WINTERSHALL NOORDZEE B.V.

Wingate Pipeline Decommissioning

Comparative Assessment Report

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Comparative Assessment Report

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Rev 0	17/11/2023	Draft for JNCC comment	RD / ESL	PE	PE
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EXECUTIVE SUMMARY

The Wingate field is located in Blocks 44/18d, 44/23f, 44/24b and 44/19, approximately 177km from the UK coastline, and 10.4km from the UK/Netherlands median line, in water depths of around 29m Lowest Astronomical Tide.

First discovered in 2008, a Normally Unmanned Installation platform was installed at the Wingate field, and production commenced in 2011. The field comprises of:

- Six development wells (of the initial six development wells, there are still four live gas wells (two currently producing, one intermittently producing and one not producing) and two abandoned gas wells (44/24b-A2Z Phase 1 and 44/24b-A6 Phase 2).);
- A 12" gas export pipeline (PL2850); and
- A 2" Methanol chemical supply line (PL2851).

Both the gas export and chemical supply line are tied back to the D15-FA-1 platform located in the Netherlands sector of the North Sea.

The Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) decommissioning guidance (BEIS, 2018) states that where a decommissioning programme includes a pipeline, a Comparative Assessment (CA) is required to be carried out for all feasible options to inform decisions relating to the decommissioning.

Two documents are being submitted in support of the plans to decommissioning Wingate, this CA and an Environmental Appraisal (EA).

This document presents the CA undertaken to support the preparation of the Decommissioning Programme on behalf of Wintershall Noordzee B.V. (Wintershall) by Intertek Metoc (Intertek).

The scope of the CA was for the UK sections of the two Wingate pipelines (PL2850 and PL2851). Eight options for decommissioning the pipelines were screened to shortlist four technically feasible options.

The CA assessed each shortlisted option against a set of criteria. The options assessed were:

- Option 1: Leave in-situ
- Option 2: Partial removal
- Option 4A: Full removal – reverse s-lay
- Option 4C: Full removal – cut and lift

Criteria were defined in line with the BEIS Guidance (BEIS, 2018) and Guidelines for Comparative Assessment in Decommissioning Programmes (OGUK, 2015). The criteria were grouped into five main sections to include Safety, Environment, Technical, Societal and Commercial. Sub-criteria were developed for each criteria. Options were scored on a scale of 1 to 5 and weightings applied to allow for differing opinions on the relative importance of the criteria.

A series of workshops were run to identify, assess and score the options for the pipeline including:

I An Environmental Risk Identification (ENVID) workshop was undertaken to identify the environmental risks associated with each option. This workshop was also used to identify the options to be carried forward to CA.

II An internal CA workshop was undertaken to score and comparatively assess the feasible options.

III A subsequent CA workshop was held with stakeholders to review and verify the scoring and ensure all concerns were identified and assessed.

The recommended decommissioning option for the Wingate pipeline based on the scoring of the CA is Partial Removal (Option 2).

The CA concludes the following:

- Partial removal is considered the best option in 9 of the 12 sub-criteria.
- Partial removal is assessed as having the lowest safety risk.
- Partial removal and leave in-situ are assessed as having the same environmental risk, technical risk, societal impact and similar economic costs.

Under Option 2:

- Pipelines will be cleaned and flushed.
- Sections of pipeline will be removed from the area immediately adjacent to the platform up to the point at which the pipeline is trenched and buried.
- Cut ends will be protected with rock deposits (estimated up to 20m^2).
- Remaining trenched and buried pipeline will remain *in situ.*

It is also proposed that after a period of five years, a survey will be carried out to provide an inspection of the *in situ* pipelines. Thereafter any inspection and frequency will be agreed with OPRED, although up to three surveys are anticipated as necessary.

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GLOSSARY

ALARP
As Low As Reasonably Practicable

BEIS
Department for Business, Energy & Industrial Strategy

BPEO
Best Practicable Environmental Option

CA
Comparative Assessment

CCS
Carbon Capture and Storage

CO_2
Carbon Dioxide

CO_2eq
Carbon Dioxide Equivalent

CSV
Construction Support Vessel

DESNZ
Department for Energy Security and Net Zero

DP
Dynamic positioning

DSV
Diving Support Vessel

ENVID
Environmental Risk Identification

HAZID
Hazard identification

HSE
Health and Safety Executive

Intertek
Intertek Metoc

JNCC
Joint Nature Conservation Committee

kHz
Kilohertz

km
Kilometre

km^2
Square Kilometre

KP
Kilometre Point

LAT
Lowest Astronomical Tide

m^2
Square metre

m
Metre

MBES
Multibeam Echo Sounder

MFE
Mass Flow Excavator

NFFO
National Federation of Fishermen's Organisation

NUI
Normally Unmanned Installation

OGA
Oil and Gas Authority

OGUK
Oil and Gas United Kingdom

OPRED
Offshore Petroleum Regulator for Environment and Decommissioning

OSPAR
Oslo Paris Convention

PSV
Pipeline Support Vessel

ROV
Remotely Operated Vehicle

SAC
Special Area of Conservation

SIMOPS
Simultaneous Operations

UK
United Kingdom

SSS
Side Scan Sonar

Wintershall
Wintershall Noordzee B.V.

Te
Tonne

1. INTRODUCTION

1.1 Purpose and Scope

The purpose of this Comparative Assessment (CA) is to evaluate, in accordance with the relevant guidance note (BEIS, 2018) the best decommissioning option for the UK sections of the Wingate gas export pipeline and the Methanol chemical supply line.

Wintershall Noordzee B.V. (Wintershall) commissioned Intertek to lead a CA in support of the Wingate Pipeline Decommissioning Programme. The outputs of the CA will assist in identifying the preferred decommissioning option. The CA will be submitted to support the decommissioning of the Wingate field to OPRED.

This report describes the infrastructure to be decommissioned, the options considered, the CA methodology and the findings of the CA.

1.2 Regulatory Context

In the UK, the principal legislation for the decommissioning of disused offshore installations and pipelines is the Petroleum Act 1998 (as amended).

The UK's international obligations on decommissioning are governed primarily by the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (OSPAR Convention). The OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations sets out OSPAR Contracting Parties obligations on the decommissioning of offshore installations.

Pipelines do not fall within the definition of offshore installations and are not covered by the OSPAR Decision 98/3, but Department for Energy Security and Net Zero (DESNZ) require that operators apply the OSPAR Framework when assessing pipeline decommissioning options. This is confirmed within the BEIS Guidance (BEIS, 2018); where a decommissioning programme includes a pipeline, a CA is required to be carried out for all feasible options to inform decisions relating to the decommissioning.

1.3 Overview of Wingate Field

The Wingate field is located in the Southern North Sea and produces gas and condensate. The Wingate field is located within Blocks 44/18d, 44/23f, 44/24b and 44/19, the Wingate platform is approximately 177km from the UK coastline, and 10.4km from the UK/Netherlands median line (see Figure 1-1 (Drawing number: P1841V-LOC-002)). The Wingate platform and 7km of the pipelines are located within the Dogger Bank Special Area of Conservation (SAC), which is designated for the Annex I habitat “Sandbanks which are slightly covered by seawater all the time”.

