Windermere Decommissioning Project

Comparative Assessment

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Title:

Windermere Decommissioning Project

Comparative Assessment Report

Notes:

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This is a report of the Comparative Assessment (CA) undertaken as part of the Windermere Decommissioning Project. The CA evaluates and compares potential decommissioning options for the 8" Gas Export Pipeline and the Umbilical that lie between Windermere and the former ST-1 platform location, and will be the subject of decommissioning activities (along with the Windermere platform), as part of the decommissioning project.

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EXECUTIVE SUMMARY

The Windermere Field is located in the Southern Basin of the UKCS in license block 49/9b. Windermere was discovered in 1989. The platform produced gas from the Leman / Rotliegendes sandstone reservoir. The offshore facilities, installed in 1997, consist of a Normally Unmanned Installation (NUI) platform with two wells, one 8" gas export pipeline to the Markham ST-1 platform (6.8km long) and an umbilical that provided power and chemicals from ST-1 to Windermere. Production ceased from Windermere in April 2016. In 2017, the pipeline and umbilical were flushed and cleaned and were left in a flooded condition. The topsides pipework was also cleaned and the wells shut-in. The wells on Windermere were subsequently plugged and abandoned in 2019. Further, the ST-1 platform was decommissioned and removed in 2019.

A Comparative Assessment of potential decommissioning options has been completed for the 8" export pipeline and the umbilical between Windermere and the former ST-1 platform location. A Comparative Assessment study is required to support the final decision for the decommissioning of the Windermere pipeline and umbilical. This report presents a description of the potential decommissioning options considered, the method used to complete the Comparative Assessment and the findings of the work undertaken.

The Comparative Assessment considered the following four main options for both the 8" pipeline and the umbilical:

- Complete Removal by Cut and Lift methods/Direct Pull and cut methods;
- Complete Removal by Reverse Reel;
- Partial Removal; and
- Leave *in situ*.

Within both the Complete Removal and Partial Removal options, a number of sub-options were assessed. In total, seven options were assessed for both the 8" gas export line and the umbilical.

The options were assessed using the OPRED Decommissioning Guidance Notes and evaluations made on the basis of qualitative and quantitative evaluation for each of the main areas of assessment, namely:

- Safety
- Environmental
- Technical
- Societal
- Cost

Workshops were held to assess the options and sub-options for decommissioning. In the case of the 8" gas export pipeline, a preferred option was determined in the course of the workshops held. In the case of the umbilical, multiple options were considered acceptable following completion of the workshops.

As such, the umbilical options were taken forward for further comparative assessment to determine the most suitable option.

8" Export Pipeline

Partial removal of the 8" pipeline is the preferred option for decommissioning.

The pipeline has a burial depth of approximately 1m below seabed for the vast majority of the route. Therefore, complete removal would present a greater technical challenge and result in a higher degree of environmental disturbance when compared to the partial removal options that were considered. Similarly, the option to leave the entire pipeline *in situ* in the Windermere field was not considered a practical long term solution due to the ongoing risk to other sea users (e.g. fisheries) and the associated ongoing responsibilities for INEOS.

Based on the assessment, it was concluded that the option for the pipeline shall incorporate the removal of the surface-laid tie-in spools and shallow buried sections of pipeline at Windermere and the former ST-1 platform ends. This would be achieved by trenching of the shallow buried sections of line, removal of the pipeline, and backfilling of the trenched areas.

It was also concluded that rock dumping should only be pursued as a contingency rather than a base case option.

Umbilical

Partial removal of the umbilical is the preferred option for decommissioning whereby the umbilical will be removed and cut at the two platform ends and the ends buried. On the remainder of the route, the umbilical has remained buried throughout the entire operating history of Windermere, with no freespans or exposures identified in any survey data between 1997 and 2014. As such, it was identified that the majority of the umbilical should be decommissioned *in situ* in order to minimise technical safety risks and environmental impacts from such works.

It was concluded that rock dumping should only be pursued as a contingency rather than a base case option.

Mattress Removal

Mattress removal has been determined to be the base case option for Windermere Decommissioning, therefore, there was no comparison of options for mattresses undertaken as it has been assumed these will be removed where possible.

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References

[1] - DECC Guidance Notes Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998.

1 Introduction

1.1 Overview of the Windermere Field

The Windermere Field is located in the Southern Basin of the UKCS in license block 49/9b. Windermere was discovered in 1989. The platform produced gas from the Leman / Rotliegendes sandstone reservoir. Production ceased in April 2016.

The offshore facilities, installed in 1997, consist of a Normally Unmanned Installation (NUI) platform with two wells, one 8" gas export pipeline to the Markham ST-1 platform (6.8km long), and an umbilical from ST-1 to Windermere (7km long).

The Windermere NUI is a fixed three-legged tripod jacket weighing 382 te, located in 35m water depth, with topside facilities (452 te) minimised to enable primary operational control from Centrica's Markham Field. There is no processing equipment on the topsides. During the production operations phase, gas was transferred by pipeline from Windermere to the ST-1 platform located in the UK Sector and from ST-1 to the J6A platform, which is located in the Dutch Sector. Electrical power, control and chemicals were provided by umbilical from the ST-1 Platform to Windermere.

Of the two production wells on Windermere, Well W1 had been shut-in since 2005 and Well W2z produced until April 2016. In 2017, the topsides pipework, export pipeline and umbilical were flushed and cleaned. The pipeline and umbilical currently remain in a flooded condition. The wells were separated from the topsides pipework and shut-in. The platform resided in hydrocarbon-free status until 2019 when the wells are plugged and abandoned.

1.2 Purpose and Scope

The purpose of this Comparative Assessment is to provide an assessment of potential decommissioning options available for the Windermere 8" gas export pipeline and umbilical against a set of assessment criteria derived from BEIS guidance documents. The output of this Comparative Assessment will assist in identifying the preferred decommissioning options and methods, and supports the submission of the decommissioning programme to OPRED.

2 The Comparative Assessment Process

2.1 Comparative Assessment Process

The Comparative Assessment process has been accomplished by completion of two workshops and, in the case of the umbilical, follow-on assessment. In the case of the 8" pipeline, a clear preferred strategy for decommissioning was determined at the workshops. In the case of the umbilical, multiple options were determined to be acceptable. As such, further assessment and, in line with OPRED guidance, cost, was used as a differentiator.

