeline decommissioning precedent/experience.

Table 9-2 Group B, Umbilicals (PLU2034 & 18.27 km of PLU2033): R/A/G Ranking and CA Recommendation

Decommissioning Option[1]	1. Total Removal by:	2. Remediate *in situ* with exposed sections:		
	a) Reverse Reeling	a) Rock Covered	b) Trenched & Buried	c) Cut and Reverse Reeled or Removed
Ranking	4th	3rd	2nd	1st
Rating Count	Red = 0	Red = 0	Red = 0	Red = 0
	Amber = 4	Amber = 2	Amber = 1	Amber = 0
	Green = 3	Green = 5	Green = 6	Green = 7
	Not Significantly Different = 6	Not Significantly Different = 6	Not Significantly Different = 6	Not Significantly Different = 6
Recommendation	Based on the evaluation results, Option 2c (Exposed Sections Cut and Reverse Reeled or Removed) was ranked 1st. Ratings across 6 of the 13 sub-criteria across all options evaluated were considered Not Significantly Different (all being individually rated Lower Impact (Green)). No Higher Impact (Red) ratings were assigned for any of the options. Recognising the lack of significant difference between all the remediate ***in situ*** options it is suggested they could all be carried forward to Execution phase C&P tendering, with Shell free to select any of the three options based on feedback from the market and potential synergies with other scopes. It is recommended that Option 1a (Total Removal by Reverse Reeling), which was ranked 4th, be discounted. It has the most Moderate Impacts (Amber) for Risk during project execution (onshore and offshore), Seabed Disturbance and additional Cost.			

[1]Options 1b Total Removal by Reverse S-lay and 1c Total Removal by Cut & Lift were both screened out in pre-screening (see Table 5-1).

9.2.1 Sensitivity Analysis

One sensitivity case (as summarised in Table 9.3) was undertaken to test the results.

9.2.1.1 Economic

The sensitivity test involved removing the Economic Criteria (Decommissioning Cost) from the assessment to reflect the regulatory guidance and stakeholder feedback that cost should not be the main driver unless all other matters show no significant difference.

The removal of Economic Criteria did not alter the rankings.

Table 9-3 A&C Pipeline Group Summary with Sensitivities

PIPELINE / UMBILCAL GROUP	DECOMMISSIONING OPTIONS		1) TOTAL REMOVAL BY:			2) REMEDIATE IN SITU WITH:		
			a) REVERSE REELING	b) REVERSE S-LAY	c) CUT & LIFT	a) EXPOSED SECTIONS ROCK COVERED	b) EXPOSED SECTIONS TRENCHED & BUIRED	c) EXPOSED SECTIONS CUT & REMOVED
Group A. Rigid Pipeline w/ Piggybacked Pipeline. Trenched with natural back fill & rock covered crossings	RANKINGS	"BASE CASE"	SCREENED OUT	SCREENED OUT	✖ 4th	**1st =**	1st =	3rd
		"NO ECONOMICS CASE"			✖ 4th	**1st =**	1st =	1st =
Group B. Umbilicals (PLU2034 & 18.27km of PLU2033). Trenched & Natural backfill, buried to target DoC/DoL over most of route.		"BASE CASE"	✖ 4th		SCREENED OUT	3rd	2nd	**1st**
		"NO ECONOMICS CASE"	✖ 4th			3rd	2nd	**1st**

10.0 CONCLUSIONS

A CA has been undertaken for the A&C Infield Subsea Pipelines and Umbilicals in support of the updated A&C DP.

A review of each Pipeline Group's rankings and a subsequent analysis exploring scope synergies and sensitivities has identified the 'Most Preferred Options' which are recommended for inclusion in the DP and for Cost Estimating.

Whilst the 'Most Preferred Options' (see Table 10-1), should be used for the cost basis, all documentation, including the DPs, should make it very clear that there is optionality on the chosen method (clearly listing those that were ranked 'acceptable' in the CA – i.e. no 'showstoppers' were identified against them) and that the exact method will be decided as part of the overall contracting strategy with input from the decommissioning contractor at point of award.

Table 10-1 Comparative Assessment Results (Most Preferred Decommissioning Option and Acceptable Options)

GROUP	MOST PREFERRED DECOMMISSIONING OPTION	ACCEPTABLE OPTIONS[1]
A[2]	**Option 2a** Remediate *in situ* with Exposed Sections Rock Covered	**Option 2b** Remediate *in situ* with Exposed Sections Trenched and Buried **Option 2c** Remediate *in situ* with Exposed Sections Cut & Removed
B	**Option 2c** Remediate *in situ* with Exposed Sections Cut & Removed	**Option 2b** Remediate *in situ* with Exposed Sections Trenched and Buried **Option 2a** Remediate *in situ* with Exposed Sections Rock Covered
C	**Option 1a** Total Removal by Reverse Reel[3]	

[1]Note: Options that had no 'showstoppers' identified against them in the CA and are therefore deemed 'acceptable' alternatives.

[2]Note: Post CA, recognising that all the Remediate in situ options were acceptable for Group A, and potential execution synergies with Group B, it was recommended that the exposed ends of Group A should be cut and removed, with spot rock placed over the cut ends. As such the Group A recommendation in Table 10-1 applies to the mid-line exposures only.

[3]Note: Screening concluded that Full Removal by Reverse Reel was the preferred option for the 12.97km section of PLU2033 that does not meet the target >0.6m DoC/DoL.

Where the tender process results in an acceptable option being selected that was not the Most Preferred Option, Shell will inform DESNZ before finalising execution plans.

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APPENDIX A – TECHNICAL DATA SHEETS

The Technical Data Sheets and following summary tables for each Group were prepared based on the Pipeline Status and Historical Review (Ref. 07).

Group ID	Guide Table	Basis of Score	Decommissioning Option					
			1. Total Removal			2. Remediate in-situ (trenched and buried sections left in-situ)		
			a. By Reverse Reeling	b. By Reverse S-Lay	c. By Cut-and-Lift	a. Exposed Sections Rock-	b. Exposed Sections Trenched	c. Exposed Sections Cut and
A - PL2030/PL2032	1	Total vessel days	Option Screened Out	Option Screened Out	188 (1567%)	15 (125%)	12 (100%)	22 (183%)
		Vessel SIMOPS days			72	0	0	0
		Mob and demob days			13	9	7	11
	2	Number vessel transit days			4.7 (174%)	2.7 (100%)	2.7 (100%)	3.3 (165%)
	3	Quantity of materials returned to shore (Te)			1517	0	0	72
	N/A	Quantity of materials for land fill (Te)			42	0	0	2
	5	Quantity of materials left on or in seabed (Te)			0	1517	1517	1444
	5	Quantity of rock cover applied (Te)			0	2048	0	2048
	N/A	Cost estimate (kGBP)			8715 (1250%)	889 (128%)	697 (100%)	1350 (194%)

Group ID	Guide Table	Basis of Score	Decommissioning Option					
			1. Total Removal			2. Remediate in-situ (trenched and buried sections left in-situ)		
			a. By Reverse Reeling	b. By Reverse S-Lay	c. By Cut-and-Lift	a. Exposed Sections Rock-	b. Exposed Sections Trenched	c. Exposed Sections Cut and
B - PLU2034 & PLU2033 (2 Sections)	1	Total vessel days	20 (154%)	Option Screened Out	Option Screened Out	18 (138%)	13 (100%)	15 (115%)
		Vessel SIMOPS days	0			0	0	0
		Mob and demob days	5			9	5	5
	2	Number vessel transit days	2 (100%)			2.7 (135%)	2.7 (135%)	3.3 (165%)
	3	Quantity of materials returned to shore (Te)	408			0	0	5
	N/A	Quantity of materials for land fill (Te)	122			0	0	1
	5	Quantity of materials left on or in seabed (Te)	0			408	408	403
	5	Quantity of rock cover applied (Te)	0			837	0	60
	N/A	Cost estimate (kGBP)	1676 (232%)			1046 (145%)	722 (100%)	853 (118%)

APPENDIX B – HIRA DATA SHEETS

Project	ATLANTIC & CROMARTY DECOMMISSIONING HIRA
NODE 1	RISK TO PROJECT PERSONNEL
Study Objective	To identify any hazards and ensure that there are adequate safeguards, controls and mitigating measures in place to minimise the occurrence, consequences and escalation potential of such events.
Mode of Operation	Decommissioning
Drawing / Procedure	Drawing: Schematic showing pipeline groupings. Procedure: None provided and assessed.
Notes	1a Total Removal by Reverse Reeling. 1b Total Removal by Reverse S-Lay (screened out N/A for all lines) . 1c Total Removal by Cut and Lift. 2a Remediate in-situ with Exposed Sections Rock Covered. 2b Remediate in-situ with Exposed Sections Trenched and Buried. 2c Remediate in-situ with Exposed Sections Cut and Removed. The original DP by BG suggests no Naturally Occurring Radioactive Material (NORM) hazards are expected. It is assumed no mercury contamination hazard is present. Note: It is assumed that there are no planned helicopter transfers to and from the vessel and that all planned transfers of personnel will be via marine transport back to shore. Unplanned helicopter transfer is (for example) medivac, and the hazards associated with helicopter movements (i.e. helicopter crash onto vessel) has not been considered as part of this assessment. Base case is that no removal methods include diver intervention (Remotely Operated Vehicle (ROV) only) – no diver risk included. Cut and lift options may utilise a pipe haul/ barge for storage/ transport of line sections (depending on volume). For Group A the rigid lines would need to be unburied prior to cut and removal activities.