The Wingate field was discovered in October 2008. The field was approved in 2010 and the single Normally Unmanned Installation (NUI) platform was installed and production began in 2011. The Wingate platform subsea arrangement and tie in are shown in Figure 1-2. Of the initial six development wells, there are still four live gas wells (two currently producing, one intermittently producing and one not producing) and two abandoned gas wells (44/24b-A2Z Phase 1 and 44/24b-A6 Phase 2). Export from the field is via the Wingate NUI platform and a 12" gas export pipeline (PL2850), piggy-backed with a 2" Methanol chemical supply line (PL2851) to the D15-FA-1 platform, in the Netherlands sector of the North Sea. It is anticipated that the field will cease production in Q4 2024 at the earliest.

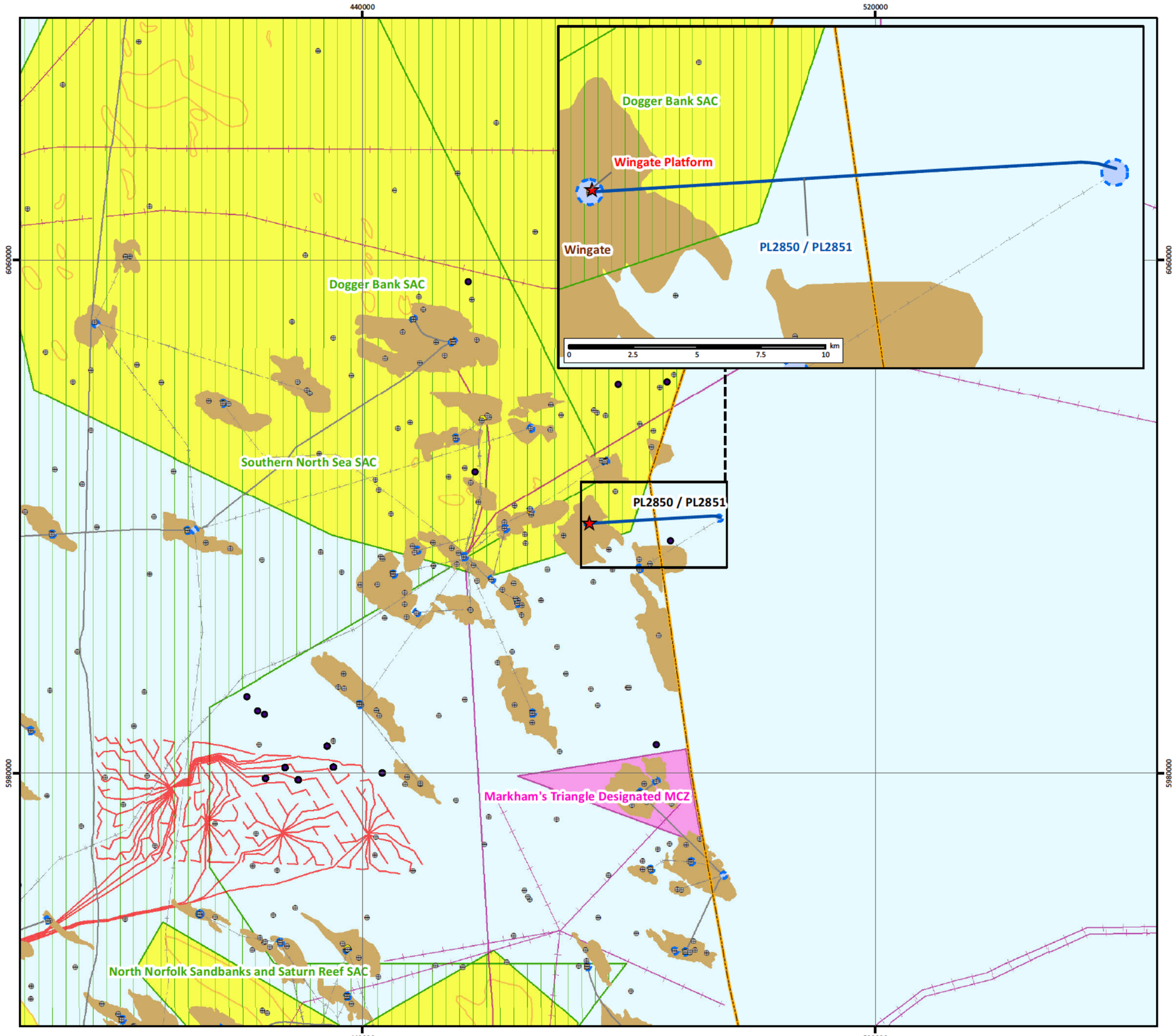
The Wingate Decommissioning Programmes document (Wintershall, 2024) concerns the following infrastructure:

- Wingate platform: Topside (894 Te) and fixed steel jacket (803 Te). The jacket weight excludes the 119 Te of pile sections to be removed (total weight of piles 451 Te);
- Export line (PL2850): 12" x 20.56 kilometers (km) and
- Methanol line (PL2851): 2" x 20.56km.

The two pipelines run in the UK sector for 10.4km (for PL2850) and 10.38km (for PL2851) of the 20.56km length and are trenched for their total length. Details of the pipelines are summarised in Table 1-1. The Pipelines enter the Dutch sector at kilometre point (KP) 10.4 and 10.38 respectively.

Water depths along the pipeline shoal gently from 29.0m Lowest Astronomical Tide (LAT) at the Wingate location (KP0.0) to a minimum water depth of 27.9m LAT between KP4.0 and KP5.0. From this point the seabed gradually deepens to 39.2m LAT at the D15-FA-1 platform.

Along the pipeline route the seabed is described as gravelly, mud rich diamictons. As the pipeline progresses towards the median line the upper sands remain essentially homogeneous but are underlain in parts by the Elbow Formation at depths greater than 5m below the seabed (DeepOcean, 2010). A more detailed environmental baseline description is set out within the Environmental Appraisal report (Intertek, 2024).



WINTERSHALL NOORDZEE B.V.

PL2850/PL2851 DECOMMISSIONING
Location Overview

Drawing No: P1841V-LOC-002	B

N
W E
S

Legend

- Wingate Platform
- PL2850/PL2851
- EEZ Boundary
- 500m Safety Zone
- Hydrocarbon Field

Infrastructure

- Well
- Platform
- Buoy

Pipelines

- Active
- Abandoned

Cables

- Power (Active)
- Telecom (Active)
- Telecom (Disused)

Environmental Designations

- SAC
- MCZ
- Sandbank Area

NOTE: Not to be used for Navigation

Date	25 January 2024
Coordinate System	ED 1950 UTM Zone 31N
Projection	Transverse Mercator
Datum	European 1950
Data Source	NSTA; MarineRegions; JNCC; NE; KISCA; ESRI
File Reference	J:\P1841\Mxd\P1841V\01_LOC\ P1841V-LOC-002.mxd
Created By	Oliver Bula
Reviewed By	Emma Langley
Approved By	Emma Langley