The first workshop was undertaken on 10th December 2014 by the engineering contractor, ODE, as part of their engineering definition scope for the Windermere Decommissioning Project.

Following completion and reporting of the ODE workshop, a second workshop was held by DEA UK on 9th February 2015 in order to review the ODE findings (and make modifications to the scorings as necessary).

2.2 Options Assessed for 8" Pipeline During the Comparative Assessment Workshops

Based on OPRED guidance notes, seven pipeline decommissioning options were identified for assessment, summarised below.

2.2.1 Complete Removal Options

Option 1: Completely remove the pipeline by untrenching and cut and lift - In this option, untrenching operations will have to be carried out to permit access to the pipeline cutting locations. The pipeline would then be cut in short sections (~15 meters) on the seabed. The cut sections would then be lifted to the surface and transported on shore. A DSV type vessel (with ROV support) could be considered to conduct the operation.

Option 2: Completely remove the pipeline by untrenching and reeling the pipeline - In this option, untrenching operations will have to be carried out to permit access to the pipeline location. The uncovered pipeline would then be removed from the seabed by being reeled on a vessel.

Option 3: Completely remove the pipeline by untrenching, lift and cut the pipeline onboard a vessel - In this option, untrenching operations will have to be carried out to permit access to the pipeline location. The uncovered pipeline would then be lifted and cut on board the vessel (Pipe lay vessel principle).

2.2.2 Partial Removal Options

Option 4: Partially remove the pipeline, leaving part of the line in situ, trench and bury the exposed areas of the line and ends - This option considers the removal of the tie-in spool sections at the Windermere and former ST-1 platform ends, and any other sections of pipeline that are unburied near the platform locations as necessary, followed by the trenching around any exposed areas and areas with insufficient burial (i.e. the two transition trench areas at the platform ends), before burying them to achieve sufficient burial.

Option 5: Partially remove the pipeline, leave part of the line in situ, rock dump the exposed areas of the line and ends - This option considers the removal of the spool sections at the Windermere and former ST-1 platform ends and any other sections of the pipeline that are unburied near the platforms, as necessary, followed by the covering of exposed areas and the two pipeline ends of the pipeline with rock dump where there is insufficient burial (i.e. at the two transition trenches at the platform ends).

The rock placement would use graded crushed rock that matches the existing rock material as closely as possible. The graded rock would be placed over the exposed pipeline sections in a carefully controlled operation.

Option 6: Partial removal of the pipeline by removal of exposed sections of pipeline by cut and lift - Under this option, each exposed or insufficiently buried section would be cut using one of a number of tools including, for instance, hydraulic shears, diamond wire cutting or abrasive water jet cutting. To make the cut using one of these tools, either the pipeline would be lifted off the seabed, or trenched to allow tool access. Burial or rock placement to cover the pipeline's cut ends would have to be considered under this option in order to provide protection against snagging of fishing nets.

2.2.3 Leave

Option 7: Leave all of the pipeline in situ, monitor and periodic debris clearance - This option considers the minimum work scope leaving the pipeline in its existing configuration. Over time the exposed sections of the pipeline would corrode and break up which would require periodic debris clearance operations to minimise future snagging risk to fishermen. The frequency and scope of the monitoring arrangements would be discussed and agreed with the OPRED.

2.3 Options Assessed for Umbilical During the Comparative Assessment Workshops

The following seven options for umbilical decommissioning were assessed

2.3.1 Complete Removal Options

Option 1: Completely remove the umbilical by untrenching, cut and lift - In this option, untrenching operations will have to be carried out to permit access to the umbilical cutting locations. The umbilical would then be cut in short sections (~15 meters) on the seabed. The cut sections would then be lifted to the surface and transported on shore. A DSV type of vessel (with ROV support) could be considered to conduct the operation.

Option 2: Completely remove the umbilical by untrenching and carrousel - In this option, untrenching operations will have to be carried out to permit access to the umbilical location. The uncovered umbilical would then be removed from the seabed by being reeled on a carrousel.

Option 3: Completely remove the umbilical by pulling from a carrousel vessel - It is assumed in this option that no untrenching or rock removal would be required. The umbilical would be pulled by force from a vessel and stored on a carrousel. The vessel would have the capability to recover the umbilical end in case of the umbilical snapping during the operation.

2.3.2 Partial Removal Options

Option 4: Partial removal: Remove the umbilical at the two platform ends and leave the remainder of the line in situ, trench and bury the two platform ends and any exposed areas of the line - This option considers the operation of trenching around any exposed area and the two ends of the umbilical before burying them.

Option 5: Partial Removal: Remove the umbilical at the two platform ends and leave the remainder of the line in situ, rock dump the exposed areas at the two platform ends and any exposed areas of the line - This option considers the operation of covering any exposed area and the two ends of the umbilical with rock dump.

The rock placement would use graded crushed rock that matches the existing rock material as closely as possible. The graded rock would be placed over the exposed umbilical sections in a carefully controlled operation.

Option 6: Partial removal of the umbilical by removal of exposed sections by cut and lift - Under this option, each exposed section would be cut using one of a number of tools including, for instance, hydraulic shears, diamond wire cutting or abrasive water jet cutting. To make the cut using the one of these tools, either the umbilical would be lifted off the seabed, or trenched to facilitate tool access. Rock placement to cover the umbilical's cut ends would have to be considered under this option in order to provide protection against snagging of fishing nets.

2.3.3 Leave

Option 7: Leave all of the umbilical in situ, monitor and periodic debris clearance - This option considers the minimum work scope leaving the umbilical in its existing configuration. Over time the exposed sections of the umbilical would corrode and break up which would require periodic debris clearance operations to minimise future snagging risk to fishermen. The frequency and scope of the monitoring arrangements would be discussed and agreed with the OPRED.

2.4 Mattresses Removal

This particular operation has not been directly compared against the other options detailed above. The reason for this is that the decommissioning of the mattresses, i.e. removal has been determined to be 'base case' for the Windermere Decommissioning Programmes and will not be subject to a comparative assessment.

2.5 Assessment Criteria

In order to evaluate each potential decommissioning option detailed above, criteria were defined in line with the OPRED guidance notes. The criteria were grouped into five main sections to include Safety, Environment, Technical, Societal and Commercial. A description of each of the criteria assessed is presented within the sections below.