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Release @ deck	Residual Hydrocarbons (HC) within lines. Inhibited seawater largely within lines.	Release to vessel deck during recovery activity. Impact on personnel on deck. Personnel injury. Gas release to atmosphere.	A	s/o	s/o	2A	n/a	n/a	2A	Group A gas export line clean, therefore residual HCs refers to MEG. Safeguards on deck to include secondary containment facilities for potential release of materials.
			B	1A	s/o	s/o	n/a	n/a	2A	
Release @ sea	Residual Hydrocarbons (HC) within lines. Residual chemicals from umbilical (hydraulic, Methanol (MeOH) etc).	Release to sea potentially adjacent to vessel. Vapours/ personnel discomfort/ injury.	A	s/o	s/o	1A	n/a	n/a	1A	Risk ranking assumed lowest non-zero risk.
			B	1A	s/o	s/o	n/a	n/a	1A	
Release @ deck	Residual chemicals from umbilical (hydraulic, Methanol (MeOH) etc). Cores removed from trees, however, no certainty that systems have been completely flushed, therefore assume material present.	Release to vessel deck during recovery activity.	A	s/o	s/o	2A	n/a	n/a	2A	Safeguards on deck to include secondary containment facilities for potential release of materials (e.g. MEG).
			B	2C	s/o	s/o	n/a	n/a	2C	
Fire	Ignition of released HCs. Vessel engine/ deck/ chemical fire. (no differentiation from vessel event)	Personnel injury. Asset damage. Schedule Delay.	A	s/o	s/o	1A	n/a	n/a	1A	
			B	1A	s/o	s/o	n/a	n/a	1A	
Explosion	Ignition of released HCs within confined space. Vessel engine/ chemicals/ flammable storage ignition.	Personnel injury. Asset damage. Schedule Delay.	A	s/o	s/o	1A	n/a	n/a	1A	
			B	1A	s/o	s/o	n/a	n/a	1A	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Impact	Winching/ Reeling/ Rigging / lifting beam / strap failure, poor weather, swinging loads, poor communications. Cut and lift options may utilise a barge for line section transport/ potential double lifts to vessel and then to barge. Impact damage to personnel as a result of release of wire in tension if it fails.	Dropped/ swinging object leading to Personnel injury, Asset damage, Schedule Delay. Inherent stored energy during reeling activity, potentially may lead to more severe consequences.	A	s/o	s/o	4B	1A	1A	4A	
			B	4B	s/o	s/o	1A	1A	4A	
Impact	Rock dumping activity. Potential for person to be entrapped/ tangled with conveyor mechanical system. Potential for individual in excavator vehicle to be injured as a result of mechanical failure/ unintended consequence from activity.	Personnel harm/ injury.	A	s/o	s/o	n/a	4A	n/a	n/a	
			B	n/a	s/o	s/o	4A	n/a	n/a	
Impact	Snagging subsea during reeling activity.	Excessive pull with eventual failure of the line. Release of energy to deck, personnel injury, vessel damage, schedule delay.	A	s/o	s/o	n/a	n/a	n/a	n/a	
			B	4B	s/o	s/o	n/a	n/a	n/a	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Equipment Failure	Vessel related systems. Rock dumping activity.	Dropped/ swinging object leading to Personnel injury, Asset damage, Schedule Delay.	A	s/o	s/o	4B	2A	2A	4B	
			B	4B	s/o	s/o	2A	2A	4B	
Structural Failure	Subsea infrastructure failure during lift/ recovery activity.	Drop to vessel/ seabed. Personnel injury. Increased seabed disturbance. Schedule delay. Added complication to subsequent removal activity. Concrete/ anode dropping off during lift.	A	s/o	s/o	4B	n/a	n/a	4A	.
			B	3B	s/o	s/o	n/a	n/a	4A	
Chemicals	No chemicals required during the decommissioning removal activities.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Transport	Vessel deck utilised (possible barge etc for cut and lift). See Simultaneous Operations (SIMOPs) guideword below.	Interaction/ collision with other field vessels. Asset damage. Personnel Injury. Note: Risk to other vessels is scored in Node 2.	A	s/o	s/o	3B	n/a	n/a	n/a	Assumes barge for cut and lift. Risk same as for Offshore SIMOPs (see below).
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Material Integrity Problems	See Structural Failure guideword above.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Climatic	Adverse weather.	Schedule delay. Personnel Injury.	A	s/o	s/o	1B	1B	1B	1B	In the event of adverse weather, all activities will be made safe and stopped. Activities will only commence once it has been determined that it is safe to do so, as per standard industry practise.
			B	1B	s/o	s/o	1B	1B	1B	
Occupational - flights	Duration related/ crew changes at site.	Flight risk (injury/ multiple fatality) related to IRPA.	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Occupational - Diving	Duration / activity related.	Personnel injury/ fatality.	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Occupational - congestion/ complication	Deck congestion/ multiple activities/ recovered items. Time at site exposed to risk related activities. Trenching equipment on vessel.	Slips Trips Falls. Occupational health consequences.	A	s/o	s/o	3B	2B	2B	3B	
			B	3B	s/o	s/o	2B	2B	3B	
Escape Evacuation and Rescue (EER)	Vessel on board event.	Personnel Injury. Asset damage.	A	s/o	s/o	2B	2B	2B	2B	
			B	2B	s/o	s/o	2B	2B	2B	
SIMOPs - offshore	More than one vessel within work area at any given time. Cut And lift options may well require barge/ pipe haul vessel support to transport line sections.	Interaction/ collision with other field vessels. Asset damage. Personnel Injury. Note: Risk to other vessels is scored in Node 2.	A	s/o	s/o	3B	n/a	n/a	n/a	It is only the cut and lift options which will require SIMOPs operations with the vessel alongside
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
SIMOPs - onshore	Shore side lifting/ off-loading.	Shore cranes/ vessel cranes lifts to shore. Impact/ asset damage. Personnel Injury.	A	s/o	s/o	4B	n/a	n/a	4B	Standard industry safeguards to be applied prior to activity i.e. completion of HIRA and task risk assessment with competent team involved in task.
			B	4B	s/o	s/o	n/a	n/a	4B	
Project interaction with adjacent live hydrocarbon system and potential for loss of containment from that live system.	Dropped objects resulting in fracture and hydrocarbon release.	Gas release. Gas emissions at sea surface with potential for ignition leading to fire and/ or explosion. Oil release. Sea surface oil pool fire.	A	s/o	s/o	5A	5A	5A	5A	Safeguards in place. Three crossings: • 32” Gas No.1 Frigg to St Fergus KP1.4(Under PL2030/PL2032); • 32” Gas No. 2 Frigg to St Fergus KP1.5 (Under PL2030/PL2032); • 10” Buzzard Pipeline (Over PL2030/PL2032). Rock has been used for protection at the three crossings. Risk takes account of existing the rock cover.
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Project	ATLANTIC & CROMARTY DECOMMISSIONING HIRA
NODE 2	**RISK TO OTHER USERS OF THE SEA**
Study Objective	To identify any hazards and ensure that there are adequate safeguards, controls and mitigating measures in place to minimise the occurrence, consequences and escalation potential of such events.
Mode of Operation	Decommissioning
Drawing / Procedure	Drawing: Schematic showing pipeline groupings. Procedure: None provided and assessed.
Notes	1a Total Removal by Reverse Reeling. 1b Total Removal by Reverse S-Lay (screened out N/A for all lines) . 1c Total Removal by Cut and Lift. 2a Remediate in-situ with Exposed Sections Rock Covered. 2b Remediate in-situ with Exposed Sections Trenched and Buried. 2c Remediate in-situ with Exposed Sections Cut and Removed. Base case is that no removal methods include diver intervention (ROV only) – no diver risk included. Cut and lift options may utilise a pipe haul/ barge for storage/ transport of line sections (depending on volume). Atlantic and Cromarty is considered of moderate importance to the fishing industry. (Reference - Scottish Government (2023). 2022 Scottish Sea Fisheries Statistics - Fishing Effort and Quantity and Value of Landings by ICES Rectangles. doi: 10.7489/12474-1).

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Release	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Fire	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Explosion	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Impact – during activity	Snagging/ impact on existing structures.	Snagged vessel/ net / fishing gear damage. Vessel occupant injury.	A	s/o	s/o	3B	2B	2B	3A	Guard vessel may be in place when construction vessel is off location, however, this reduces but does not prevent potential for fishing vessel to enter area and for such vessel to snag on subsea pipelines. Exclusion zone in the area vessels are working in. Notification zone for areas where working has been completed and also will be completed. Technical fact sheets outline time at risk associated with removal activities- higher duration presents opportunities for fishing vessels to access areas where exposed pipeline present.
			B	2B	s/o	s/o	2B	2B	2B	
Impact – post activity	Snagging/ impact rock dump.	Snagged vessel/ Net / fishing gear damage.	A	s/o	s/o	n/a	2A	2A	2A	Snagging of umbilical is expected to result in

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
	Possible unfilled trench/ berms left post removal works.	Vessel occupant injury. Reputational issues driving consequences risk assessment.	B	n/a	s/o	s/o	2B	2A	2A	umbilical damage/snapping rather than damage to the fishing vessel. Assumed risk from fishing activity. All full removal options assume a safe seabed status is provided, as per DP requirements. Therefore, all ranked n/a.
Equipment Failure	Vessel related systems – sea fastening etc	Dropped/ swinging object leading to Personnel injury, Asset damage, Schedule Delay.	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Chemicals	No chemicals envisaged during removal activities.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Transport	Vessel deck utilised & barge/ pipe haul vessel. See SIMOPs guideword below.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Material Integrity Problems	See Structural Failure guideword above.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections			Comments
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover	
Climatic	Adverse weather.	Schedule delay. Personnel Injury (on other vessels).	A	s/o	s/o	1B	1B	1B	1B	
			B	1B	s/o	s/o	1B	1B	1B	
Occupational - flights	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Occupational - Diving	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
Occupational - congestion/ complication	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	
EER	No risk to other users of sea envisaged.	-	A	s/o	s/o	n/a	n/a	n/a	n/a	Considered n/a across all the groups or options
			B	n/a	s/o	s/o	n/a	n/a	n/a	

Project	ATLANTIC & CROMARTY DECOMMISSIONING HIRA
NODE 3	**RISK TO THOSE ON LAND**
Study Objective	To identify any hazards and ensure that there are adequate safeguards, controls and mitigating measures in place to minimise the occurrence, consequences and escalation potential of such events.
Mode of Operation	Decommissioning – Offloading of removed pipelines at dockside and hazards associated with decommissioning at yard.
Drawing / Procedure	Drawing: Schematic showing pipeline groupings. Procedure: None provided and assessed.
Notes	1a Total Removal by Reverse Reeling. 1b Total Removal by Reverse S-Lay (screened out N/A for all lines) . 1c Total Removal by Cut and Lift. 2a Remediate in-situ with Exposed Sections Rock Covered. 2b Remediate in-situ with Exposed Sections Trenched and Buried. 2c Remediate in-situ with Exposed Sections Cut and Removed. The original DP by BG suggests no Naturally Occurring Radioactive Material (NORM) hazards are expected (Ref. 01). It is assumed no mercury contamination hazard is present.

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections		
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover
Release	Residual Hydrocarbons (HC) within lines. Pockets within high points. Umbilicals flushed – assumption is that only residual materials will be present.	Release to sea/ release to vessel deck during transfer to shore activity. Release onshore during decommissioning activity.	A	s/o	s/o	3C	n/a	n/a	3B
			B	3C	s/o	s/o	n/a	n/a	3B
Fire	Ignition of released HCs. Onshore engine/ equipment/ chemical fire.	Personnel injury. Asset damage. Schedule Delay.	A	s/o	s/o	3C	n/a	n/a	3B
			B	3C	s/o	s/o	n/a	n/a	3B
Explosion	Ignition of released HCs within area which has sufficient congestion to support an explosion, with potential harmful effects to individual. Site/Yard engine/ chemicals/ flammable storage ignition.	Personnel injury. Asset damage. Schedule Delay.	A	s/o	s/o	3C	n/a	n/a	3B
			B	3C	s/o	s/o	n/a	n/a	3B
Impact	Winching/ Rigging / lifting beam / strap failure, poor weather, swinging loads, poor communications.	Dropped/ swinging object leading to Personnel injury, Asset damage, Schedule Delay.	A	s/o	s/o	4B	n/a	n/a	4B
			B	4B	s/o	s/o	n/a	n/a	4B
Structural Failure	Subsea infrastructure failure	Drop to vessel/ harbour.	A	s/o	s/o	4B	n/a	n/a	4A