wintershall intertek

0 10 20 30 40 km

Figure 1-2 Wingate Platform Subsea Arrangement and Tie In

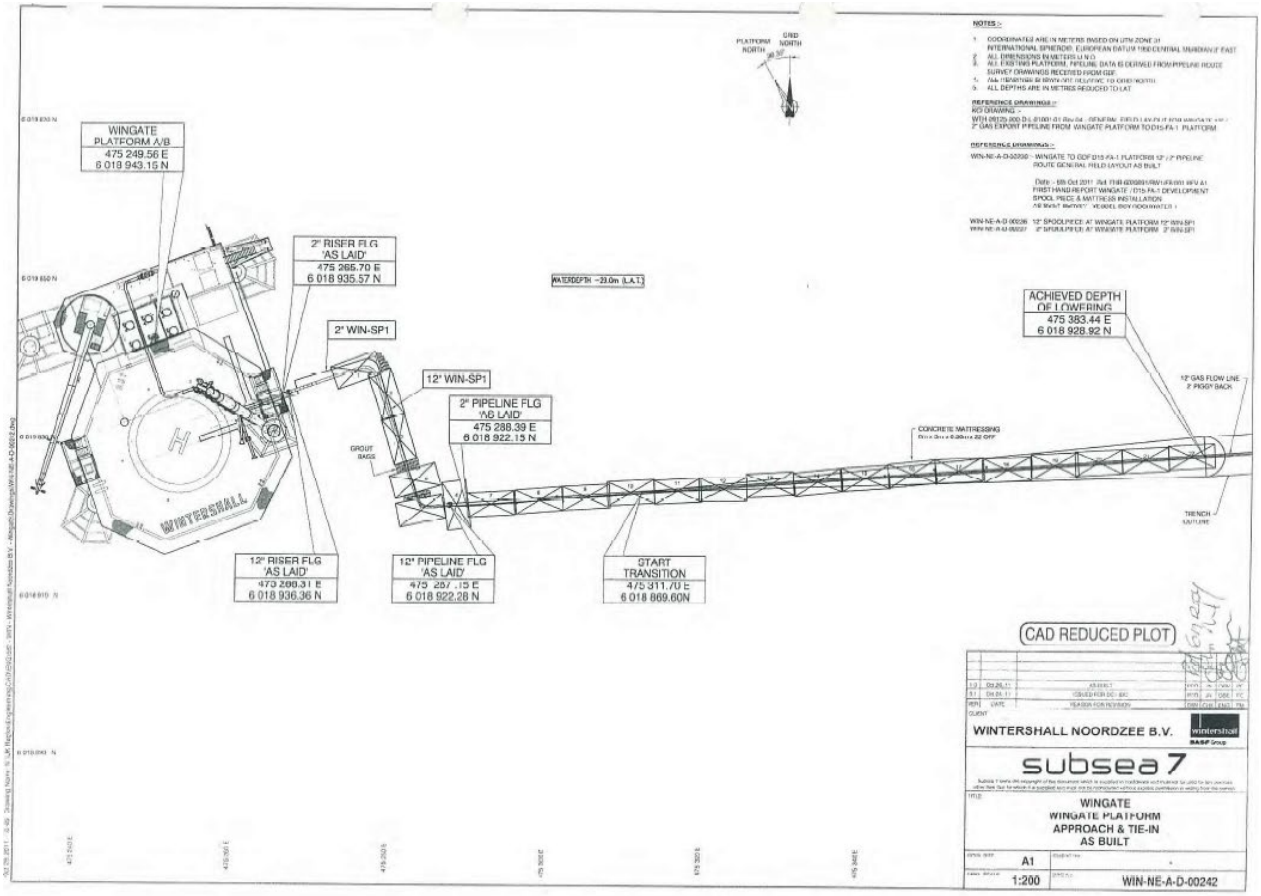


Table 1-1 Pipeline Information

Description	Pipeline Number	Diameter (inches)	Length (km)	Description of Component Parts	Product Conveyed	Burial Status	Current Content
Export line	PL2850	12"	20.56 (10.40 in UK sector)	3-layer PP coated Carbon steel	Gas	Trenched and buried, no exposure	Hydrocarbon
Methanol (MeOH) line	PL2851	2"	20.56 (10.38 in UK sector)	3-layer PP Coated Carbon steel	Chemicals	Trenched and buried, no exposure	Chemicals – injection water transport

1.3.1 Depth of Burial

Acoustic inspection surveys undertaken in 2018 (Fugro, 2018) and 2022 (GEOXYZ, 2023) indicated that there are no areas of spans, exposure or shallow burial throughout the pipeline length. The latest depth of burial (2013) (Wintershall, 2013) is shown in Figure 1-3 and shows the depth of burial for the whole length of the pipeline from the Wingate platform to the D15-FA-1 platform. The length of the section from the Wingate platform to where the piggybacked pipelines are trenched and buried is approximately 100m. From this point the pipelines are trenched and buried to a minimum of 0.7m until reaching the D15-FA-1 platform.

Figure 1-3 Wingate Pipelines Depth of Burial (2013)

Source: Wingate 2013 pipeline inspection survey (Wintershall, 2013)

A technical study was undertaken by Wintershall in 2019 to determine the risk of pipeline exposure. The study assessed historical seabed data around the pipeline and combined this with seabed dynamics and development of exposures and free spans and technical information on the pipeline.

The study concluded that the seabed has been stable over the period assessed (2011 to 2018) and the pipelines are at low risk of exposure and free spans (Wintershall, 2019). Depth of Burial surveys, including sub bottom profiles, are undertaken on a rotating interval and the next one is planned for 2026. Findings from this survey will be used within the Decommissioning Programme.

2. COMPARATIVE ASSESSMENT PROCESS

2.1 Comparative Assessment Process

The Comparative Assessment process follows the following steps:

1. Definition of purpose and scope (addressed in Section 1.1 above);
2. Options identification and screening (Sections 2.2 and 2.3);
3. Selecting attributes and criteria (Section 2.4.2 and 2.4.3);
4. Weighting factors (Section 2.4.4);
5. Option analysis (Section 2.5);
6. Identification of the best practicable environmental option (BPEO) (Section 3) and
7. Integration into decision making (Section 4.1).

The following assumptions are made:

- The objective is to leave a clear seabed, therefore topsides and jacket are to be removed with the piles cut 3m below the mudline and mattresses and grout bags to be removed (if possible, however during the operation itself there may be elements of the infrastructure which need to be left in situ, in the event of this being required DESNZ will be consulted).
- The scope of the CA is for the UK sections of the two pipelines. A subsequent regulatory process for the Dutch sector will be undertaken with the Regulatory Authorities in the Dutch sector, in parallel to this CA in the UK. The Minister of Economic Affairs and Climate makes a decision (based on Section 45 of the Dutch Mining Act and Article 103.1 of the Dutch Mining Regulation). Under the Dutch regulations, the current starting point is that a pipeline can remain in situ unless it does not meet certain criteria, to date the Wingate Pipelines meet these criteria.
- A depth of burial survey of the pipeline will be required as part of the main decommissioning activities (Note a separate survey will be undertaken for the Wingate Platform).
- An over-trawlability survey may be required to ensure any infrastructure left *in-situ* does not present a snagging hazard.
- Any pipeline being left *in-situ* would be subject to legacy monitoring surveys, this CA assumed that there will be three surveys in total.
- Impact on commercial activities is assessed in proportion to vessel activity.
- Only a high-level comparison of what differentiates the costs is used.
- Onshore costs are excluded from the cost of decommissioning activities.
- A 'generic' suitably licensed facility is to be selected and awarded for onshore activities.
- Should materials recovered be contaminated then separate facilities may be needed for decontamination, materials recovery and waste disposal.
- Qualitative treatment of potential logistics impacts of materials movement between locations is included.

2.2 Scoping of Decommissioning Options

A long list of options was developed and assessed. The options identified for decommissioning of the two pipelines are summarised in Table 2-1.