2.5.1 Safety

- Risk to other users of the sea (post ops) - Assesses the risk that each decommissioning option poses to other sea users, post operations. This includes fishermen, shipping and other general sea users;
- Risk to those offshore (during ops) - Assesses the risk that each decommissioning option poses to those personnel working offshore during the operations, including vessel personnel, but excludes subsea divers;
- Risk to 3rd party assets/vessels (during ops) - Assesses the risk that each decommissioning option poses to 3rd party assets and vessels during operations. This can include pipelines, cables, support vessels etc;
- Level of Diving Intervention - Assesses the risk that each decommissioning option poses to divers;
- Risk to those onshore (during ops) - Assesses the risk that each decommissioning option poses to personnel onshore (transportation and waste) during operations.

2.5.2 Environmental

- Chemical Discharge - Assesses the expected environmental impact that each decommissioning option poses for chemical discharge during operations (i.e. the discharge of pipeline chemicals);
- Hydrocarbon discharge - Assesses the expected environmental impact that each decommissioning option poses for hydrocarbon discharge during operations (i.e. the discharge of residual hydrocarbons from the pipeline);
- Seabed Disturbance - Assesses the estimated environmental impact that each decommissioning option poses to the seabed, during operations;
- Energy Usage - Assesses expected energy use that each decommissioning option poses for the operations (excludes waste processing energy);
- Atmospheric emissions - Assesses expected atmospheric emissions that each decommissioning option poses for the operations;
- Accidental Spills - Assesses the estimated percentage of the material (i.e. pipeline) that each decommissioning option will discard to sea (left *in situ*);
- Noise underwater and onshore - Assesses the noise underwater and onshore that each decommissioning option will cause.

2.5.3 Technical

- Technical Challenge - Assesses how much of a technical challenge it would be for each decommissioning option. This implies assessing the risk of downtime due to technical difficulties.
- Weather Sensitivity - Assesses how sensitive to weather downtime each decommissioning activity is;
- Risk of Major Project Failure - Assesses the risk of major project failure for each decommissioning option.

2.5.4 Societal

- Fisheries and Shipping Access (post ops) - Assesses the risk that each decommissioning option poses to access for fisheries and shipping (exclusion zone or non-trawling areas);
- Community (onshore) disturbance - Assesses the risk that each decommissioning option poses to onshore communities, when materials are brought ashore for disposal or processing (i.e. communities situated near the sites);
- Local Employment - Assesses the risk or the opportunity that each decommissioning option poses/offers to local employment, such as those working in local shipping yards.

2.5.5 Commercial

- Economic - Assesses the magnitude of the cost of each decommissioning option;
- Ongoing Responsibility - Assesses the risk that each decommissioning option poses to on-going responsibility for inspection and correction.

2.6 Scoring Criteria

Each of the options and assessment criteria described within the sections above was scored in terms of their likelihood and impact using a standard 5x5 risk assessment matrix, as shown in Figure 2-1 below.

Figure 2-1 Risk Assessment Matrix

	Likelihood				
Impact Score	Rare	Unlikely	Possible	Likely	Almost Certain
5 Catastrophic	5	10	15	20	25
4 Major	4	8	12	16	20
3 Moderate	3	6	9	12	15
2 Minor	2	4	6	8	10
1 Negligible	1	2	3	4	5

Score	Risk Level	Recommended Response
15-25	High	Immediate action or detailed planning to be included in implementation plans
8-14	Medium	Measures to be included into action plans and monitored
1-7	Low	Limited action and review will be undertaken

3 Comparative Assessment Results

This section of the report summarises the main outcomes from the Comparative Workshops held on the 10th December 2014 and 9th February 2015, and in the case of the Umbilical, the further comparative assessment work undertaken.

3.1 8" Pipeline

The 8" gas export pipeline is 6.8km in length with a wall thickness of 10mm. The pipeline is buried at an average depth of approximately 1m below seabed for the majority of the route, apart from relatively short exposed sections where the two tie-in spools join at each platform end and in the transition trench areas where the pipelines approach the two platforms (approximately 100m long). A single rock dumped section is present, approximately 2km from Windermere, for a length of 42 meters.

Each of the decommissioning options was discussed against the assessment criteria and given a score for likelihood and impact, therefore providing the risk level, which is presented in Table 3-1 below. Appendix A presents the reasoning behind the scores and therefore an explanation of the risk levels.

A burial profile for the 8" gas export line is provided as Appendix B.

The results of the workshops concluded in favour of ***Partial Removal*** for the 8" gas export line.

Other options, i.e. complete removal or leave *in situ*, scored substantially higher than this option.

The sub-option with the lowest overall score considered removal of the tie-in spools and trench/burial of the exposed ends. It was concluded that rock dumping of the two pipeline ends, (although scoring second lowest in the assessment), would only be suitable as a contingency option in the event that trench/bury approach fails.

Table 3-1 Summary of Comparative Assessment Workshop Scoring Worksheets for 8" Pipeline