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections		
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover
	during lift/ shore transfer activity. Possibly weakened/ damaged during offshore retrieval lift.	Drop to shore/ quayside. Personnel injury. Quayside damage. Harbour bed disturbance. Schedule delay. Added complication of subsequent removal activity.	B	3B	s/o	s/o	n/a	n/a	3B
Chemicals	Not envisaged – water 'treatment' assumed only. If chemicals were required to be used, there would be subject to appropriate hazard and risk assessment (currently no chemicals envisaged).		A	s/o	s/o	n/a	n/a	n/a	n/a
			B	n/a	s/o	s/o	n/a	n/a	n/a
Transport of material from quay	Road Transport from quayside/ site to final destination. Transportation from quayside to pipeline dismantling yard.	Road traffic accident. Personnel Injury (staff/ public).	A	s/o	s/o	5B	n/a	n/a	5B
			B	5B	s/o	s/o	n/a	n/a	5B
Material Integrity Problems	See Structural Failure guideword above.	-	A	s/o	s/o	n/a	n/a	n/a	n/a
			B	n/a	s/o	s/o	n/a	n/a	n/a
Climatic	Adverse weather.	Schedule delay.	A	s/o	s/o	2A	n/a	n/a	2A

Hazard / Guideword	Causes / Deviation	Consequences	Group	1. Full removal			2. Remediate in situ with Exposed Sections		
				a) Reverse Reeling	b) Reverse S-Lay	c) Cut & Lift	a) Rock Covered	b) Trench & Buried	c) Cut & Recover
	Impacting activity either transport of pipelines from vessel to shore and/ or onshore itself.	Personnel Injury.	B	2A	s/o	s/o	n/a	n/a	2A
Occupational - Cutting	Cutting activities/ operations within site/ yard.	Personnel injury.	A	s/o	s/o	4A	n/a	n/a	4A
			B	4B	s/o	s/o	n/a	n/a	4A
Occupational – Noise and vibration	Grinding and cutting activities within yard/ site.	Personnel injury. Public disturbance. Reputational.	A	s/o	s/o	2B	n/a	n/a	2B
			B	2C	s/o	s/o	n/a	n/a	2B
Occupational - Odour	Marine waste drying out at site.	Personnel injury. Public disturbance. Reputational.	A	s/o	s/o	1C	n/a	n/a	1C
			B	1C	s/o	s/o	n/a	n/a	1C
Occupational - congestion/ complication	Site/ yard congestion/ multiple activities/ recovered items. Time at site exposed to risk related activities.	Slips Trips Falls. Occupational health consequences.	A	s/o	s/o	2C	n/a	n/a	2B
			B	2C	s/o	s/o	n/a	n/a	2B
Occupational - Security	Unauthorised access to site/ yard.	Personnel injury. Asset Damage/ loss. Reputational.	A	s/o	s/o	1C	n/a	n/a	1C
			B	1C	s/o	s/o	n/a	n/a	1C
EER	Yard/ Site event.	Personnel Injury. Asset damage.	A	s/o	s/o	1B	n/a	n/a	1B
			B	1B	s/o	s/o	n/a	n/a	1B

PROJECT	ATLANTIC & CROMARTY DECOMMISSIONING HIRA
NODE 4	**RISK OF HIGH CONSEQUENCE EVENTS**
Study Objective	To identify any hazards and ensure that there are adequate safeguards, controls and mitigating measures in place to minimise the occurrence, consequences and escalation potential of such events.
Mode of Operation	Decommissioning
Drawing / Procedure	None.
Notes	1a Total Removal by Reverse Reeling. 1b Total Removal by Reverse S-Lay (screened out N/A for all lines). 1c Total Removal by Cut and Lift. 2a Remediate in-situ with Exposed Sections Rock Covered. 2b Remediate in-situ with Exposed Sections Trenched and Buried. 2c Remediate in-situ with Exposed Sections Cut and Removed.

Release, Fire, Explosion, dropped objects, helicopter operations etc covered within other Nodes.
No specific differentiation identified between options 1 to 3. Review of Nodes 1 to 3 findings identified

APPENDIX C - ENVID DATA SHEETS

GROUP A	ENVID Nodes within each Sub-criteria	Decommissioning Option			
CA Sub-criteria		1.Total Removal	2. Remediate in-situ (trenched and buried sections left in-situ)		
		c. Cut and Lift	a. Exposed Sections Rock-Covered	b. Exposed Sections Trenched and Buried	c. Exposed Sections Cut and Removed
Environmental Sub-criteria					
Impact of Decommissioning Operations Offshore	**Vessel emissions**	Impact significance: Minor	Impact significance: Minor	Impact significance: Minor	Impact significance: Minor
		The ENVID determined that the impact significance of vessel emissions on climate change is Minor across all options, such that they vessel emissions is not considered a differentiator across options.			
	Underwater noise	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		The ENVID determined that the impact significance of noise from vessels is Slight across all options, such that underwater noise is not considered a differentiator across options.			
	Discharges to sea from vessels or pipelines	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		The ENVID determined that the impact significance of discharges to sea is Slight across all options, such that vessel discharges is not considered a differentiator across options.			
Seabed Disturbance - Short Term	**Disturbance to the seabed**	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		ENVID workshop determined that the full recovery option has the greatest level of impact significance. addition of rock cover had the greatest level of impact significance. This higher impact relative to the other options should be considered in the CA.			
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight
		Not considered applicable to Option 1a as this option results in no infrastructure remaining. Option 2a) considered to have a higher impact relative to the other options as would result in the addition of rock cover. This higher impact relative to the other options should be considered in the CA.			
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	Impact significance: Slight	N/A	N/A	Impact significance: Slight
		Impact significance is considered Slight for all relevant options.			
Societal Sub-criteria					
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight
		Impact significance for Option 2a) is considered greater than the impact significance for Options 2b) and 2c) due to the addition of rock.			
Socio-economic impact on communities and amenities	**Yard activities**	Impact significance: Slight	N/A	N/A	Impact significance: Slight
		The ENVID determined that the impact significance of yard activities is Slight across all applicable options.			

GROUP B	ENVID Nodes within each Sub-criteria	Decommissioning Option			
CA Sub-criteria		1.Total Removal	2. Remediate in-situ (trenched and buried sections left in-situ)		
		a. Reverse Reeling	a. Exposed Sections Rock-Covered	b. Exposed Sections Trenched and Buried	c. Exposed Sections Cut and Removed
Environmental Sub-criteria					
Impact of Decommissioning Operations Offshore	**Vessel emissions**	Impact significance: Minor	Impact significance: Minor	Impact significance: Minor	Impact significance: Minor
		The ENVID determined that the impact significance of vessel emissions on climate change is Minor across all options, such that they vessel emissions is not considered a differentiator across options.			
	Underwater noise	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		The ENVID determined that the impact significance of noise from vessels is Slight across all options, such that underwater noise is not considered a differentiator across options.			
	Discharges to sea from vessels or chemicals in umbilical cores	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		The ENVID determined that the impact significance of discharges to sea is Slight across all options, such that vessel discharges is not considered a differentiator across options.			
Seabed Disturbance - Short Term	**Disturbance to the seabed**	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight	Impact significance: Slight
		ENVID workshop determined that the full recovery option has the greatest level of impact significance. addition of rock cover had the greatest level of impact significance. This higher impact relative to the other options should be considered in the CA.			
Loss of Habitat - Long Term	**Impact of physical presence of materials left on the seabed** *only on benthic species- not fishing.*	N/A	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight
		Not considered applicable to Option 1a as this option results in no infrastructure remaining. Option 2a) considered to have a higher impact relative to the other options as would result in the addition of rock cover. This higher impact relative to the other options should be considered in the CA.			
Waste Processing i.e. processing of returned materials and use of landfill	**Generation of waste/use of landfill**	Impact significance: Slight	N/A	N/A	Impact significance: Slight
		Impact significance is considered Slight for all relevant options.			
Societal Sub-criteria					
Impact on Commercial Fisheries	**Impact of materials left on the seabed on other users**	N/A	Impact significance: Minor	Impact significance: Slight	Impact significance: Slight
		Impact significance for Option 2a) is considered greater than that associated with other relevant options due to addition of rock.			
Socio-economic impact on communities and amenities	**Yard activities**	Impact significance: Slight	N/A	N/A	Impact significance: Slight
		The ENVID determined that the impact significance of yard activities is Slight across all applicable options.			

APPENDIX D – CA RATINGS GUIDE TABLE

Assessment Criteria	RATING		LOW	MODERATE	HIGH
TECHNICAL FEASIBILITY	**Risk of Major Project Failure**		Routine operational procedures proposed. Scope is straightforward and understood. Offshore Execution Phase Schedule unlikely to slip beyond planned schedule plus contingencies applied.	Some specialist operational procedures required. Some minor scope uncertainties to be resolved before execution. Potential for some schedule slippage activity resulting project delay but not leading to revisit to execution methods.	Unique operational procedures proposed. Major scope uncertainties will remain at execution. Potential for unplanned and unforeseen activity resulting in significant project delay or potential revisit to execution methods.
	Technical Complexity & Track Record		Uses established technology and/or working methods designed for this field of operation. Large experienced contractor pool available.	Uses proven technology and/or working method but in a diverse field of operation. Some experienced contractors available.	Uses novel technology untested in this field of operation or untried methods to be introduced. Likely to be new to contractors.
SAFETY	**Risk During Project Execution**	**To Project Personnel**	Relatively short campaign (exposure duration) No vessel SIMOPS. No diving. Minimal materials handling or interaction with deck crew.	Longer exposure duration. Low vessel SIMOPS (2 vessels). Some diving involved, but short duration. Some materials handling on deck (No toxic or high-risk materials, no heavy loads)	Long or multiple campaigns High level vessel SIMOPs (>2 vessels). Significant diving activity anticipated. Significant materials handling on deck (involving either toxic or high-risk materials, or heavy loads)
		To Those on Land	Minimal materials returned onshore. Routine materials handling anticipated	More materials returned onshore for disposal. Some additional materials cutting and handling. No contaminated materials anticipated.	Significant volume of materials returned onshore with large cutting/ dismantling effort before disposal. Contaminated materials also to be managed.
		To Other Users of the Sea	No increased risk to other vessels than currently under normal operations.	Some additional risk to other vessels due to additional construction vessel activity and vessel transits but over short durations. Activities involved at seabed means construction vessels need little time before initiating evasive action from collision.	Increased risk to other vessels due to multiple construction vessels activity and vessel and barge transits over prolonged period. Activities involved at seabed means it is difficult for construction vessel to initiate evasive action from collision.
	Residual Risk to Other Users of the Sea		No increased risk to fishing trawlers introduced than currently present out with the current field exclusion zones.	Some additional risk to fishing vessels introduced due to infrastructure being decommissioned in-situ. However snagging risk mitigated by infrastructure expected to remain over trawlable.	Increased risk from structures / exposed sections of pipeline or protection / stabilisation features decommissioned in-situ, with no mitigation introduced to prevent snagging from over trawling.
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*		Undetectable impact from emissions to air. No/minor permitted discharges to sea. Underwater noise generated is not expected to exceed existing background noise.	Effects of emissions to air are detectable. Potential for unplanned discharges not resulting in noticeable environmental impact. Noise generated could exceed existing background levels resulting in noticeable displacement of cetaceans.	Noticeable impact in air quality on local populations. Potential for unplanned discharges resulting in noticeable environmental impact. Underwater noise generated resulting in physical injury to cetacean species could be possible.
	Seabed Disturbance - Short Term		Localised disturbance to the seabed. Possible addition of small volumes of rock cover.	Localised changes to the seabed are possible e.g. addition of rock to sandy seabed area.	Widespread mid-to long term (2 + years) degradation of the seabed e.g. resettlement of OBM contaminated cuttings over a much wider seabed area relatively to existing footprint.
	Change of Habitat - Long Term		No additional material added (e.g. rock) to support decommissioning activities. Benthic species in area are widespread. Any potential impact to the sediment and associated ecology is expected to be barely detectable.	Some additional material added (e.g. rock) to support decommissioning activities. Benthic species in area are widespread. Detectable impact to the sediment and associated ecology. (e.g. from plastics or wax at exposed sections).	Significant impact on a designated species. Detectable impacts to sediments and water column and associated ecologies (e.g. from plastics or wax at exposed sections).
	Waste Processing (*i.e. processing of returned materials and use of landfill)*		Minimal volumes of non-hazardous waste returned that cannot be recycled or re-used. Relatively small volumes of hazardous material.	Relatively small volumes of non-hazardous waste returned that cannot be recycled or re-used. Moderate volumes of hazardous material.	Large volumes of non- hazardous materials returned that cannot be recycled or re-used. Large volumes of hazardous material.
SOCIETAL	**Impact on Commercial Fisheries**		Option results in area becoming or continuing to be accessible to fishing gear.	Stabilisation features e.g. rock cover means that though seabed is accessible to fishing gear, this could change over time (e.g. potential for the rock berms to become dislodged following multiple trawl passes).	Available fishing area decreases, due to self-imposed exclusion zones by fishermen likely due to recurring snagging hazards.
	Socio-economic impact on communities and amenities		Additional employment created and minimal disruption to local communities.	Maintaining local jobs and minimal disruption to local communities.	Significant impact on local communities e.g. noise, traffic, odour. No additional employment.
ECONOMIC RISK	**Cost for Decommissioning/ Removal activities**		Lowest cost option or within 30% of lowest cost.	Between 130% and 200% of lowest cost option.	Greater than 200% of lowest cost option.
	Cost for long term monitoring / Remediation activities		Minimal potential ongoing cost liability. Post project assessment survey only.	Potential for 2 to 3 periodic monitoring surveys to review behaviour of site post project completion. Potential for some remediation activities (e.g. re-profile unstable rock berms).	Requirement for more than 3 periodic monitoring surveys, and over a much more prolonged period to review behaviour of site post project completion. It is more likely that some post project remediation activities will be required.