Table 2-1 Long List of Decommissioning Options for Pipeline

Option ID / Name		Mattresses & Grout bags	Spool pieces	Pipeline Inside SAC	Pipeline outside SAC
			<100m	7km	3km
0A	Re-use (Carbon Capture and Storage (CCS))	Leave *in-situ*	Leave *in-situ* with monitoring as agreed with OPRED		
0B	Re-use (hydrocarbons)		Leave *in-situ* with monitoring as agreed with OPRED		
1	Leave *in-situ*	Recover to shore	Rock dump cut ends & leave *in-situ*	Leave *in-situ*	Leave *in-situ*
2	Partial removal (Base Case)		Removed returned to shore. Cut ends rock dumped	Leave *in-situ*	Ends buried left *in-situ*
3	Targeted Removal			Remove if shallower than depth criteria (0.6m)	
4A	Full Removal – reverse S Lay		Full removal via reverse 'S / J lay'		
4B	Full Removal – Reeling		Full removal via reeling		
4C	Full Removal – cut and lift		Full removal via cut and lift		

2.3 Initial Screening Assessment

Following identification of the long list of potential options for decommissioning of the pipeline, a screening assessment was undertaken. This assessment was based on engineering input on technical feasibility and the environmental characteristics of the area, to identify those which should be carried forward to CA and those which should be screened out of further consideration. The results of the screening assessment are presented in Table 2-2.

Table 2-2 Summary of Options Screening Assessment

Option	Status	Rationale
Option 0A: Re-use (CCS)	Screened out.	A review of potential for reuse for CCS undertaken by Wintershall has indicated that there are no viable reuse options in the location. See Wingate Decommissioning Programme (Wintershall, 2024).
Option 0B: Re-use (hydrocarbons)	Screened out.	A review of potential for reuse for hydrocarbons has indicated that there are no viable reuse options in the location.
Option 1: Leave *in-situ*	Taken forward.	Retained as a viable leave *in-situ* option as there are no areas of spans, exposure or shallow burial.
Option 2: Partial removal (Base Case)	Taken forward.	Retained as a viable option as there are no areas of spans, exposure or shallow burial. Pipeline on the seabed immediately adjacent to the platform will be removed under this option.
Option 3: Targeted Removal	Screened out.	No areas of burial above 0.6m have been identified in latest survey (2013). The last acoustic inspection

Option	Status	Rationale
		survey was in 2022. The pipeline was seen trenched and buried over most, >99%, of its length and no exposures on the pipeline reported.
Option 4A: Full Removal – reverse S Lay	Taken forward.	Known technical challenges associated with reverse s-lay of the piggybacked pipelines but retained as secondary full removal option.
Option 4B: Full Removal – Reeling	Screened out.	Excluded due to the inability to reel the rigid pipeline.
Option 4C: Full Removal – cut and lift	Taken forward	Retained as the most credible full removal option for pipeline.

The CA assesses each shortlisted option against a set of criteria. Only options considered technically feasible are included in the CA, which means that:

- All options will be capable of safe delivery (i.e. ALARP according to industry norms).
- Options considered to carry unacceptable (post mitigation) project risk will not be considered further.
- Each option considered in the CA is sufficiently defined to run an Environmental Risk Assessment (ENVID)/ Hazard Identification (HAZID) and to 'score' impacts.

2.4 Evaluation

Following identification of the options for assessment, ENVID and HAZID workshops were undertaken to provide additional information in order to undertake the CA.

2.4.1 CA Methodology

In order to evaluate each of the potential decommissioning options, criteria were defined in line with the BEIS Guidance note (BEIS, 2018) and Guidelines for Comparative Assessment in Decommissioning Programmes (OGUK, 2015). The criteria were grouped into five main sections to include Safety, Environment, Technical, Societal and Commercial. Sub-criteria were developed for each criteria to cover: safety, all potential significant impacts to the marine environment in the short and long term, potential impacts to the Dogger Bank SAC and conservation objectives, atmospheric emissions and energy use, potential risk of project failure and technical challenges and costs.

Each decommissioning option was assessed against the following criteria and sub-criteria:

- Safety:
  - Risk to personnel offshore;
  - Risk to other users of the sea; and
  - Risk to personnel onshore.
- Environmental – short term:
  - Marine impact of operations (discharges, noise, smothering); and
  - Environmental emissions (air quality).
- Environmental – long term:
  - Physical disturbance;
  - Energy use / Carbon dioxide (CO_2) emissions;

- Materials recovery CO_2 emissions saved; and
- Other (conservation objectives and cumulative impacts).

- Technical:
  - Project failure risk.
- Societal:
  - Commercial fisheries.
- Economic:
  - Cost – Capital expenditure (£).

A description of each of the criteria assessed is presented within the sections below.

2.4.2 Assessment Criteria

CA assessment criteria are based around groups of environmental aspects / safety hazards and are selected on the basis of the potential to affect the outcome of the CA. This means that where an aspect / hazard clearly carries similar risk for all options and has a relatively low risk then it may be dropped from CA.

Environmental aspects and safety hazards assessed will cover both the offshore decommissioning site and the onshore dismantling and disposal sites. It is noted that the onshore site considered has been a generic and suitably licensed site.

Options will not be discounted from the CA on pure economic grounds. Where cost has potential to directly influence the CA outcome then further cost benefit analysis will be undertaken.

2.4.2.1 Safety

- **Risk to personnel offshore –** This assesses the risk to offshore personnel for the operations of each of the options assessed, including divers and vessel personnel.
- **Risk to other users of the sea –** This assesses the risk to third party asset owners or other vessels (such as fisheries and commercial shipping) for each of the options during and after the operations, this included the risk of snagging and consequential risk to life.
- **Risk to personnel onshore –** This assesses the risk to onshore personnel for the operations of each of the options in regard to personnel involved in the handling of the recovered items when returned to shore.

2.4.2.2 Environmental

- **Environmental (short term) –** The sub-criteria below are assessed in regard to the short term (< 1 year) environmental impacts.
  - **Marine impact of operations –** This principally assessed the impacts of chemical discharges, noise, seabed disturbance, smothering etc. These are typically impacts which would occur during the activities themselves.
  - **Atmospheric emissions (air quality)** – This assesses the impact of the emissions from all vessels and other machinery involved in the offshore activities on air quality.
- **Environmental (long term)** – The sub-criteria below are assessed in regard to the long-term impacts on the environment (> 1 year).
  - **Physical disturbance –** This assesses the long-term effects to the environment from each options' activities, such as rock placement and scars left on the seabed.

- **Energy use / CO_2 emissions –** This assesses the long-term effects of the energy consumption used during the activities. Each option is assessed for its CO_2 equivalent (CO_2eq) to cover CO_2 emissions directly relating from fuel use for all activities requiring energy use during the offshore operations. Onshore emissions were not considered.
- **Materials recovery CO_2 emissions saved –** This assesses each option for the amount of materials recovered in regard to saved CO_2 emissions. Options which do not offer materials recovery are treated as failing to provide a CO_2eq saving.
- **Other (conservation objectives and cumulative impacts) –** This assesses each option for the long-term impact's other subjects, such as the conservation objectives of the Dogger Bank SAC, cumulative impacts etc.

2.4.2.3 Technical

- **Project failure –** This assesses the risks to project failure for each of the decommissioning options. Used to characterise the inherent technical risk of option. This also includes consideration of weather impacting operations.

2.4.2.4 Societal

- **Commercial fisheries –** This assesses each option for the posed risks to fisheries and fishing vessels in relation to displacement. Note that safety risks were considered under Safety – Risk to other users of the sea – above.