Assessment Criteria	Decommissioning Options - Pipeline																				
	Complete Removal Options									Partial Removal Options									Leave		
	1: Completely remove the line. Untrench, cut on seabed and lift			2: Completely remove the line. Untrench and reel			3: Completely remove the line. Untrench, lift and cut on board the vessel			4: Remove tie-in spools. Leave remainder *In situ*. Trench and bury where necessary to acheieve sufficient bural			5. Remove tie-in spools. Leave remainder *In situ*. Rock dump where there is insufficient burial			6. Remove tie-in spools. Remove all other sections of pipeline by cut and lift where there is insufficient burial			7. Leave *In situ* . Monitor and periodic debris clearance		
	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R
1. Safety																					
1.1 Risk to other users of the sea (post ops)	1	1	1	1	1	1	1	1	1	2	2	4	3	2	6	3	2	6	4	3	12
1.2 Risk to those offshore (during ops)	2	4	8	1	4	4	2	4	8	1	4	4	1	4	4	2	4	8	1	1	1
1.3 Risk to 3rd party assets/vessels (during ops)	2	3	6	2	3	6	1	3	3	2	3	6	2	3	6	2	3	6	2	3	6
1.4 Level of Diving Intervention	3	4	12	1	4	4	1	4	4	1	4	4	1	1	1	2	4	8	1	1	1
1.5 Risk to those onshore (during ops)	2	4	8	1	4	4	2	4	8	1	1	1	2	4	8	1	4	4	1	1	1
Average Safety Value:	**7.00**			**3.80**			**4.80**			**3.80**			**5.00**			**6.40**			**4.20**		
2. Environmental																					
2.1 Chemical Discharge	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2.1 Hydrocarbon discharge	2	2	4	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2
2.3 Seabed Disturbance	5	4	20	5	4	20	5	4	20	5	2	10	5	2	10	5	2	10	5	1	5
2.4 Energy Usage	5	3	15	5	2	10	5	2	10	5	1	5	5	1	5	5	1	5	5	1	5
2.5 Atmospheric emmissions	5	3	15	5	2	10	5	2	10	5	1	5	5	1	5	5	1	5	5	1	5
2.6 Accidental Spills	3	3	9	3	3	9	3	3	9	3	2	6	2	2	4	2	2	4	2	2	4
2.7 Noise underwater and onshore	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Environmental Value:	**9.43**			**7.57**			**7.57**			**4.29**			**4.00**			**4.00**			**3.29**		
3. Technical																					
3.1 Technical Challenge	3	3	9	2	2	4	2	2	4	2	2	4	2	2	4	2	3	6	1	1	1
3.2 Weather Sensitivity	2	2	4	2	2	4	2	2	4	2	2	4	1	1	1	2	2	4	2	1	2
3.3 Risk of Major Project Failue	2	2	4	2	2	4	2	2	4	2	2	4	1	1	1	2	2	4	1	1	1
Average Technical Value:	**5.67**			**4.00**			**4.00**			**4.00**			**2.00**			**4.67**			**1.33**		
4. Societal																					
4.1 Fisheries and Shipping Access (post ops)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	3	2	6
4.2 Community (onshore) disturbance	5	3	15	5	2	10	5	3	15	5	1	5	5	2	10	5	1	5	5	1	5
4.3 Local Employment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Societal Value:	**5.67**			**4.00**			**5.67**			**2.33**			**4.00**			**3.33**			**4.00**		
5. Commercial																					
5.1 Economic	5	5	25	5	3	15	5	4	20	5	1	5	5	1	5	5	3	15	5	2	10
5.2 Ongoing Responsibility	2	1	2	2	1	2	2	1	2	4	2	8	4	2	8	4	2	8	5	4	20
Average Commercial Value:	**13.50**			**8.50**			**11.00**			**6.50**			**6.50**			**11.50**			**15**		
Total Scores	**41**			**28**			**33**			**21**			**22**			**30**			**28**		

3.2 Umbilical

3.2.1 Results of CA Workshops

The umbilical is 7km in length with a diameter of 95mm. The umbilical is buried apart from exposed lengths at each platform end, however, depth of burial is variable along the route. In surveys undertaken between 1997 and 2014 the umbilical has remained buried throughout with no exposures or freespans identified on the route, except for one isolated reading in 2014 (see below). A summary of umbilical survey data is provided as Table 3-2.

Table 3-2 Summary of Survey Data for the Umbilical

	Maximum Depth of Burial (m)	Minimum Depth of Burial (m)	Average Depth of Burial (m)
1997	1.0	0.2	0.71
1998	0.87	0.21	0.64
1999	1.1	0.3	0.6
2000	1.2	0.1	0.7
2001	1.2	0.4	0.7
2002	1.4	0.5	1.2
2003	1.3	0.7	0.9
2004	0.9	0.2	0.7
2005	1.3	0.4	0.8
2006	1.3	0.4	0.9
2007	1.5	0.4	0.6
2014	1.2	0*	0.7
Average	**1.2**	**0.32**	**0.76**
Max	**1.5**	**0.7**	**1.2**
Min	**0.87**	**0***	**0.6**
Variance	**0.63**	**0.7**	**0.6**

*Approximately 0.25m of umbilical recorded as exposed at surface by instrumentation. However, visibility was poor on the survey and it was not possible to verify this reading by visual observation. Additionally, surveys undertaken in 2015 did not observe any surface exposures on the pipeline/umbilical route.

The survey data shows an average burial depth of 0.76m throughout the surveys undertaken. Although the data has shown variance of between 0.6-0.7m throughout this time, there have not been any exposures or freespans observed along the main umbilical route throughout the duration of Windermere operations other than at the platform ends and on the single reading from the 2014 survey.

In the workshops, each of the decommissioning options was discussed against the assessment criteria and given a score for likelihood and impact. The results of the CA workshops are provided in Table 3-3 below. Appendix D presents the reasoning behind the scores attributed to each option during the CA workshops.

The CA workshops concluded that both ***partial removal*** and ***complete removal*** options were potentially acceptable for the umbilical, however, the best scoring option was shown to be ***partial removal.*** The results of the CA workshops are summarised in Table 3-3 below.

Given the depth of burial shown in the survey data collected, it was not considered necessary to undertake remedial work on the umbilical other than at the two platform ends. Although survey data has shown burial to be less than 600mm in places, the survey data has shown a reasonable degree of variability (up to 600mm) and, given that the umbilical has never been exposed at surface (other than one single survey reading), or in freespan, during the entire operational history of Windermere, it is considered to be sufficiently stable.

Additionally, by limiting the decommissioning of the umbilical to only the platform ends, this significantly limits the degree of safety risk and environmental impact that would otherwise be encountered by the seabed disturbance along the umbilical route.