APPENDIX E – CA EVALUATION WORKBOOK

Rating Workbook - A&C Group A - Final.xlsx

Rigid Pipeline with Piggybacked Pipeline - Trenched and Natural backfill/ Rock Covered at Crossings

TECHNICAL & SAFETY CRITERIA

Assessment Criteria		Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
			c)	a)	b)	c)
		Sub Criteria/ / Sub Options	CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY		Risk of Major Project Failure	Due to the significant depth of burial, excavation to access the pipelines may require multiple passes of mass flow excavation before the pipelines are exposed for removal, potentially an uncertain extension to the overall campaign duration. The 49 concrete mattresses within the trench would also need to be recovered. These mattresses are required to be removed regardless since, when removed, they would leave sections of pipeline below the required 0.6m DoB. The pipelines were in operation from 2006 until 2009 and have been under IPR since, they were installed in 2005 and will have been in-situ for at least 20 years at the time of decommissioning, Since the lines are fully trenched and buried, the ability to externally inspect has been limited. The condition of the pipelines at cut locations for this recovery technique is therefore uncertain. Base case assumption is that PL2030/PL2032 sections of pipeline local to the three currently live 3rd party crossings will be left to be decommissioned later at the time of the 3rd party pipelines decommissioning, as currently fully rock covered at the crossing.	The majority of the pipelines route has a DOC significantly >0.6, with a total exposure of ~ only 200m across both lines at pipeline ends, where they transition to the surface to enable tie-in. In addition, trenching operations to achieve minimum cover for UHB at the time of installation failed to achieve full depth, therefore 49 mattresses were installed post-trenching which will be required to be removed during decommissioning. Removal of 33 of these mattresses will result in areas of pipeline with a burial below the required 0.6m, thus remediation is required. The Scottish Fisherman's Federation (SFF) have previously advised that, for safety reasons, it would be advisable to create a "link" between rock berms which are in series along the same pipeline where rock berms were close to one another (approx. 50 m). Of the 49 mattresses, the removal of 33 will reduce the DoB to below 0.6m. Of these 33, 29 mattress locations are within 50m from one another along the pipeline route, therefore the extent of pipeline where these mattresses are located must be treated as a singular section equivalent to 537m (KP2.046 to 2.583). Three additional locations require individual remediation meaning the total length of pipeline requiring remediation is c. 560m. Additional rock to be applied under this option is c.2,048te The scope is straightforward with very high confidence in successfully achieving target DoC first time. Scope is straightforward and understood with no specific uncertainties identified. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.	The majority of the pipelines route has a DOC significantly >0.6, with a total exposure of ~ only 200m across both lines at pipeline ends, where they transition to the surface to enable tie-in. In addition, trenching operations to achieve minimum cover for UHB at the time of installation failed to achieve full depth, therefore 49 mattresses were installed post-trenching which will be required to be removed during decommissioning. Removal of these mattresses will result in areas of pipeline with a burial below the required 0.6m, thus remediation is required. Of the 49 mattresses, the removal of 33 will reduce the DoB to below 0.6m. Of these 33, 29 mattress locations are within 50m from one another along the pipeline route. Retrenching operations require a run-in / run-out transition of ~50m, i.e. the trenching activity must commence ~50m before the target area to be buried and end ~50m after the target area to be buried. This is to allow the trenching tool to achieve the target DoC. Therefore, any areas of insufficient DoC within 50m of each other must be considered as a single section requiring continuous remediation. Therefore the extent of pipeline where these mattresses are located must be treated as a singular section equivalent to 537m (KP2.046 to 2.583). Three additional locations require individual remediation meaning the total length of pipeline requiring remediation is c. 560m. Scope is well understood and whilst technical complexity exists, it is not considered to threaten execution within a single season and therefore has not been double-counted as an impact here	The majority of the pipelines route has a DOC significantly >0.6, with a total exposure of ~ only 200m across both lines at pipeline ends, where they transition to the surface to enable tie-in. In addition, trenching operations to achieve minimum cover for UHB at the time of installation failed to achieve full depth, therefore 49 mattresses were installed post-trenching which will be required to be removed during decommissioning. Removal of these mattresses will result in areas of pipeline with a burial below the required 0.6m, thus remediation is required. Of the 49 mattresses, the removal of 33 will reduce the DoB to below 0.6m. Of these 33, 29 mattress locations are within 50m from one another along the pipeline route. Previous decommissioning experience has highlighted that it is expected that at cut ends, spot rock will be required to ensure pipeline ends are adequately buried. As such, the implications raised for Option 2a) by SFF are equally applicable for this option where spot rock placements are within 50m. Therefore the extent of pipeline where these mattresses are located must be treated as a singular section equivalent to 537m (KP2.046 to 2.583). Three additional locations require individual remediation meaning the total length of pipeline requiring remediation is c. 560m. Additional rock to be applied under this option is c 2,048te Scope is straightforward and understood with no specific uncertainties identified. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		Technical Complexity & Track Record	Although cut and lift does not require new technology or working practices to be introduced. Option has been assumed as Moderate Impact (Amber) to take cognisance of the additional and diverse activities associated with cutting and removing the piggback spacer blocks and removing the anodes on the pipelines as they are lifted onto the vessel deck .	No new technology or working practices to be introduced. The scope is straightforward with very high confidence in successfully achieving target DoC first time. Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Therefore regarded as having Lower Rating.	No new technology or working practices to be introduced. Noted that trenching length will be slightly longer than reported pipeline exposure lengths at each end of the pipeline exposures based on trenching equipment constraints (up to 50m transition for each trench). It is not known why the locations which required the additional protection of UHB matts did not achieve target DoC at the time of installation. Therefore, repeating the same scope carries a risk of similar failure. Trenching has good industry track record in the North Sea and can be executed by numerous contractors with significant previous experience of all activities involved. However, uncertainty remains that re-trenching will be successful when it initially failed to achieve DoC at installation. Further, the proposed scope would seek to remediate relatively short sections of line which are connected to the rest of the line holding the sections to be trenched in tension, reducing the flexibility of the line. The fact that the lines are piggybacked further increases complexity and uncertainty of success. Whilst none of these considerations make retrenching a non-feasible option, they increase the uncertainty of success in comparison to options 2a and 2c. Unsuccessful trenching would likely require a second rock cover campaign to introduce sufficient DoC. Therefore regarded as having Moderate Rating.	No new technology or working practices to be introduced. Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Noted that it is expected that at cut ends, spot rock will be required to ensure pipeline ends are adequately buried. Therefore regarded as having Lower Rating.
		RATING	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
		TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Moderate Impact**	**Lower Impact**
SAFETY	Risk During Project Execution	To Project Personnel	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively long vessels campaign duration (c.188 days), with 72 days of two vessel SIMOPS (ROVSV + Tug/Barge compared to other options. c.23.6km/1,572te of line + 49/ 441te concrete mattresses to be managed on deck compared to c.0.2km/26te and no mattresses associated with Option 2c) and no materials to be managed on deck for Options 2a) and 2b). Pipe sections will be recovered in c. 24m lengths (c . 490 separate lifts). More deck crew material handling compared to other options. Also deck crew activities associated with cutting and removing the piggyback spacer blocks and removing the anodes on the pipelines by grinding increases deck crew interaction before transfer and stacking of pipeline lengths on barge i.e. double handling. Although production line has been cleaned at CoP, potential exposure to pipelines residue at cut ends remains, risks will be mitigated by safeguards on deck to include secondary containment facilities for potential release of materials.	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c. 15 days), single vessel, no SIMOPS. No materials returned to deck. Minimal deck crew activity as rock placement is mostly automated i.e. normal operation for vessel with minimum deck crew interaction	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c.12 days), single vessel, no SIMOPS. No materials returned to deck. Minimal deck crew activity/ interaction with equipment and associated with launching and recovery of ROV and trenching equipment only i.e. normal operation for vessel.	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c . 22days), single vessel, no SIMOPS. Some deck crew material handling as pipe sections will be recovered in c. 24m lengths (c. 32 separate lifts, c. 26te total recovered) - However considered Moderate Impact Significance in HIRA. Trenching operations to achieve minimum cover for UHB failed to achieve the required DoL, therefore 49 mattresses were installed post-trenching which will be required to be removed during decommissioning. Potential exposure to pipeline residues at cut ends will be mitigated by safeguards on deck to include secondary containment facilities for potential release of materials. Assuming Lower Impact (Green) to take cognisance of the fact that only 26te of materials to be handled (32 x 24m lengths) significantly less than option 1c) and no transfer to barge anticipated as pipeline sections can be backloaded on ROVSV. Also this is not considered a significant differentiator from Options 2a), 2b) and 3) .
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Management of materials returned onshore will be at licensed yards. c.23.6km/1,517te of pipeline (in c.980 x 24m lengths) and 49/ 441te concrete mattresses returned onshore. Potential for NORM and wax unknown, but containment processes will be adopted when required. Most deconstruct work in yard is limited to cutting pipelines into shorter lengths for road transport, will be carried out using appropriate equipment and procedures. 60 times more pipeline materials + 49/44te of concrete mattresses to be road transported between dismantling yard and final disposal/ recycling destination than option 2c). As such, assuming Moderate Impact (Amber), Not High to take cognisance of the fact that only 12" and 4" dia pipework has to be managed onshore and that it has already been cut into manageable length before transport back onshore.	Nothing returned onshore except the 49/ 441 te concrete mattresses. Approximately 2,048te rock cover to be supplied and transported, however not identified as a major risk as supply of rock cover is an ongoing industry practice.	Nothing returned onshore except the 49/ 441 te concrete mattresses.	Management of materials returned onshore will be at licensed yards. Only c. 0.56km/ 26te of recovered pipeline returned onshore, most cutting will be done offshore. Most deconstruct work in yard is limited to cutting pipelines into shorter lengths for road transport, will be carried out using appropriate equipment and procedures - However considered Moderate Impact Significance in HIRA. The 49 mattresses installed post-trenching which will be required to be removed during decommissioning. Approximately 2,048te rock cover to be supplied and transported, however not identified as a major risk as supply of rock cover is an ongoing industry practice. Minimal quantities to be road transported between dismantling yard and final disposal/ recycling destination and is not a significant differentiator from Options 2a) and 2b).
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Some additional risk to other vessels compared to other decommissioning options due to additional construction vessel activity over the 11.78km route between Cromarty well location and the Atlantic manifold also c. 5 vessel transits to/from onshore. Activities involved at seabed means construction vessels need a little time before initiating evasive action from collision. Following excavation of the buried pipelines but before recovery of the pipelines if the construction vessel needs to be off location a guard vessel will be in place, however, this reduces but does not prevent potential for fishing vessel to enter area and for such vessel to snag on the exposed subsea pipelines Therefore, ranked as Moderate Impact (Amber) and not High to take cognisance of the fact that main deconstruction (SIMOPS) activity with ROVSV and Tug /Barge is only c.72days and within a relatively short pipeline route of c 11.78km. It is not expected that other users of the sea will be significantly impacted.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c. 15 days. No vessel transits other than initial Mobilisation and Demobilisation. Activity is limited to ends of pipeline, and at exposure locations only. Risk is considered to be Low Impact.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c. 12 days. No vessel transits other than initial Mobilisation and Demobilisation. Activity is limited to ends of pipeline, and at exposure locations only. Risk is considered to be Low Impact.	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c. 22 days. No vessel transits other than initial Mobilisation and Demobilisation. Activity is limited to ends of pipeline, and at exposure locations only. Risk is considered to be Low Impact.
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		Residual (Long Term) Risk To Other Users of the Sea	No residual risk as this option will leave a safe seabed. Scattered rock cover from the excavated crossings and sediments from excavated trench would remain over trawlable. Therefore risk is considered to be Low Impact for this option.	The three pipeline crossings associated with this pipeline group are protected by rock berms that are proposed to be left in place for Options 2a), 2b) and 2c) (two Frigg crossings under PL2030 and one Buzzard crossing over PL2030) . These rock berms were specified and installed to be over trawlable, have been stable since original installation and will be monitored periodically post decommissioning to ensure they maintain stability. Pipelines are mainly fully trenched and buried over the entire route with a good DoC. Pipelines are predicted to remain trenched and buried with no new exposures developing over time. Only exposures reported are at the trench transitions where the pipelines tie-in to surface laid equipment and those associated with the removal of the UHB mattresses. These exposures will be remedied by the application of c. 2,048te (c. 760m long in total) of new rock cover which will be installed to be over trawlable and consistent in specification with existing rock berms at the existing pipeline crossings. Note: The Scottish Fisherman's Federation (SFF) have previously advised that, for safety reasons, it would be advisable to create a "link" between rock berms which are in series along the same pipeline where rock berms were close to one another (approx. 50 m). Risk is considered to be Low Impact for this option.	Pipelines are mainly fully trenched and buried over the entire route with a good DoC. Pipelines are predicted to remain trenched and buried with no new exposures developing over time. Only exposures reported are at the trench transitions where the pipelines tie-in to surface laid equipment and those associated with the removal of the UHB mattresses. These exposures will be remedied by trenching and burying to eliminate potential snagging hazard. Risk is considered to be Low Impact for this option.	Pipelines are mainly fully trenched and buried over the entire route with a good DoC. Pipelines are predicted to remain trenched and buried with no new exposures developing over time. Only exposures reported are at the trench transitions where the pipelines tie-in to surface laid equipment and those associated with the removal of the UHB mattresses. These exposures will be remedied by cutting and removing the pipeline ends within the trench transition and lengths revealed by removing the UHB mattresses, and covering the cut ends at the bottom of the trench with spot rock to eliminate potential snagging hazard. As such, the implications raised for Option 2a) by SFF are equally applicable for this option where spot rock placements are within 50m. Risk is considered to be Low Impact for this option.
		RATING	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
		SAFETY: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - A&C Group A - Final.xlsx