2.4.2.5 Economic

- **Cost –** This assesses the relative costs (capital expenditure) associated with each option. This includes indicative costs for offshore operations and any required legacy monitoring surveys.

2.4.3 Assessment Criteria Scoring

The final score for an option is a function of the following:

i Score (on a scale of 1 to 5).

ii Score multiplier – needed to adjust the scores because on the scoring scales used, a score of 5 is far more than 5 times worse than a score of 1.

iii Weighting – this allows differing opinions on the relative importance of the scoring criteria evaluation to be evaluated.

Scoring scales and multipliers are described here and weightings in Section 2.4.4.

The above sub-criteria have been scored on a five point scale ranging from 1 (very low) to 5 (very high). 1 represents the best performance/lowest risk/lowest impact and 5 represents the worse performance/highest risk/highest impact. These are summarised in Table 2-3.

Where available quantitative data has been used and are based on measurable data i.e. CO_2 emissions (tonnes) and cost estimates (£).

The environmental assessment for both pipelines was split into short-term operational impacts and longer-term legacy impacts due to related activities on the seabed.

The scoring methodology allowed for the effects of six scoring multipliers to be examined (see Table 2-4). The exponential (e^n , where n is the score) was selected as the default value.

Table 2-3 Impact Criteria Scoring

Assessment Criteria	Sub-criteria	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Safety	Risk to personnel offshore	Minor/ first aid possible	Minor/ first aid likely Permanent disability/fatality plausible (rare occurrence in similar situations	Medical aid/ Lost time injury likely Permanent disability/fatality unlikely	Permanent disability/ fatality likely Multiple fatalities plausible (rare occurrence in similar situations)	Multiple fatalities
	Risk to other users of the sea					
	Risk to personnel onshore					
Environmental – short term (weeks/months)	Marine impact of operations (discharges, noise, smothering)	Insignificant impact	Minor/local changes to habitats or species	Moderate/local changes to habitats or species	Major changes, but reversable impacts to habitats or species	Permanent, major effect on habitats or species (i.e. long term impacts)
	Atmospheric emissions (air quality)	Change unlikely to be noticed against the background	Change within normal variability but could be noticed	Localised effect but with full recovery back to existing variability	Major contribution to air quality impacts	Widespread degradation to the quality
Environmental – long term (years+)	Physical disturbance	Within normal variability	Insignificant changes to the environment	Minor changes to the environment	Moderate changes to the environment	Major changes to the environment
	Energy use / CO_2 emissions	< 10,000 tonnes CO_2eq	10,000 – 50,000 tonnes CO_2eq	50,000 – 100,000 tonnes CO_2eq	100,000 – 150,000 tonnes CO_2eq	>150,000 tonnes CO_2eq
	Materials recovery CO_2 emissions saved	<10,000 tonnes CO_2eq	10,000 – 50,000 tonnes CO_2eq	50,000 – 100,000 tonnes CO_2eq	100,000 – 150,000 tonnes CO_2eq	>150,000 tonnes CO_2eq
	Other (conservation objectives and cumulative impacts)	Insignificant impact	Minor effect on conservation objectives	Moderate effect to conservation objectives	Major effect to conservation objectives	Permanent, major effect to conservation objectives

Assessment Criteria	Sub-criteria	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Technical	Project failure risk	Routine operations with high confidence of outcomes. Very low risk of failure	Routine operations with good confidence of outcomes. Low risk of failure	Non-routine operations but with good experience base. Low risk of failure	Non-routine operations with limited experience base. Moderate risk of failure	Untried technique. Higher risk of failure
Societal	Commercial fisheries	Insignificant effect	minor displacement	Moderate displacement	Major displacement	Permanent, major restriction of access
Economic	Cost – Capital expenditure (£) associated with each option	<£1m	£1-5m	£5-10m	£10-15m	>£15m

Table 2-4 Score Multipliers

Ranking	Linear n	Square n2	Cubic N3	2^n	e^n	10^n
	2	**3**	**4**	**5**	**6**	**7**
1	1	1	1	1	1	1
2	2	4	8	2	3	10
3	3	9	27	4	7	100
4	4	16	64	8	20	1,000
5	5	25	125	16	55	10,000

2.4.4 Weightings

Six different sets of weightings were examined as listed in Table 2-5. Each weighting was identified to allow differing opinions on the relative importance of the scoring criteria evaluation to be evaluated.

Table 2-5 Weightings

Criteria	A Even	B 200% Long term	C 200% short term	D 200% fisheries	E Balanced	F Long term, no cost
Safety	1.0	1.0	1.0	1.0	2.0	1.0
Environment – short term	1.0	1.0	2.0	1.0	1.0	1.0
Environment – long term	1.0	2.0	1.0	1.0	1.5	2.0
Technical	1.0	1.0	1.0	1.0	1.0	1.0
Societal	1.0	1.0	1.0	2.0	1.5	2.0
Economic	1.0	1.0	1.0	1.0	0.5	0.0

2.4.5 CA Workshops

Intertek ran a series of specialist workshops (October to November 2023) to identify, assess and score the decommissioning options:

- An ENVID workshop was undertaken to identify the environmental risks associated with each option. This workshop was also used to identify the options to be carried forward to CA.
- An internal CA workshop was undertaken to score and comparatively assess the feasible options.
- A subsequent CA workshop was held with stakeholders to review and verify the scoring and ensure all concerns were identified and assessed.

The internal CA workshop was attended by experts from Wintershall in decommissioning planning, pipelines, environment and safety assessment and progressed through stages as outlined below:

1. Verification of technical options to be considered:
   - Conclusions concerning screening out of options; and
   - Suitability of scoring process.
2. For technically feasible options, review criteria scores and weightings, to establish/confirm:
   - assessment criteria screening – criteria assessed as low impact and the same across all options are dropped from the CA (being both low influence and low impact).
   - review preliminary scoring (following the ENVID).
   - determine relative scoring (instead of using integers between 1 and 5) relative scores were assigned using 1 decimal place (e.g. two options both scoring 1 may be rescored to 1.2 and 1.4 to reflect relative positions on the scale).
   - ensure participant consensus on scores (and note any differences).
   - examine effect on CA outcome of score multiplier and assessment criteria weightings.
3. Re-examine scores and weightings with potential to influence the overall result, to examine overall score sensitivity to:

- potential adjustments to scores identified above;
- changes to the weight given to each rank; and
- changes to the relative weights given to environmental criteria.

2.4.6 Stakeholder Engagement

The stakeholder CA workshop was held by Intertek and Wintershall on 28/11/2023 with representatives from National Federation of Fishermen's Organisations (NFFO), Health and Safety Executive (HSE) and DESNZ. OPRED attended the workshop in the role of observers and to provide advice on decommissioning regulations/guidance as required. The purpose of this workshop was to receive input from these stakeholders in the evaluation of decommissioning options and ensure transparency in the identification of the preferred option. Ahead of this workshop Joint Nature Conservation Committee (JNCC) were consulted and provided comments on an early draft of the CA report to ensure environmental aspects were identified and evaluated appropriately. Wintershall attended the workshop in the role of observers and to provide advice on the decommissioning operations. The meeting minutes from the stakeholder workshop are included within Appendix A.

This report has been shared with NFFO, HSE, DESNZ and JNCC prior to finalisation of the preferred decommissioning option for the Wingate pipelines.

2.5 Options Assessed in CA Workshops

The following options were assessed in the CA.