Table 3-3 Summary of Comparative Assessment Workshop Scoring Worksheets for Umbilical

Assessment Criteria	Decommissioning Options - umbilical																				
	Complete Removal Options									Partial Removal Options									Leave		
	1: Completely remove the line. Untrench, cut on seabed and lift			2: Completely remove the line. Untrench and reel umbilical on carroussel			3. Completely remove the line. Pull from Vessel			4: Remove surface laid sections at platforms ends. Leave remainder *In situ*. Trench and bury the sections of line where there is insufficient burial			5. Remove surface laid sections at platform ends. Leave remainder *In situ*. Rock dump the sections of line where there is insufficient bural			6. Remove surface laid sections at platform ends. Remove sections of umbilical by cut and lift form sections where there is insufficient burial.			7. Leave in situ: Monitor and periodic debris clearance		
	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R	L	I	R
1. Safety																					
1.1 Risk to other users of the sea (post ops)	1	1	1	1	1	1	1	1	1	2	2	4	3	2	6	3	2	6	4	3	12
1.2 Risk to those offshore (during ops)	2	4	8	1	4	4	2	4	8	1	4	4	1	4	4	2	4	8	1	1	1
1.3 Risk to 3rd party assets/vessels (during ops)	2	3	6	2	3	6	2	3	6	2	3	6	2	3	6	2	3	6	2	3	6
1.4 Level of Diving Intervention	3	4	12	1	4	4	2	4	8	1	4	4	1	1	1	2	4	8	1	1	1
1.5 Risk to those onshore (during ops)	2	4	8	1	4	4	2	3	6	1	1	1	2	4	8	1	4	4	1	1	1
Average Safety Value:	**7.00**			**3.80**			**5.80**			**3.80**			**5.00**			**6.40**			**4.20**		
2. Environmental																					
2.1 Chemical Discharge	2	1	2	2	1	2	2	1	2	1	1	1	1	1	1	2	1	2	2	1	2
2.1 Hydrocarbon discharge	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2.3 Seabed Disturbance	5	4	20	5	4	20	5	2	10	5	2	10	5	2	10	5	2	10	5	1	5
2.4 Energy Usage	5	3	15	5	2	10	5	2	10	5	1	5	5	1	5	5	1	5	5	1	5
2.5 Atmospheric emmissions	5	3	15	5	2	10	5	2	10	5	1	5	5	1	5	5	1	5	5	1	5
2.6 Accidental Spills	3	3	9	3	3	9	2	2	4	3	2	6	2	2	4	2	2	4	2	2	4
2.7 Noise underwater and onshore	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Environmental Value:	**9.00**			**7.57**			**5.43**			**4.14**			**3.86**			**4.00**			**3.29**		
3. Technical																					
3.1 Technical Challenge	3	3	9	2	2	4	3	2	6	2	3	6	2	3	6	2	3	6	1	1	1
3.2 Weather Sensitivity	2	2	4	2	2	4	2	2	4	2	2	4	1	1	1	2	2	4	2	1	2
3.3 Risk of Major Project Failue	2	2	4	2	2	4	2	2	4	2	2	4	1	1	1	2	2	4	1	1	1
Average Technical Value:	**5.67**			**4.00**			**4.67**			**4.67**			**2.67**			**4.67**			**1.33**		
4. Societal																					
4.1 Fisheries and Shipping Access (post ops)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	4	4	3	12
4.2 Community (onshore) disturbance	5	3	15	5	2	10	5	2	10	5	1	5	5	2	10	5	1	5	5	1	5
4.3 Local Employment	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Average Societal Value:	**5.67**			**4.00**			**4.00**			**2.33**			**4.00**			**3.33**			**6.00**		
5. Commercial																					
5.1 Economic	5	5	25	5	4	20	5	3	15	5	2	10	5	2	10	5	2	10	5	2	10
5.2 Ongoing Responsibility	2	1	2	2	1	2	2	1	2	5	3	15	5	3	15	4	4	16	5	4	20
Average Commercial Value:	**13.50**			**11.00**			**8.50**			**12.50**			**12.50**			**13.00**			**15**		
Total Scores	**41**			**30**			**28**			**27**			**28**			**31**			**30**		

4 Conclusion of Comparative Assessment

4.1.1 8" pipeline

The result of the comparative assessment of the different options for decommissioning Windermere 8" pipeline shows that the best scoring option when considering criteria such as Safety, Environment, Technical, Societal and Commercial, consists of:

- ***Partial Removal***: Remove tie-in spool sections at the platform ends, and leave the remainder of the existing buried pipeline *in situ* – Trench and bury the exposed areas of the line and the ends.

Therefore, it was concluded that a strategy of ***Partial Removal*** should be employed for the Windermere pipeline decommissioning. The specific engineered solution should be determined during the detailed design stage of the project, however, the base case method should be as above unless it can be demonstrated that this approach is not possible.

4.1.2 Umbilical

Regarding the umbilical, the CA workshops determined ***Partial Removal*** was the best scoring option, consisting of removal at both platform ends where the umbilical is unburied with the ends trenched and buried. The burial stability of the umbilical has been shown to be good from the survey data collected between 1997 and 2014, with no freespans identified in the history of operations an only one limited recorded exposure. Due to this stability, the risk of snagging was considered low and therefore it was not considered of benefit to undertake works on the umbilical other than at the two platform ends.

4.1.3 Mattresses

During this comparative assessment exercise, the operation of removing mattresses located on top of the pipeline and the umbilical was determined to present a high risk regarding safety and technical challenges. However, this is the base case decommissioning plan and has therefore not been subject to comparative assessment.

Appendix A - 8" Pipeline Score Reasoning

A-1 Completely remove the pipeline by untrenching and cut and lift

Safety

The complete removal of the pipeline eliminates any snagging hazards.

Main risks are due to the potential for dropped objects during onshore and offshore operations.

Due to the large quantity of subsea operations, it is likely that diving intervention will be required which poses a high risk.

There is also a risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment, but this is considered to be low.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed. However, more interaction with the pipeline in this option, i.e. cutting, could result is discharge of residual chemicals, solids, etc. that may be left in the line, or generated from the cutting activities, compared to other options that do not involve cutting the line.

It is anticipated that there would be high disturbance to the seabed, approximately 120-200% of equipment footprint.

Energy usage and atmospheric emissions are also estimated to be high, due to the large amount of equipment required for multiple activities of long durations.

There is risk of accidental spills from operation vessels which is increased due to long duration of cutting activities.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

There are a high number of activities required for this decommissioning option, which increases the likelihood of technical challenges. Furthermore, although there is a high level of historical experience for decommissioning activities, they remain a non-routine task which also increases risk.

The requirement of a crane for lifting means activities have both wind and wave restrictions, making them weather sensitive.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the pipeline being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards.

However, there will be an increase of activity around the local ports and yards which could disrupt the onshore community.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

A-2 Completely remove the pipeline by untrenching and reeling the pipeline

Safety

The complete removal of the pipeline eliminates any snagging hazards.