Rigid Pipeline with Piggybacked Pipeline - Trenched and Natural backfill/ Rock Covered at Crossings

ENVIRONMENTAL CRITERIA

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	c)	a)	b)	c)
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Although vessel durations (c.1 88 days) for this option are significantly greater than the other options (c. 12 to 22 days) all vessels will be MARPOL compliant. As the lines have been flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, any discharges from the lines during cutting or recovery are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with excavation of the trench, cutting and recovery of components. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Pipeline cutting techniques, if required, are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.15days and vessels will be MARPOL compliant. As the lines have been flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, discharges from the pipelines during the application of rock cover is not anticipated however in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock placement. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Pipeline cutting is not anticipated for this option, but if it became necessary, cutting techniques are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.12 days and vessels will be MARPOL compliant. As the lines have been flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, discharges from the pipelines during the trenching and burial activity is not anticipated however in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated trenching and burial of the pipeline ends within the trench transitions only. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Pipeline cutting is not anticipated for this option, but if it became necessary, cutting techniques are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.22 days and vessels will be MARPOL compliant. As the lines have been flushed and cleaned to reduce the hydrocarbon contents to as low as reasonable practicable, discharges from the pipelines during cutting or recovery of the short end sections within the trench transitions is not expected to have a significant impact. However in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated cutting and recovery of the pipeline ends within the trench transitions, placement of spot rock coverage over cut ends and exposures associated with the removal of the UHB mattresses only. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term	This option involves deburying 11.78km of the trenched and buried lines. The average depth of cover along the route is 1.32m + rock cover is applied at 3 existing crossings (1338te rock cover in total) and may require mass flow excavation to expose the pipelines for recovery. 49 No/ 441te of concrete mattresses will also be recovered from the trench. The seabed is expected to begin recovery once the activities are completed, such that the Magnitude of Effect considered Minor (2) and the Impact Significance is considered Minor for this option. This option is considered to be Higher impact relative to the other options and is therefore considered Moderate	Existing rock berms and existing sediments within the trench remain undisturbed in this option. New/ additional rock berm of similar specification to existing berm to be added at exposed ends (200m) and length exposed due to removal of the UHB mattresses (560m) only (2,048te of new rock berm in total). Note: The Scottish Fisherman's Federation (SFF) have previously advised that, for safety reasons, it would be advisable to create a "link" between rock berms which are in series along the same pipeline where rock berms were close to one another (approx. 50 m). This option is recognised to result in short term localised disturbance during rock placement. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with Option 1c). This option is considered to be Lower Impact (Green) for and this sub criterion.	Existing rock berms and existing sediments within the trench remain undisturbed in this option. This option is recognised to result in short term localised disturbance during the trenching and burying activities at each end of the pipeline route at the existing trench transitions and the sections exposed due to the removal of the UHB mattresses. It is noted that additional trench transitioning is required, therefore the length will be greater that the length of the exposed sections of the lines. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with Option1c). This option is considered to be Lower Impact (Green) for and this sub criterion.	Existing rock berms and existing sediments within the trench remain undisturbed in this option. Previous decommissioning experience has highlighted that it is expected that at cut ends, spot rock will be required to ensure pipeline ends are adequately buried. As such, the implications raised for Option 2a) by SFF are equally applicable for this option where spot rock placements are within 50m. This option is recognised to result in short term localised disturbance during cutting and removal of the pipeline sections and rock placement. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with Option 1c). This option is considered to be Lower Impact (Green). for and this sub criterion.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	Note: No designated areas impacted by any of the options. Sensitivity of the habitat in all options is considered to be Medium (B) due to the presence of the OSPAR and UKBAP listed threatened and/or declining habitat 'Sea pen and burrowing megafauna communities' as well as the PMF Arctica islandica. Requires deburying 11.780 km of trenched and buried lines by mass flow excavation, however the seabed is expected to begin recovery once the activities are completed, such that the long term Impact Significance is considered slight for this option. This option is considered to be Lower Impact (Green) for and this sub criterion.	Additional rock cover means the introduction of a different habitat type to the area. This will potentially impact on existing ecosystem, by allowing other species to settle in the area. Area impacted is relatively small (c. 760m x 10m maximum), however, the Magnitude of Effect is still considered Minor (2) and the Impact Significance is considered Minor for this option. This option is considered to be Higher impact relative to options1c) and 2b) and is therefore considered Moderate.	No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed, such that the Magnitude of Effect is considered Slight (1) and the Impact Significance is considered Slight for this option. This option is considered to be Lower Impact (Green) for and this sub criterion.	Additional rock will be used to cover the pipeline ends in the trench. This will potentially impact on existing ecosystem by allowing other species to settle in the area. However, the area impacted is relatively very small (c. 7,600m2), Recovery of the ecosystem in the wider impacted area from the removal of the pipeline sections is expected to commence as soon as the decommissioning activities are completed, such that the Magnitude of Effect is considered Minor (2) and the Impact Significance is considered Minor for this option. This option is considered to be Higher impact relative to options1c) and 2b) and is therefore considered Moderate.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Approximately 11.78km of 12"/4" diameter pipeline (1,517te) and 49 No/ 441te of concrete mattresses returning onshore. Given the commitment to maximise re-use/ recovery/ recycle, volumes of material to landfill will be minimised as the pipelines are mostly steel which can be recycled, there is 42te of materials associated with hard rubber piggy back spacers and 441te of concrete, which may also be recycled rather than being directed to landfill. Potential for NORM and wax residues is uncertain but can managed. Overall quantities associated with this option are not significant and impacts are therefore considered Lower Impact (Green).	Trenching operations to achieve minimum cover for UHB failed to achieve the desired DoL, therefore 49 mattresses (441te) were installed post-trenching which will be required to be removed during decommissioning. Overall quantities associated with this option are not significant and impacts are therefore considered Lower Impact (Green).	Trenching operations to achieve minimum cover for UHB failed to achieve the desired DoL, therefore 49 mattresses (441te) were installed post-trenching which will be required to be removed during decommissioning. Overall quantities associated with this option are not significant and impacts are therefore considered Lower Impact (Green).	Total quantities returned onshore only c.560m/ 26te across all pipelines made up of mostly steel with only 1.4te associated with associated with hard rubber piggy back spacers, which may also be recycled or incinerated rather than being directed to landfill. Trenching operations to achieve minimum cover for UHB failed to achieve the desired DoL, therefore 49 mattresses (441te) were installed post-trenching which will be required to be removed during decommissioning. Overall quantities associated with this option are not significant and impacts are therefore considered Lower Impact (Green).
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - A&C Group A - Final.xlsx