- Option 1: Leave *in-situ*
- Option 2: Partial Removal
- Option 4A: Full removal – reverse S-lay
- Option 4C: Full removal – Cut and lift

The following elements are common to all options:

- The removal of mattresses and grout bags where safe to do so;
- Removal of the riser with the jacket of the Wingate platform;
- Both pipelines will be cleaned, flushed and then cut at seabed level; and
- All vessels involved in pipeline works will use dynamic positioning (DP) and no anchoring will be required.

2.5.1 Option 1: Leave In-situ

BEIS (2018) Guidance states, as a general guide, that pipelines may be candidates for *in-situ* decommissioning when meeting certain criteria, including adequately buried and which are not subject to development of spans and are expected to remain so. A minimum depth of burial of 0.6m is expected in most cases. The Wingate pipelines are within this criteria.

Under this option the pipelines will be cleaned and flushed. Following this the pipelines (export and methanol line) will be cut at the riser base of the Wingate platform and the cut ends rock protected. The Spool pieces will be left in place and rock protected. The footprint of the rock protection will be a worst case of 100m^2. The remaining pipeline will be left in place as there are no areas of spans, exposure or shallow burial. The operations will last three days and involve one vessel.

Following the completion of decommissioning activities, a debris clearance survey, post-decommissioning environmental survey and post decommissioning pipeline survey will be undertaken

to support a close-out report, which will be required to be submitted within a year of the completion of the decommissioning.

Wintershall propose that after approximately five years a survey will be undertaken to provide general inspection of the *in-situ* pipelines. The survey will include a Multibeam Echo Sounder (MBES) at low frequency 200-700kHz and Side Scan Sonar (SSS) at 520kHz frequency. The subsequent inspection frequency will be agreed with OPRED, but is assumed to include three surveys in total. These surveys will be short (0.5 days) and involve one vessel.

2.5.2 Option 2: Partial Removal

Under this option the pipelines will be cleaned and flushed. Sections of the pipeline on the seabed immediately adjacent to the platform will be removed up to where the pipe goes into burial and cut ends covered with rock protection. Rock protection will be placed at the cut ends of the pipelines and will be 5m long, 2m wide and 1m high. This equates to a worst case footprint of $10m^2$ at each of the pipeline cut ends. The footprint of the rock protection will be a maximum of $20m^2$. The spool pieces will be removed and recovered to shore, recycled where possible and remainder sent to landfill for disposal. The remaining pipeline will be left in place as there are no areas of spans, exposure or shallow burial. The operations will last three days and involve one vessel.

Following the completion of decommissioning activities, a debris clearance survey, post-decommissioning environmental survey and post decommissioning pipeline survey will be undertaken to support a close-out report, which will be required to be submitted within a year of the completion of the decommissioning.

Wintershall propose that after approximately five years a survey will be undertaken to provide general inspection of the *in-situ* pipelines. The survey will include a MBES at low frequency 100kHz and SSS at 500kHz frequency. The subsequent inspection frequency will be agreed with OPRED, but is assumed to include three surveys in total. These surveys will be short (0.5 days) and involve one vessel.

2.5.3 Option 4A: Full Removal – by Reverse S-lay

The reverse S-lay option involves:

- removal/loosening of material above the piggybacked pipeline (12" + 2") using a jet plough;
- pulling pipeline onto the vessel in a reverse S-lay;
- separation of the two pipelines (export and methanol); and
- cutting to sections on the vessel for transport to shore.

Prior to removal the pipeline will be cleaned and flushed. Then the pipeline will be picked up and continuously pulled onto the barge where it is cut into lengths that would be suitable for storage on the vessel before being offloaded to the pipe support vessel (PSV). Then the pipeline will be transported to shore.

Due to the pipelines being piggybacked, the reverse S-lay would require the separation of these pipelines when reaching the vessel, this will be undertaken using a jet plough to remove the top layer of sediment before pulling the pipelines onboard for separation.

The pipeline must be prepared at each end by a construction support vessel (CSV) and the duration of this activity will be seven days. This is done prior to removal by a lay barge. The CSV will support the lay barge during the removal, as it will unbury the pipeline using a jet plough. The rate of removal via reverse S-lay is estimated at 1500m/day. The operations will last 14 days.

Depending on the pipe hold capacity of the lay barge, it will have to be further supported by a PSV for temporary storage of the pipe.

For the first seven days a CSV would be required, then simulations operations will involve the use of three vessels: one CSV (with jet plough), one lay barge and one PSV (depending on lay barge capacity), with use of 150 personnel in total.

The pipeline sections will be disposed of at a licenced onshore site in the UK, with steel recycled and Polypropylene coating removed and recycled or burnt for energy recovery. The spool pieces would also be recovered and recycled where possible and remainder sent to landfill for disposal.

2.5.4 Option 4C: Full Removal – Cut and lift

The cut and lift option involves:

- unburying the piggybacked pipeline (12" + 2") using a Mass Flow Excavator (MFE);
- cutting the pipe into lengths using shear cutters;
- recovering the pipe sections onto a PSV using a hydraulic pipe grabbing tool and transport to shore.

Prior to removal the pipeline will be cleaned and flushed. The method of cut and lift would require the pipeline to be cut into sections, usually via divers or a remotely operated vehicle (ROV) and recovered to a relevant vessel. It is estimated that cut and lift can be undertaken at a rate of 500m/day. The operations will last 20 days.

A Diving Support Vessel (DSV) will be onsite and continuously supported by a PSV for temporary storage of the pipe. The cut and lift method is one of the most commonly used methods for short pipeline removal and can also be used on longer subsea pipelines.

Two vessels will be operating at the same time during these operations: one DSV (with the MFE, shear cutters and grabber) and one PSV, with use of approximately 100 personnel in total.

The pipeline sections (12" + 2") will be disposed of at a licenced onshore site in the UK, with steel recycled and Polypropylene coating removed and burnt for energy recovery. The spool pieces would also be recovered and recycled where possible and remainder sent to landfill for disposal.

3. COMPARATIVE ASSESSMENT RESULTS

3.1 Comparative Assessment Scoring

A summary of the CA is shown in Table 3-1. This following internal workshops and a stakeholder verification workshop. The sections below summarise the score reasoning for each sub-criteria.

Table 3-1 Comparative Assessment Scoring

Assessment Criteria	Sub-criteria	Decommissioning Options			
		Option 1: Leave *in-situ*	**Option 2: Partial removal**	**Option 4A: Full removal via reverse S-Lay**	**Option 4C: Full removal via Cut and Lift**
Safety	Risk to personnel offshore	1.0	1.0	2.0	2.5
	Risk to other users of the sea	1.2	1.1	1.0	1.0
	Risk to personnel onshore	1.0	1.0	1.5	1.5
Environmental – short term	Marine impact of operations	1.2	1.2	1.4	2.4
	Atmospheric emissions (air quality)	1.0	1.0	2.2	2.6
Environmental – long term	Physical disturbance	1.2	1.1	1.2	1.4
	Energy use / CO_2 emissions	1.1	1.1	1.4	1.5
	Materials recovery CO2 emissions saved	1.2	1.2	1.0	1.0
	Other (conservation objectives and cumulative impacts)	1.2	1.1	1.0	1.3
Technical	Project failure risk	1.0	1.0	3.0	1.4
Societal	Commercial fisheries	1.0	1.0	1.1	1.4
Economic	Cost – Capital expenditure	1.0	1.0	3.1	2.5

3.1.2 Safety Comparative Assessment

3.1.2.1 Risk to personnel offshore

Table 3-2 Risk to Personnel Offshore

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Risk to personnel offshore	1.0	1.0	2.0	2.5

All the activities and techniques are used frequently within the North Sea and it is, therefore, assumed that the health and safety risks of the activities are broadly acceptable. The assessment identified the key differences between the options.