The use of a reel vessel also eliminates risks for dropped objects offshore, however offshore and onshore personal risks still exist.

There is no known requirement for diving intervention therefore risks are low.

There is also a risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment, but this is considered to be low.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed.

It is anticipated that there would be high disturbance to the seabed, approximately 120-200% of equipment footprint.

Energy usage and atmospheric emissions are remain high but are lower than those of option 1 due to a reduction in cutting activities.

There is risk of accidental spills from operation vessels.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the pipeline being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards. There will some disruption to the onshore community but this was considered lower than that of option 1.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

A-3 Completely remove the pipeline by untrenching, lift and cut the pipeline onboard a vessel

Safety

The complete removal of the pipeline eliminates any snagging hazards.

Main risks are due to the potential for dropped objects and cutting hazards during onshore and offshore operations.

Because pipeline cutting occurs above water, there is low requirement for subsea divers.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed.

It is anticipated that there would be high disturbance to the seabed, approximately 120-200% of equipment footprint.

Energy usage and atmospheric emissions are also estimated to be high, due to the large amount of equipment required for multiple activities of long durations.

There is risk of accidental spills from operation vessels.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the pipeline being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards. There will some disruption to the onshore community but this was considered lower than that of option 1.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

A-4 Partially remove the pipeline, leave part of the line *in situ, t*rench and bury the exposed areas of the line and ends

Safety

There is a potential snagging hazard when leaving a pipeline *in situ* however the likelihood is low due to burial of exposed areas and ends.

There are negligible risks for dropped objects offshore however operational risks during trenching apply.

There is no known requirement for diving intervention therefore risks are low.

There is also a slight risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment.

The overall safety risk was considered to be low.

Environmental

Environmental risks were considered to be low apart from seabed disturbance which is high due to trenching around the pipeline.

Energy usage and atmospheric emissions are also estimated to be low, due to the less amount of equipment required for multiple activities of shorter durations.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low in all areas due to fewer disturbances by leaving the pipeline *in situ*.

Commercial

This option is expected to have a low costs and with some ongoing responsibility.

A-5 Partially remove the pipeline, leave part of the line *in situ,* rock dump the exposed areas of the line and ends

Safety

There is a potential snagging hazard when leaving a pipeline *in situ* however the likelihood is low due to rock dumping of exposed areas and ends.

There are risks for dropped objects onshore when loading the vessel, however risks offshore are low.

There is no known requirement for diving intervention therefore risks are low.

Environmental

There is only a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed.

No trenching activities also reduce risk of accidental spills from operational vessels.

It is anticipated that there would only be a negligible disturbance to the seabed.

Energy usage and atmospheric emissions are also estimated to be low, due to the less amount of equipment required for multiple activities of shorter durations.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low, however disturbance to onshore communities could occur.

Commercial

This option is expected to have a low costs and with some ongoing responsibility.

A-6 Leave all of the pipeline *in situ*: Monitor and periodic debris clearance

Safety

Leaving the pipeline *in situ* without covering exposed areas and ends is a snagging hazard.

Opening up the exclusion zone to this hazard poses risks to other users of the sea and third parties.

However, there are negligible risks to onshore and offshore operatives because there are near to no activities.

There is also no requirement for diving intervention therefore overall safety risks are low.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed.

Societal

There is some risk of access for fisheries and shipping if there is movement of debris from the site.

Commercial

This option is expected to have a mid-level costs and with high ongoing responsibility.

A-7 Partial removal of the pipeline by removal of exposed sections of pipeline by cut and lift

Safety

Main risks are due to the potential for dropped objects during onshore and offshore operations.

Due to increased subsea operations there is likely to be a requirement for diving intervention which poses a high risk, however fewer cuts reduces the likelihood and therefore risks compared to Option 1.

Environmental

There is only a low risk for chemical and hydrocarbon discharge due to the pipeline having already been flushed.

There will be high levels of seabed disturbance however this will only occur at sites where the pipeline is exposed.

Fewer operations also means a reduced risk for energy usage, atmospheric emissions and accidental spills.

Technical

There are fewer activities required for this decommissioning option; however there is still risk of technical challenges, specifically with subsea cutting. Furthermore, although there is a high level of historical experience for decommissioning activities, they remain a non-routine task which also increases risk.

There is a requirement for lifting activities therefore the operations are fairly weather sensitive.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore, there is risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access because the exclusion zone will be opened after decommissioning activities.

There is also the potential for benefits to local employment at ship and disposal yards.

However, there will be an increase of activity around the local ports and yards which could disrupt the onshore community.

Commercial

This option is expected to have a high costs and with mid-level ongoing responsibility.

A-8 Mattress removal - affect common to all the other options

Safety

The overall safety risk for removing a mattress is high, because of the uncertainty of lifting activities. If the mattress has a low structural integrity there is significant risk for dropped concrete onto the vessel causing damage.

Furthermore, there is a requirement for diving intervention due to the majority of activities being subsea.

Environmental

There are low environmental risks due to negligible chemical and hydrocarbon discharge and low seabed disturbance, energy usage and atmospheric emissions.