Rigid Pipeline with Piggybacked Pipeline - Trenched and Natural backfill/ Rock Covered at Crossings

SOCIETAL & ECONOMIC RISK CRITERIA

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	c)	a)	b)	c)
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
SOCIETAL	Impact on Commercial Fisheries	Both pipelines lines and concrete mattresses within the trench will be fully removed and although the disturbed rock berm material at existing crossings and sediment from excavation of the trench will be scattered and left in place, overtrawl trials will be carried out to ensure an accessible seabed for trawlers before leaving the worksite, therefore no impact on commercial fisheries is anticipated with this option. Considered to be Lower Impact (Green).	The three pipeline crossings associated with this pipeline group are protected by rock berms that are proposed to be left in place for Options 2a), 2b), 2c) and 3 . These rock berms were specified and installed to be over trawlable, have been stable since original installation and will be monitored periodically post decommissioning to ensure they maintain stability. The total area occupied by the rock berms at these crossings is only *c.2,400m2* , therefore, a relatively small fishing area may be impacted if the berm was to eventually become dislodged following multiple trawl passes. Two new small rock berm extensions will be installed at trench transitions either end of the pipelines route each *c* .200m long (*c.2,* 000m^2 area) the berms will be installed consistent in specification with existing rock berms. In addition rock will be required to cover the c. 560m long exposed sections of pipeline where the UHB mattresses have been recovered (c. 5,600m2 area) the berms will be installed consistent in specification with existing rock berms. For the purposes of the workshop, comparatively considered to be Moderate (Amber) to commercial fisheries as worst case scenario would result in an additional *c* 7,600m2 of fishing area being impacted, however, recognised that the additional footprint is minimal on a UKCS scale, and that fishermen would be able to continue to actively fish over the berms.	The exposed sections of pipelines are to be trenched and buried to a depth greater than 0.6m. Considered to be Lower Impact (Green) to commercial fisheries on the basis that existing rock berms left in place are over trawlable. Even in worst case scenario (where the rock berms to become dislodged following multiple trawl passes) would result in on c 2,400m2 of fishing area would be impacted.	The exposed sections of pipelines will be cut and removed at the lowest point of the trench and spot rock covering the cut ends at the bottom of the trench to eliminate a future potential snagging hazard. As per Option 2a), for the purposes of the workshop, comparatively considered to be Moderate (Amber) to commercial fisheries as worst case scenario would result in an additional c 7,600m2 of fishing area being impacted, however, recognised that the additional footprint is minimal on a UKCS scale, and that fishermen would be able to continue to actively fish over the berms.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities	Although more materials are returned onshore when compared to the other options being evaluated, the pipelines quantity (c. 1,572te + 441te of concrete mattresses) is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased road traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities. Therefore is considered to be Low Impact for this sub criterion.	No materials returned, such that no new onshore jobs anticipated. Similarly no impact on communities and amenities. *c.* 2,048te rock cover to be supplied and transported, however not identified as significant increase in business to the supply chain Therefore is considered to be Low Impact for this sub criterion.	No materials returned, such that no new onshore jobs anticipated. Similarly no impact on communities and amenities. Therefore is considered to be not applicable for this sub criterion.	Negligible quantity of materials returned (98te) such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated. Similarly no impact on communities and amenities. c.2,048te rock cover to be supplied and transported, however not identified as significant increase in business to the supply chain. Therefore is considered to be Low Impact for this sub criterion.
	RATING	Not Significantly Different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Moderate Impact**
ECONOMIC RISK	Combined Cost (Decommissioning + Long Term Monitoring)	Comparative combined cost estimated to be 1,250% of the lowest cost option (2b) and scored as a High.	Comparative combined cost estimated to be 128% of the lowest cost option (2b). However, deemed only marginally more costly so scored as a Low.	Comparative combined cost estimated to be the lowest cost option, so scored as a Low.	Comparative combined cost estimated to be 194% of the lowest cost option (2b), and scored as a Moderate.
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Higher Impact**	**Lower Impact**	**Lower Impact**	**Moderate Impact**

Rating Workbook - A&C Group A - Final.xlsx

Rigid Pipeline with Piggybacked Pipeline - Trenched and Natural backfill/ Rock Covered at Crossings

VISUAL RATING SUMMARY (HEATMAP)

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	c)	a)	b)	c)
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
SAFETY	Risk During Project Execution – To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Risk During Project Execution – To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Risk During Project Execution – To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Waste Processing	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SOCIETAL	Impact on Commercial Fisheries	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities	Not Significantly Different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Total Cost for Decommissioning (Decommissioning / Removal Activities Cost) + (Surveying, Remediation, and / or Future Inspections Cost)	Higher Impact	Lower Impact	Lower Impact	Moderate Impact
	OVERALL RANKING	4th	1st=	1st=	3rd
	RATINGS/RANKING OBSERVATIONS	Ratings across options 2a), 2b) and 2c) are not significantly different. Options 2a) and 2b) were ranked 1st= as although option 2a) had one more Moderate Impact (Amber) rating than option 2c), it was acknowledged that whilst option 2a)'s Change of Habitat and Impact on Commercial Fisheries were comparatively worse than option 1c) and 2b), that the areas impacted were Low on a UKCS scale. Additionally, the uncertainty for technical/trenching success for option 2b) along the section that could not be adequately trenched previously could have subsequent implications against other criteria rankings should the trenching not be successful, driving the overall preference for option 2a). Option 2c) was ranked 3rd, reflecting that the cut ends will require spot rock coverage, and that due to the cut ends spacing and SFF rock guidance, that the rock quantity would be similar to option 2a), but with the additional operations associated with the removal of the cut lines. Option 1c) is ranked 4th and is different in terms of Higher Impact (Red) for significant additional Cost and Moderate Impact (Amber) ratings attracted to Risk during project execution (onshore, offshore and to other users) and risk of major project failure and technical complexity. Compared to option 2a) and 2c).			
	Rating Count	Red = 1 Amber = 6 Green = 2 Not Significantly Different = 4	Red = 0 Amber = 2 Green = 7 Not Significantly Different = 4	Red = 0 Amber = 1 Green = 8 Not Significantly Different = 4	Red = 0 Amber = 3 Green = 6 Not Significantly Different = 4
	COMMENTS AND RECOMMENDATIONS	Based on these evaluation results Options 2a), 2b) are ranked 1st= and Option 2c) is ranked 3rd. All three remediate in-situ options should be carried forward to C&P tendering for the execution phase. Option 1c) is ranked 4th and has been rated sufficiently worse than the other three decommissioning option to be discounted as an option to be carried forward.			

Rating Workbook - A&C Group A - Final.xlsx

Rigid Pipeline with Piggybacked Pipeline - Trenched and Natural backfill/ Rock Covered at Crossings

VISUAL RATING SUMMARY - WHERE ECONOMIC CRITERIA IS NOT CONSIDERED

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	c)	a)	b)	c)
		CUT AND LIFT	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Technical Complexity & Track Record	Moderate Impact	Lower Impact	Moderate Impact	Lower Impact
SAFETY	Risk During Project Execution – To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Risk During Project Execution – To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Risk During Project Execution – To Other Users of the Sea	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Residual (Long Term) Risk To Other Users of the Sea	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Waste Processing	Not significantly different	Not significantly different	Not significantly different	Not significantly different
SOCIETAL	Impact on Commercial Fisheries	Lower Impact	Moderate Impact	Lower Impact	Moderate Impact
	Socio-economic Impact on Communities and Amenities	Not Significantly Different	Not significantly different	Not significantly different	Not significantly different
OVERALL RANKING		4th	1st =	1st =	1st =
Rating Count		Red = 0	Red = 0	Red = 0	Red = 0
		Amber = 6	Amber = 2	Amber = 1	Amber = 2
		Green = 2	Green = 6	Green = 7	Green = 6
		Not Significantly Different = 4	Not Significantly Different = 4	Not Significantly Different = 4	Not Significantly Different = 4
COMMENTS AND RECOMMENDATIONS		Ratings across options 2a), 2b) and 2c) are not significantly different. Therefore the comments and recommendations described in the Visual Ratings Summary (Heatmap) remain justified.			