Option 1: This option has reduced risk to offshore personnel due to minimal offshore operations. The operations are within routine offshore operations and will be undertaken by qualified and skilled workers. The selected decommissioning contractor will abide by all relevant UK HSE and Wintershall's safety management system. This is scored as Very Low (minor/first aid possible).

Option 2: Similar to Option 1. This is scored as Very Low (minor/first aid possible).

Option 4A: This option has the potential for risk to offshore personnel, but lower risk than Option 4C. Whilst the use of divers is lessened during this option (only required for set up), there will be increased Simultaneous Operations (SIMOPS) due to more vessels being present during the operations. It is likely to require up to 150 offshore personnel. There will also be an increased risk due to the handling and transferring of the removed pipeline onto the vessel. Overall, this is scored as Low (minor/ first aid likely).

Option 4C: This option has the highest potential for risk to offshore personnel. This option would require more diving than for Option 4A (with divers required for the duration of the activities), there would be lower SIMOPS due to less vessels involved. The use of divers is considered to pose a higher risk to safety. This option would require up to 100 offshore personnel. There will also be an increased risk due to the handling and transferring of the removed pipeline sections onto the vessel. Overall due to the increased safety risks involved in the activities this is scored as Low (minor/ first aid likely).

3.1.2.2 Risk to other users of the sea

Table 3-3 Risk to Other Users of the Sea

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Risk to other users of the sea	1.2	1.1	1.0	1.0

The risks to other users of the sea are considered to be for the duration of the decommissioning activities and subsequent impacts due to snagging of fishing gear for any infrastructure left *in-situ*.

Option 1: This option has the highest potential for risk to other users, such as shipping and fishing vessels, however, this risk is considered to be Very Low. The small potential for risk is due to the potential for snagging of fishing nets onto the pipeline ends when left *in-situ* or rock dump (100m^2 footprint). However, the location of the pipeline will be marked on vessel charts, and the pipeline is unlikely to be exposed due to the stable seabed. Any rock placed will be within the SAC, in which use

of mobile fishing gear (e.g. use of trawling nets) is prohibited, therefore, not likely to pose a significant snagging risk. The subsequent legacy monitoring surveys will help to monitor and allow for mitigation if required, to ensure snagging risks are minimised. Therefore, this is scored as Very Low (minor/ first aid possible).

Option 2: The assessment for this option similar to Option 1, the rock protection footprint will however be smaller (20m^2). This is scored as Very Low (minor/ first aid possible).

Option 4A: This option has reduced risk to other sea users, due to the full removal of the pipeline and elimination of any snagging risks. This is scored as Very Low (minor/ first aid possible).

Option 4C: The assessment for this option is the same as for Option 4A.

The assessment of this sub-criteria was subject to sensitivity analysis (see section 3.2), to examine the potential influence of higher impact scoring for options in which the pipeline was left *in-situ*.

3.1.2.3 Risk to personnel onshore

Table 3-4 Risk to Personnel Onshore

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Risk to personnel onshore	1.0	1.0	1.5	1.5

Option 1: This option has the lowest risk to onshore personnel due to no onshore activities. This is scored as Very Low (minor/ first aid possible).

Option 2: This option has a reduced risk to onshore personnel due to minimal onshore activities, relating to the removal of spool pieces only. This will see 6.4 tonnes of material returned to shore. Overall, this is scored as scored as Very Low (minor/ first aid Possible).

Option 4A: This option has the potential for risk to onshore personnel. This option would require significantly more onshore personnel than Option 2, due to the lifting, cutting and handling of removed pipeline to and from the barge prior to recycling or disposal. This will see 1,300 tonnes of material returned to shore. Overall, this is scored as Very Low (minor/ first aid Possible).

Option 4C: The onshore activities for this option is the same as option 4A, therefore the assessment for this option is the same as for Option 4A.

3.1.3 Environmental (Short-term)

3.1.3.1 Marine impacts of operations

Table 3-5 Marine Impacts of Operations

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Marine impact of operations	1.2	1.2	1.4	2.4

For all options it was considered that there is a Low risk of chemical and hydrocarbon discharges due to the pipeline being cleaned and flushed for all options. The assessment identified the key differences between the options.

Option 1: This option has a small risk to the marine environment during the operations. The duration of the activities is three days and only involves one vessel, therefore, has a lower risk of chemical and fuel spills. During the operation, the burial of pipeline ends can cause smothering of the benthos, which is increased with the placement of rock on top of the trenched and buried pipeline ends. Overall, this is scored as Very Low (insignificant impact).

Option 2: This option has a small risk to the marine environment. During the operation, the burial of pipeline ends can cause smothering of the benthos, which is increased with the placement of rock on top of the trenched and buried pipeline ends. The removal of more length of pipeline (~100m) will cause slightly greater disturbance than Option 1, but the seabed will recover within a short period of time (within several weeks). Overall, this is scored as Very Low (insignificant impact).

Option 4A: This option has an increased risk to the marine environment than Options 1 and 2. The removal of the complete length of the pipelines would cause a greater disturbance to the seabed than Options 1 and 2. The duration of the activities is 14 days and involves two vessels, therefore, has a slightly higher risk of unplanned discharges (chemical and fuel spills) from the extended vessel operations. During the operations, the seabed disturbance from jetting plough and the removal of the pipeline is likely to cause a short-term depression in the seabed as well as some localized smothering. The seabed disturbance footprint is expected to be 0.205km^2 (this is based on a disturbance width of 20m from the jet plough), however, jet ploughs are generally accepted as having good recovery rates this is expected to be recovered within a short time period (within several weeks). Noise generated from jet plough is slightly lower than noise generated from MFE and will be minimal. Overall, this is scored as Very Low (insignificant impact).

Option 4C: This option has the highest risk to the marine environment when compared to Options 1, 2 and 4A. The removal of the complete length of the pipelines via cut and lift would cause a greater disturbance to the seabed than Options 1 and 2. The duration of the activities is 20 days and involves three vessels, therefore, has the highest risk of unplanned discharges (chemical and fuel spills) from the extended vessel operations. During the operations, the seabed disturbance from MFE and the removal of the pipeline is likely to cause a short-term depression in the seabed as well as some localized smothering. The expected seabed disturbance footprint is expected to be 0.257km^2, (this is based on a disturbance width of 25m from the MFE), however, this is expected to be recovered within a short time period (within several weeks). Noise generated from MFE is similar to noise generated from Jet plough. Overall, this is scored as Low (minor/local changes to habitats or species).

3.1.3.2 Atmospheric emissions (air quality)

Table 3-6 Atmospheric Emissions (Air Quality)

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Atmospheric emissions (air quality)	1.0	1.0	2.2	2.6

Option 1: This option has a Very Low impact on the atmospheric emissions and air quality in the local vicinity of the operations, with change unlikely to be noticed against the background. This is due to the relatively low energy use (one vessel) and based on short lived duration of offshore works (three days), resulting in lower emissions to air. For CO_2 emissions, see section 3.4.1.2. This option would have additional atmospheric emissions from survey vessels during the legacy monitoring surveys (expected to include three surveys). These surveys will be short (0.5 days) and involve 1 vessel. This is scored as Very Low (change unlikely to be noticed against the background).