Technical

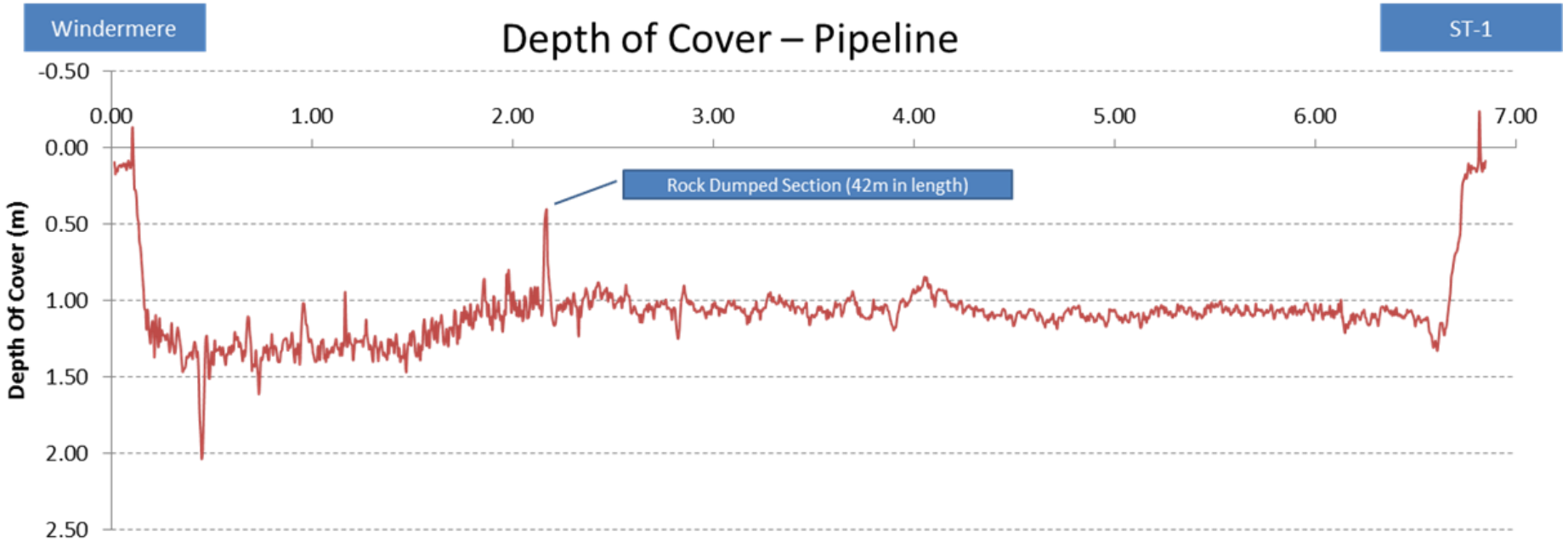
Significant technical risks exist because failure to remove the mattress means DECC requirements have not been satisfied.

The activity is also very weather sensitive, which could lead to delays in the project programme.

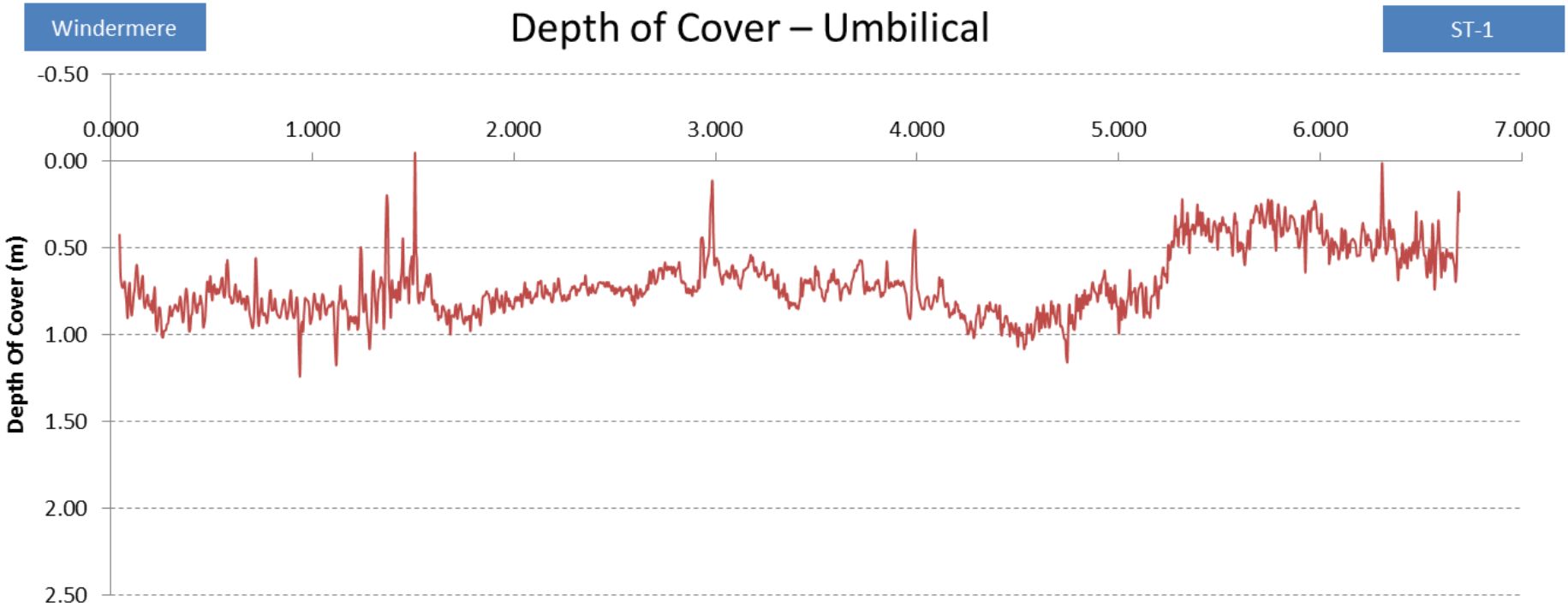
Societal

There is a low stakeholder risk as there would be negligible community disturbance and little impact to fishery and shipping access.

Appendix B - 8” Gas Export Pipeline Burial Profile



Appendix C - Umbilical Burial Profile



Appendix D - Umbilical Score Reasoning (Workshops)

D-1 Completely remove the umbilical by untrenching and cut and lift

Safety

The complete removal of the umbilical eliminates any snagging hazards.

Main risks are due to the potential for dropped objects during onshore and offshore operations.

There is also a risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment, but this is considered to be low.

Due to the large quantity of subsea operations there is likely to be a requirement for diving intervention which poses a high risk.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed.

It is anticipated that there would be high disturbance to the seabed, approximately 120-200% of equipment footprint.

Energy usage and atmospheric emissions are also estimated to be high, due to the large amount of equipment required for multiple activities of long durations.

There is however risk of accidental spills from operation vessels which is increased due to long duration of cutting activities.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

There are a high number of activities required for this decommissioning option, which increases the likelihood of technical challenges. Furthermore, although there is a high level of historical experience for decommissioning activities, they remain a non-routine task which also increases risk.

The requirement of a crane for lifting means activities have both wind and wave restrictions, making them weather sensitive.

The decommissioning option does not depend upon novel techniques, however proven technology is being applied differently. Therefore there is risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the umbilical being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards. However, there will be an increase of activity around the local ports and yards which could disrupt the onshore community.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

D-2 Completely remove the umbilical by untrenching and carrousel

Safety

The complete removal of the umbilical eliminates any snagging hazards.