Rating Workbook - A&C Group B - Final.xlsx

Umbilical (PLU2034) Trenched and Self Burying/ Partially Rock Covered

TECHNICAL & SAFETY CRITERIA

Assessment Criteria		Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
		Sub Criteria/ / Sub Options	a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REVERSE REELED OR REMOVED
TECHNICAL FEASIBILITY		Risk of Major Project Failure	Potentially the umbilicals may be "pulled through" the sediment cover within the trench, however due to the notable DoC over the umbilicals within this group an allowance has been included in vessel time and cost estimate to enable pre excavation of the sediments and spot rock cover before reverse reeling commences. Since the lines are trenched and buried, the ability to externally inspect has been limited. Therefore condition of the umbilicals to withstand the tension and bending stresses applied a "pull through" method of recovery and reeling is uncertain. Although theoretical analysis before mobilisation will improve confidence of the capabilities of the umbilicals to be recovered by this technique. Base case assumption is that sections of umbilicals local to the three currently live 3rd party crossings (two under and one over) will be left to be decommissioned later at the time of the 3rd party pipelines decommissioning, as currently fully rock covered at the crossings. Assuming pre-excavation is adopted before reverse reeling, scope is straightforward and understood with no specific uncertainties identified. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.	Exposed sections to be remediated under options 2a), 2b)and 2c) are assumed to just be the exposures at the trench transitions the ends of umbilical route (0.4km total exposed length) NOT the section of umbilical PLU2034 along the route where a Depth of Lowering is greater than 0.6m and Depth of Cover is ~0.48m i.e. 3.39km section of umbilical between KP 8.47 and KP11.85 which is naturally backfilling. This is aligned with other pipeline decommissioning precedent/experience. Additional rock to be applied under this option is c. 837te at the umbilicals ends to provide DoC above 0.6m where it exits the trench. Scope is straightforward and understood with no specific uncertainties identified. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.	The trenching of umbilical ends is not always straightforward as ends tend to have excess length and are subsequently laid in curves/loops/coils especially after disconnection. Therefore, uncertainty remains as to the feasibility and practicality of easily achieving the trench and burial depth required under this option without additional intervention. Therefore there remains some scope uncertainties to be resolved before execution and potential for some schedule slippage activity resulting project delay with this option. This uncertainty could be clarified and concluded by initiating a specific trenching study by potential trenching contractors prior to award of the execution scope.	The short exposed sections at the ends of the umbilicals within the trench transitions may be cut and removed in c. 24m lengths. It is expected that additional rock will be required to spot rock cover the umbilical ends to ensure adequate DoC. Additional rock to be applied under this option is c. 60te. Scope is straightforward and understood with no specific uncertainties identified. Offshore Execution Phase Schedule is unlikely to slip beyond planned schedule plus contingencies applied.
		RATING	Lower Impact	Lower Impact	Moderate Impact	Lower Impact
		Technical Complexity & Track Record	No new technology or working practices to be introduced. Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Therefore not significantly different from other options.	No new technology or working practices to be introduced. Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Therefore not significantly different from other options.	No new technology or working practices to be introduced. Noted that trenching length will be slightly longer than reported umbilical exposure lengths at each end of the umbilicals based on trenching equipment constraints (up to 50m transition for each trench). Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Therefore not significantly different from other options.	No new technology or working practices to be introduced. Noted that it is expected that at cut ends, spot rock will be required to ensure umbilical ends are adequately buried. Option has good industry track record in the North Sea and can be executed by contractors with significant previous experience of all activities involved. Therefore not significantly different from other options.
		RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
		TECHNICAL: OVERALL RATING BASED ON AVERAGE	**Lower Impact**	**Lower Impact**	**Moderate Impact**	**Lower Impact**
SAFETY	Risk During Project Execution	To Project Personnel	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short campaign duration (c.20 days), single vessel, no SIMOPS. c.30.24km/408te of umbilical to be managed on deck compared to c.0.4km/4.9te associated with Option 2c) and no materials to be managed on deck for Options 2a) and 2b). Potential dropped/ swinging object when attaching recovered umbilical end to the reel on vessel deck leading to personnel injury and/or asset damage, Inherent stored energy during reeling activity, potentially may lead to more severe consequences. Considered to be Moderate Impact significance in the HIRA. Deck crew exposure to residues in the umbilical cores(water based hydraulic fluid and a low MEG/ water mix) to be managed by capping umbilical before it is reeled, residues will also escape into water column as the umbilicals are lifted to the vessel.. Potential snagging subsea during reeling activity leading to excessive pull with eventual failure of the line, and release of energy to deck, personnel injury, vessel damage. Drop of failed umbilical to seabed resulting in increased seabed disturbance, schedule delay and additional complication to subsequent removal activity.	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c.18 days), single vessel, no SIMOPS. No materials returned to deck. Minimal deck crew activity as rock placement is mostly automated i.e. normal operation for vessel with minimum deck crew interaction.	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c.13 days), single vessel, no SIMOPS. No materials returned to deck. Minimal deck crew activity/ interaction with equipment and associated with launching and recovery of ROV and trenching equipment only i.e. normal operation for vessel.	No planned helicopter transfers to and from the vessel. No diver intervention anticipated. Relatively short duration (c.15 days), single vessel, no SIMOPS. Similar risks as identified in Option 1a) however only ~1% of the umbilical is recovered compared to Option 1a), therefore shorter duration activity. However, scored as Lower Impact (Green) to take cognisance that suitable risk mitigation will be put in place.
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Management of materials returned onshore will be at licensed yards. c.30.24km/408te of umbilical returned onshore. Quayside/ yard crew exposure to residues (water based hydraulic fluid and an MEG/ water mix)to be managed when umbilical is un-reeled and cut into sections for onward transport for disposal and recycle. Most deconstruct work in yard is remote from personnel and carried out using appropriate equipment. Larger quantities of materials to be road transported between dismantling yard and final disposal/ recycling destination than Option 2c) (*c.0.4km/4.9te*)	Nothing returned onshore. Approximately c. 837te rock cover to be supplied and transported, however not identified as a major risk as supply of rock cover is an ongoing industry practice.	Nothing returned onshore.	Management of materials returned onshore will be at licensed yards. Only c.0.4km/4.9te of recovered umbilical returned onshore. Quayside/ yard crew will have minimal exposure to residues(water based hydraulic fluid and an MEG/ water mix). Significantly less quantities than Option 1a) to be road transported between dismantling yard and final disposal/ recycling destination and is not a significant differentiator from Options 2a) and 2b). Therefore, scored Lower Impact (Green) to take cognisance of the fact that only 4.9te of materials to be managed, ~1% less than option 1a).
		RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration c. 20 days total incl Mob/Demob The reel vessel will be connected to the umbilical on seabed during recovery. An evacuation plan to cut and laydown the umbilical in an emergency or to avoid a collision with other vessels will be in place. Guard vessel will also be in place during period when either umbilical has been unburied. Exclusion zone will also be applied to the area where the construction vessels are working in for duration of the campaign. With these mitigations in place risk is considered to be Lower Impact (Green)	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c.18 days total incl Mob/Demob Activity is at ends of the umbilicals, at exposure locations only. Risk is considered to be Lower Impact (Green).	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c.13 days total incl Mob/Demob Activity is at ends of the umbilicals, at exposure locations only. Risk is considered to be Lower Impact (Green).	No increased risk to other vessels than currently under normal operations. Relatively short campaign duration of c.15 days total incl Mob/Demob Activity is at ends of the umbilicals, at exposure locations only. Risk is considered to be Lower Impact (Green).
		RATING	Not significantly different	Not Significantly Different	Not Significantly Different	Not Significantly Different
		Residual (Long Term) Risk To Other Users of the Sea	No residual risk as this option will leave a safe seabed. Scattered rock cover from the excavated crossings and spot rock cover within the trenches and sediments from excavated trenches would remain over trawlable. Therefore risk is considered to be Lower Impact (Green) for this option.	The three pipeline crossings associated with this umbilical group are protected by rock berms that are proposed to be left in place for Options 2a), 2b) and 2c) (two 32" Frigg crossings under PLU2034 and one 10" Buzzard crossing over PLU2034) . These rock berms were specified and installed to be over trawlable, have been stable since original installation and will be monitored periodically post decommissioning to ensure they maintain stability. Except for 3 pipeline crossings the umbilical is fully trenched and buried, except for its ends (0.4km) with a good DoL >0.6m and good DoC (with evidence of continuing self burial) and is predicted to remain trenched and buried with no exposures developing over time. The exposed sections in the trench transition (0.4km in total) will be remediated in-situ by the application of c. 837te of new rock cover which will be installed to be over trawlable and consistent in specification with existing rock berms at the existing pipeline crossings. Therefore risk is considered to be Lower Impact (Green) for this option.	The exposed sections in the trench transition (0.4km in total) will be remediated in-situ will by trenching and burying. Therefore risk is considered to be Lower Impact (Green) for this option.	The exposed sections in the trench transition (0.4km in total) will be remediated in-situ will by cutting the umbilical ends, and recovering in 24m lengths. There will be spot rock added to the cut umbilical ends at the trench transitions amounting to c. 60te in total. Therefore risk is considered to be Lower Impact (Green) for this option.
		RATING	Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
		SAFETY: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - A&C Group B - Final.xlsx

Umbilical (PLU2034) Trenched and Self Burying/ Partially Rock Covered

ENVIRONMENTAL CRITERIA

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	a)	b)	c)
		REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REVERSE REELED OR REMOVED
ENVIRONMENTAL	**Impact of Decommissioning Operations Offshore** *(includes emissions to air, discharges to sea and underwater noise)*	Vessel durations is c.20 days and vessels will be MARPOL compliant. As the chemical cores have been flushed and cleaned and contains only low MEG/ water mix, and the control cores contain water based hydraulic fluid. The base case assumption is that the umbilicals can be capped and reeled without first cutting and minimising discharges during recovery , however in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with excavation of the trench and recovery/ reeling of the umbilicals. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Umbilical cutting techniques, if required, are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.18 days and vessels will be MARPOL compliant. As the chemical cores have been flushed and cleaned and contains only low MEG/ water mix, and the control cores contain water based hydraulic fluid, discharges from the umbilicals during the application of rock cover is not anticipated however in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated with rock cover. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Umbilical cutting is not anticipated for this option, but if it became necessary, cutting techniques are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.13 days and vessels will be MARPOL compliant. As the chemical cores have been flushed and cleaned and contains only low MEG/ water mix, and the control cores contain water based hydraulic fluid, discharges from the umbilicals during the trenching and burial activity is not anticipated however in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels and the noise associated trenching and burial of the umbilical ends within the trench transitions only. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Umbilical cutting is not anticipated for this option, but if it became necessary, cutting techniques are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).	Vessel durations is c.15 days and vessels will be MARPOL compliant. As the chemical cores have been flushed and cleaned and contains only low MEG/ water mix, and the control cores contain water based hydraulic fluid. The base case assumption is that the umbilicals can be capped after cutting thus minimising discharges during recovery , however in the unlikely event any discharges occur, these are not expected to have a significant impact. However in the unlikely event any discharges occur, these are not expected to have a significant impact. Sources of underwater noise will include the presence of vessels, the noise associated cutting and recovery of the umbilical ends within the trench transitions and the noise associated with spot rock cover over cut ends. These underwater noise sources are not considered to have a significant impact on marine mammals or fish species in the area. Cutting techniques are similar for all options and explosives will not be used. Impacts across all environmental aspects evaluated under this sub criterion are similar and considered to be Lower Impact (Green).
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term *(includes disturbance to the cuttings piles)*	Existing rock berms at the 3 crossings and existing sediments and spot rock cover within the trench remain undisturbed for Options 2a) 2b) and 2c).			
		There is also existing rock berms at 3 existing crossings (1338te rock cover in total) and may require mass flow excavation to expose the umbilicals for recovery. Given the notable DoC present for this group, it is expected that prior excavation of the umbilical will be required to allow for removal. This will result in seabed disturbance along the entirety of the group and a wider area of sediment resettlement. Taking account of the total length of line to be recovered the short term area of disturbance is considered higher for this option than for the other four options, such that the Magnitude of Effect considered Minor (2) and the Impact Significance is considered Minor for this option. This option is considered to be Higher impact relative to the other options and is therefore considered Moderate	New/ additional rock berm of similar specification to existing berm to be added to 0.4km providing a final DoL/DoC of >0.6m. Total new rock to be applied is 837te. This option is recognised to result in a smaller area of disturbance relative to Option 1a) during rock placement. The footprint of this short term disturbance is considered significantly smaller than the footprint of disturbance associated with Option 1a). This option is considered to be Lower Impact (Green) for this sub criterion.	This option is recognised to result in short term localised disturbance during the trenching and burying activities at the ends of the umbilicals. The footprint of this short term disturbance is considered smaller (c 0.4km long) at ~1% the footprint of disturbance associated with Option1a). This option is considered to be Lower Impact (Green) for and this sub criterion.	This option is recognised to result in short term localised disturbance during the cut and recovery. In addition it is likely that the ends of the umbilicals will require spot rock added to provide adequate coverage (~60te). The footprint of this short term disturbance is considered significantly smaller than Option1a). This option is considered to be Lower Impact (Green) for and this sub criterion.
	RATING	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term	Note: No designated areas impacted by any of the options. Sensitivity of the habitat in all options is considered to be Low (A).			
		No long term change to habitat anticipated at end of activities such that this criterion is considered Lower (Green) for this option.	Additional rock cover means the introduction of a different habitat type to the area. This will potentially impact on existing ecosystem, by allowing other species to settle in the area. Area impacted is relatively small (*c* . 0.4km within the confines of the existing trench) such that the Magnitude of Effect is considered Minor (2) and the Impact Significance is considered Minor for this option. For the purposes of the workshop, comparatively considered to be Moderate (Amber) reflecting the addition of 837te of rock, however, recognised that there is already 1,228te of rock on these lines, and the additional footprint is minimal on a UKCS scale.	No additional material introduced to support decommissioning activities. Recovery of the ecosystem in the impacted area is expected to commence as soon as the decommissioning activities are completed, such that the Magnitude of Effect is considered Slight (1) and the Impact Significance is considered Slight for this option. This option is considered to be Low Impact for and this sub criterion.	A small amount of rock will be used to cover the umbilical ends in the trench. This will potentially impact on existing ecosystem by allowing other species to settle in the area. However, the area impacted is relatively very small, Recovery of the ecosystem in the wider impacted area from the removal of the umbilical sections is expected to commence as soon as the decommissioning activities are completed, such that the Magnitude of Effect is considered Slight (1) and the Impact Significance is considered Slight for this option. This option is considered to be Low Impact for and this sub criterion.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing *(i.e. processing of returned materials and use of landfill)*	Approximately 30.24km of 90mm OD (408te) returning onshore. Given the commitment to maximise re-use/ recovery/ recycle, volumes of material to landfill will be minimised as the umbilical is are mostly steel / copper which can be recycled, there is 1.2te of plastics and rubber may directed to landfill. Overall waste quantities associated with this option whilst more than other options are not significant and impacts are therefore considered Lower Impact (Green).	No materials returned onshore. Impacts are therefore considered Lower Impact (Green).	No materials returned onshore. Impacts are therefore considered Lower Impact (Green).	Approximately 0.4km of 90mm OD (4.9te) returning onshore. Given the commitment to maximise re-use/ recovery/ recycle, volumes of material to landfill will be minimised as the umbilical is are mostly steel / copper which can be recycled, there is limited plastics and rubber may directed to landfill. Overall waste quantities associated with this option whilst more than options 2a) and 2b) are not significant and impacts are therefore considered Lower Impact (Green).
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	ENVIRONMENTAL: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**

Rating Workbook - A&C Group B - Final.xlsx

Umbilical (PLU2034) Trenched and Self Burying/ Partially Rock Covered

SOCIETAL & ECONOMIC RISK CRITERIA

Assessment Criteria	Decommissioning Options	1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options	a)	a)	b)	c)
		REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REVERSE REELED OR REMOVED
SOCIETAL	Impact on Commercial Fisheries	The umbilical will be fully removed and although the disturbed rock berm material at existing crossings and sediment and spot rock cover from excavation of the trench will be scattered and left in place, overtrawl trials will be carried out to ensure an accessible seabed for trawlers before leaving the worksite, therefore no impact on commercial fisheries is anticipated with this option. Therefore is considered to be Lower Impact (Green) for this sub criterion.	The three pipeline crossings associated with this pipeline group are protected by rock berms that are proposed to be left in place for Options 2a), 2b) and 2c) (two 32" Frigg crossings under and one 10" Buzzard crossing over) . These rock berms were specified and installed to be over trawlable, have been stable since original installation and will be monitored periodically post decommissioning to ensure they maintain stability. The total area occupied by the rock berms at these crossings is only *c.1,600m2* , and is installed partially within the (Frigg) crossings trenches therefore, a relatively small fishing area may be impacted if the berm was to eventually become dislodged following multiple trawl passes. Three new small rock berm extensions of similar specification to existing berms will be installed at trench transitions ends of the umbilicals (*c.1,800*m^2 area in total). Considered a higher impact than Options 2b) and 2c) and a Moderate Impact (Amber)to commercial fisheries. For the purposes of the workshop, comparatively considered to be Moderate (Amber) reflecting the addition of 837te of rock, however, recognised that there is already 1,228te of rock on these lines, and the additional footprint is minimal on a UKCS scale, and that fishermen would be able to continue to actively fish over the berms.	The exposed end sections of umbilical are to be trenched and buried to a depth greater than 0.6m. Considered to be Lower Impact (Green) to commercial fisheries on the basis that existing rock berms left in place are over trawlable.	The umbilical ends will be cut and removed at the lowest point of the trench and have a total of ~60te of spot rock added to ensure adequate DoC of umbilical ends to eliminate future potential snagging hazard. Considered to be Lower Impact (Green) to commercial fisheries on the basis that existing and new spot rock left in place are over trawlable.
	RATING	Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities	Although more materials are returned onshore when compared to the other options being evaluated, the quantity (*c* .408te) is not expected to result in the creation of new jobs. In addition, impacts on communities and amenities as a result of increased road traffic, odour and noise are not expected to be significant as materials will be returned to licensed and currently operating yards and recycling/ disposal facilities. Therefore is considered to be Lower Impact (Green) for this sub criterion.	No materials returned, such that no new onshore jobs anticipated. Similarly no impact on communities and amenities. *c.837*te rock cover to be supplied and transported, however not identified as significant increase in business to the supply chain Therefore is considered to be Low Impact for this sub criterion.	No materials returned, such that no new onshore jobs anticipated. Similarly no impact on communities and amenities. Therefore is considered to be not applicable for this sub criterion.	Negligible quantity of materials returned (5te) such that impacts on communities and amenities as a result of increased traffic, odour and noise are not expected to be significant. In addition, no new onshore jobs anticipated. Similarly no impact on communities and amenities. c.60te rock cover to be supplied and transported, however not identified as significant increase in business to the supply chain Therefore is considered to be Low Impact for this sub criterion.
	RATING	Not significantly different	Not significantly different	Not significantly different	Not significantly different
	SOCIETAL: OVERALL RATING - BASED ON AVERAGE	**Lower Impact**	**Moderate Impact**	**Lower Impact**	**Lower Impact**
ECONOMIC RISK	**Combined Cost** (Decommissioning + Long Term Monitoring)	Comparative combined cost estimated to be 232% of the lowest cost option (2b), so ranked as a Moderate.	Comparative combined cost estimated to be 145% of the lowest cost option (2b). However, deemed only marginally more costly so scored as a Low.	Comparative combined cost estimated to be the lowest cost option, so scored as a Low.	Comparative combined cost estimated to be 118% of the lowest cost option (2b). However, deemed only marginally more costly so scored as a Low.
	ECONOMIC RISK: OVERALL RATING BASED ON AVERAGE	**Moderate Impact**	**Lower Impact**	**Lower Impact**	**Lower Impact**

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Umbilical (PLU2034) Trenched and Self Burying/ Partially Rock Covered

VISUAL RATING SUMMARY (HEATMAP)

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REVERSE REELED OR REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Not significantly different	Not Significantly Different	Not Significantly Different	Not Significantly Different
	Residual (Long Term) Risk To Other Users of the Sea		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not Significantly Different
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Not significantly different	Not significantly different	Not significantly different	Not Significantly Different
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
ECONOMIC RISK	Total Cost of Decommissioning (Removal / Decommissioning Cost) + (Surveying, Remediation and/or Future Inspection Cost)		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	OVERALL RANKING		4th	3rd	2nd	1st
	RATING/ RANKING OBSERVATIONS		Ratings across 6 of the 13 sub-criteria across all options evaluated are considered Not significantly different (all being individually rated Lower Impact (Green)). No Higher Impact (Red) rating has been considered for any of the options. Option 2c) is ranked 1st with all Low Impact (Green) ratings. Option 2b) (ranked 2nd) performs only slightly worse (with one Moderate Impact (Amber) on Technical Feasibility reflecting that the trenching of umbilical ends is not always straightforward due to excess length being laid in curves/loops/coils, therefore, uncertainty remains as to the feasibility and practicality of readily achieving the trench and burial depth required under this option without additional intervention. Options 2a) ranked 3rd performed only slightly worse, with two Moderate Impacts (Amber) for the Long Term Change of Habitat and Impact on Commercial Fisheries associated with the additional rock placement. However, it is recognised that the quantity of rock is relatively small compared to what is already in place for the crossings. Option 1a) is ranked 4th and has the most Moderate Impacts (Amber) for Risk during project execution (onshore and offshore), Seabed Disturbance and additional Cost.		
	Rating Count		Red = 0 Amber = 4 Green = 3 Not Significantly Different = 6	Red = 0 Amber = 2 Green = 5 Not Significantly Different = 6	Red = 0 Amber = 1 Green = 6 Not Significantly Different = 6	Red = 0 Amber = 0 Green = 7 Not Significantly Different = 6
	COMMENTS AND RECOMMENDATIONS		Based on these evaluation results Option 2c) is ranked 1st and is the preferred option. However, all three remediate in-situ options have very similar performance overall with any differences across the sub criteria being very marginal. As such all 3 Options should therefore be carried forward to C&P tendering for the execution phase. Option 1a) ranked 4th and has been rated sufficiently worse than the other three decommissioning option to be discounted as an option to be carried forward.			

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Umbilical (PLU2034) Trenched and Self Burying/ Partially Rock Covered

VISUAL RATING SUMMARY - WHERE ECONOMIC CRITERIA IS NOT CONSIDERED

Assessment Criteria	Decommissioning Options		1. TOTAL REMOVAL BY:	2. REMEDIATE IN-SITU WITH:		
	Sub Criteria/ / Sub Options		a)	a)	b)	c)
			REVERSE REELING	EXPOSED SECTIONS ROCK COVERED	EXPOSED SECTIONS TRENCHED AND BURIED	EXPOSED SECTIONS CUT AND REVERSE REELED OR REMOVED
TECHNICAL FEASIBILITY	Risk of Major Project Failure		Lower Impact	Lower Impact	Moderate Impact	Lower Impact
	Technical Complexity & Track Record		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SAFETY	Risk During Project Execution	To Project Personnel	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Those on Land	Moderate Impact	Lower Impact	Lower Impact	Lower Impact
		To Other Users of the Sea	Not significantly different	Not Significantly Different	Not Significantly Different	Not Significantly Different
	Residual (Long Term) Risk To Other Users of the Sea		Not Significantly Different	Not Significantly Different	Not Significantly Different	Not Significantly Different
ENVIRONMENTAL	Impact of Decommissioning Operations Offshore		Not significantly different	Not significantly different	Not significantly different	Not significantly different
	Seabed Disturbance- Short Term		Moderate Impact	Lower Impact	Lower Impact	Lower Impact
	Change of Habitat - Long Term		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Waste Processing		Not significantly different	Not significantly different	Not significantly different	Not significantly different
SOCIETAL	Impact on Commercial Fisheries		Lower Impact	Moderate Impact	Lower Impact	Lower Impact
	Socio-economic Impact on Communities and Amenities		Not significantly different	Not significantly different	Not significantly different	Not significantly different
OVERALL RANKING			4th	3rd	2nd	1st
Rating Count			Red = 0	Red = 0	Red = 0	Red = 0
			Amber = 3	Amber = 2	Amber = 1	Amber = 0
			Green = 3	Green = 4	Green = 5	Green = 6
			Not Significantly Different = 6	Not Significantly Different = 6	Not Significantly Different = 6	Not Significantly Different = 6
COMMENTS AND RECOMMENDATIONS	There is no change to the rankings compared to the original evaluation (see VRS heatmap worksheet). Therefore the comments and recommendations described in the Visual Ratings Summary (Heatmap) remain justified with Option 2c) the Preferred Option.					