The use of a reel vessel also eliminates risks for dropped objects offshore, however offshore and onshore personal risks still exist.

There is no known requirement for diving intervention therefore risks are low.

There is also a risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment, but this is considered to be low.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed. There is however risk of accidental spills from operation vessels.

It is anticipated that there would be high disturbance to the seabed, approximately 120-200% of equipment footprint.

Energy usage and atmospheric emissions are remain high but are lower than those of option 1 due to a reduction in cutting activities.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the umbilical being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards. There will some disruption to the onshore community but this was considered lower than that of option 1.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

D-3 Completely remove the umbilical by pulling pull from a carrousel vessel

Safety

The complete removal of the umbilical eliminates any snagging hazards.

Main risks are due to the potential for the umbilical to snap during offshore operations.

It is likely that diving intervention will be required which poses a high risk.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed.

It is anticipated that there would be high disturbance to the seabed as well as high energy usage and atmospheric emissions due to the large amount of equipment required for multiple activities of long durations.

There is risk of accidental spills from operation vessels.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access due to the umbilical being completely removed and the exclusion zone opened.

There is also the potential for benefits to local employment at ship and disposal yards. There will some disruption to the onshore community but this was considered lower than that of option 1.

Commercial

This option is expected to have a high costs and therefore large economic risks but negligible ongoing responsibility.

D-4 Partial Removal: Remove the umbilical at the two platform ends and leave the remainder of the line *in situ, t*rench and bury the two platform ends and any exposed areas of the umbilical

Safety

There is a potential snagging hazard when leaving a umbilical *in situ* however the likelihood is low due to burial of exposed areas and ends.

There are negligible risks for dropped objects offshore however operational risks during trenching apply.

There is no known requirement for diving intervention therefore risks are low.

There is also a slight risk to 3rd party assets and vessels during operations due to the potential for breakdown of trenches which could damage the trenching equipment.

The overall safety risk was considered to be low.

Environmental

Environmental risks were considered to be low apart from seabed disturbance which is high due to trenching around the umbilical.

Energy usage and atmospheric emissions are also estimated to be low, due to the less amount of equipment required for multiple activities of shorter durations.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions. The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low in all areas due to fewer disturbances by leaving the umbilical *in situ*.

Commercial

This option is expected to have a low costs and with some ongoing responsibility.

D-5 Partial Removal: Remove the umbilical at the two platform ends and leave th remainder of the line *in situ, r*ock dump the exposed areas at the two platform ends and any exposed areas of the line

Safety

There is a potential snagging hazard when leaving a umbilical *in situ* however the likelihood is low due to rock dumping of exposed areas and ends.

There are risks for dropped objects onshore when loading the vessel, however risks offshore are low.

There is no known requirement for diving intervention therefore risks are low.

Environmental

There is only a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed.

It is anticipated that there would only be a negligible disturbance to the seabed.

Energy usage and atmospheric emissions are also estimated to be low, due to the less amount of equipment required for multiple activities of shorter durations.

No trenching activities also reduce risk of accidental spills from operational vessels.

There are currently no regulator restrictions of underwater noise for subsea cutting and there is likely to be low vibrational impacts. Onshore noise is a safety issue considered within the noise control philosophy.

Technical

Technical risks are considered to be low for this option due to a reduction of subsea work and utilisation of a vessel specific to this type of work.

There is also no requirement for lifting activities therefore fewer weather restrictions.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is some risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low, however disturbance to onshore communities could occur.

Commercial

This option is expected to have a low costs and with some ongoing responsibility.

D-6 Leave all of the umbilical *in situ, m*onitor and periodic debris clearance

Safety

Leaving the umbilical *in situ* without covering exposed areas and ends is a snagging hazard. Opening up the exclusion zone to this hazard poses risks to other users of the sea and third parties.

However, there are negligible risks to onshore and offshore operatives because there are near to no activities.

There is also no requirement for diving intervention therefore overall safety risks are low.

Environmental

There is a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed.

Societal

There is some risk of access for fisheries and shipping if there is movement of debris from the site.

Commercial

This option is expected to have a mid-level costs and with high ongoing responsibility.

D-7 Partial removal of the umbilical by removal of exposed sections by cut and lift

Safety

Main risks are due to the potential for dropped objects during onshore and offshore operations.

Due to increased subsea operations it is likely that diving intervention is required which poses a high risk, however fewer cuts reduces the likelihood and therefore risks compared to Option 1.

Environmental

There is only a low risk for chemical and hydrocarbon discharge due to the umbilical having already been flushed.

There will be high levels of seabed disturbance however this will only occur at sites where the umbilical is exposed.

Fewer operations also means a reduced risk for energy usage, atmospheric emissions and accidental spills.

Technical

There are fewer activities required for this decommissioning option; however there is still risk of technical challenges, specifically with subsea cutting. Furthermore, although there is a high level of historical experience for decommissioning activities, they remain a non-routine task which also increases risk.

There is a requirement for lifting activities therefore the operations are fairly weather sensitive.

The decommissioning option does not depend upon novel techniques; however proven technology is being applied differently. Therefore there is risk of delays to the project but negligible risk for project failure.

Societal

Risks to stakeholders were considered low for fisheries and shipping access because the exclusion zone will be opened after decommissioning activities.

There is also the potential for benefits to local employment at ship and disposal yards.

However, there will be an increase of activity around the local ports and yards which could disrupt the onshore community.

Commercial

This option is expected to have a high costs and with mid-level ongoing responsibility.

D-8 Mattress removal - affect common to all the other options

Safety

The overall safety risk for removing a mattress is high, because of the uncertainty of lifting activities. If the mattress has a low structural integrity there is significant risk for dropped concrete onto the vessel causing damage.

Furthermore, there is a requirement for diving intervention due to the majority of activities being subsea.

Environmental

There are low environmental risks due to negligible chemical and hydrocarbon discharge and low seabed disturbance, energy usage and atmospheric emissions.

Technical

Significant technical risks exist because failure to remove the mattress means DECC requirements have not been satisfied.

Societal

There is a low stakeholder risk as there would be negligible community disturbance and little impact to fishery and shipping access.