Option 2: The assessment for this option is the same as for Option 1.

Option 4A: This option has an increased impact in atmospheric emissions and air quality in the local vicinity of the operations. Due to the higher vessel activities (two vessels over duration of 14 days), and the added operations close to shore, Option 4A would result in lower air quality around the vessels. For CO_2 emissions, see section 3.4.1.2. No subsequent monitoring surveys would be required. This is scored as Low (change within normal variability but could be noticed).

Option 4C: This option has the highest potential for impact on atmospheric emissions and air quality in the local vicinity of the operations, when compared to the other options. Due to the higher vessel activities than in option 4A (three vessels over 20 days), and the added operations close to shore, Option 4C would result in lower air quality around the vessels. For CO_2 emissions, see Section 3.4.1.2. No subsequent monitoring surveys would be required. This is scored as Low (change within normal variability but could be noticed).

3.1.4 Environmental (Long-term)

3.1.4.1 Physical disturbance

Table 3-7 Physical Disturbance

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Physical disturbance	1.2	1.1	1.2	1.4

Option 1: The physical disturbance for this option will be Low, the option does, however, include rock placement, which will change the substrate. The placement of rock would have a permanent effect in the seabed within the Dogger Bank SAC. However, the rock placement will be highly localised. The footprint of the rock protection will be a maximum of 100m² and the seabed is expected to recover within a year of the operations. Subsequent legacy monitoring surveys would not cause disturbance of the seabed. This is scored as Very Low (within normal variability).

Option 2: The assessment for this option is similar to Option 1, the rock protection footprint will however be smaller (20m²). This is scored as Very Low (within normal variability).

Option 4A: This option has an increased physical disturbance to the seabed. Due to the removal of the pipeline, there will be a disturbance footprint of approximately 2.54km² from the jet plough. However, jet ploughs are generally accepted as having good recovery rates for sediments and the seabed has a relatively fast recovery time and the disturbance is expected to be temporary and highly localised. This is scored as Very Low (within normal variability).

Option 4C: This option has the highest potential for physical disturbance to the seabed, when compared to the other options. This is due to the removal of the pipeline via the use of MFE, this method has a greater disturbance area than jetting plough, there will be a disturbance footprint of approximately 2.57km². However, the seabed has a relatively fast recovery time and the disturbance is expected to be temporary and highly localised. Due to the larger footprint this option has the highest score, but is still scored as Very Low (within normal variability).

3.1.4.2 Energy use/ CO_2 emissions

Table 3-8 Energy Use/ CO_2 Emissions

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Energy use / CO_2 emissions	1.1	1.1	1.4	1.5

Quantitative scoring was used to score the CO_2eq emissions involved with each option.

Option 1: This option has a lower energy use and CO_2eq emissions (69 tonnes of CO_2eq) from vessel operations, when compared to removal options (4A and 4C) due to the short duration and the minimal operations involved (one vessel for three days). This option would have additional atmospheric emissions from survey vessels during the legacy monitoring surveys (expected to include three surveys). These surveys will be short (0.5 days each) and involve 1 vessel. This will lead to the emission of 49 tonnes of CO_2eq for three surveys. This is scored as Very Low (< 10,000 tonnes CO2eq).

Option 2: The assessment for this option is the same as for Option 1.

Option 4A: This option has an increased energy use and CO_2eq emissions compared to Options 1 and 2. This is due to the length of operations (14 days) and vessel usage (two vessels), it is calculated that the reverse S-lay operations would produce approximately 2,753 tonnes of CO_2eq from vessel operations. No subsequent monitoring surveys would be required. This is scored as Very Low (< 10,000 tonnes CO_2eq).

Option 4C: This option has the highest energy use and CO_2eq emissions compared to Options 1, 2 and 4A. The cut and lift operations have an increased CO_2eq emissions due to requirement of multiple vessels (three vessels) and longer operation timescales (20 days). It is calculated that the operations would produce approximately 3,165 tonnes of CO_2eq from vessel operations. No subsequent monitoring surveys would be required. This is scored as Very Low (< 10,000 tonnes CO2eq).

3.1.4.3 Materials recovery CO_2 emissions saved

Table 3-9 Materials Recovery CO_2 Emissions Saved

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Materials recovery CO2 emissions saved	1.2	1.2	1.0	1.0

Option 1: This option has a higher score for the material recovered due to this option having no items recovered, therefore, the lost opportunity to save CO_2 emissions from recovered materials (net) is increased. This is scored as Very Low (< 10,000 tonnes CO_2eq).

Option 2: This option has a higher score for the materials recovered through the lost opportunity to save CO_2 emissions from recovered materials (net). Under this option spool pieces would be recovered and plastic coating would be recycled as recovered energy (0.11 tonnes), as well as steel material being recycled (6.4 tonnes). The estimated value of CO2 emissions saved by recovery of steel is 9.79 tonnes CO_2eq. This is scored as Very Low (< 10,000 tonnes CO^2eq).

Option 4A: This option has a lower score for materials recovered and CO_2 emissions saved through materials recovery, due to the option containing the removal of the pipeline. The volume of material made available for reuse, recycling or destined for landfill would be directly related to the quantity recovered. Plastic coating recovered would be recycled as recovered energy (21 tonnes). Steel material would be recycled (1,250 tonnes). The estimated value of CO_2 emissions saved by recovery of steel is 1,912.5 tonnes CO^2eq. This is scored as Very Low (< 10,000 tonnes CO_2eq).

Option 4C: The assessment for this option is the same as for Option 4A.

3.1.4.4 Other (conservation objectives and cumulative impacts)

Table 3-10 Other (Conservation Objectives and Cumulative Impacts)

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Other (conservation objectives and cumulative impacts)	1.2	1.1	1.0	1.3

The Dogger Bank SAC has a 'recover' conservational objective (JNCC, 2022a), so any further disturbance should be considered for potential to effect the environment or species within. JNCC (2022b) Advice on Operations for Dogger Bank SAC identifies a number of pressures relating to Oil and Gas decommissioning activities which the SAC is sensitive to, including abrasion/disturbance of the substrate on the surface of the seabed, changes to suspended solids, habitat structures changes, physical change and penetration and/or disturbance of the substrate below the seabed. JNCC (2022c) identify that removal of oil and gas infrastructure will have a temporary impact on the site and may result in some local restoration of the sandbank due to recolonisation of sandbank communities where the original substrate is exposed. However decommissioning operations may also result in further permanent impacts, due to deposition of material (e.g. rock dump) which can differ in size from sandbank substrate, which may cause localised changes to the sediment type (JNCC, 2022c). BEIS (2019) advise that the extent of physical disturbance relating to oil and gas decommissioning activities is estimated to be relatively small compared to the extent of habitat within the SAC and impacts to habitats and associated communities from decommissioning activities would be temporary.

Option 1: This option has a Low score for impacts to conservation objectives and cumulative effects, but is slightly higher than Option 4A. Whilst there will be rock protection involved with this option the footprint will be less than 100m² and, therefore, compared to the area covered by the SAC (12,331km²) this is considered to be an insignificant impact on the conservation objectives. HRA of decommissioning of pipelines in the Dogger Bank SAC (BEIS, 2019) states that pipelines that are trenched and buried are not predicted to have an impact on the structure or function of the Dogger Bank sandbank. However, pipelines coated in a plastic polymer have the potential to degrade or corrode. The polymer would take longer to decompose than the steel and would likely occur very gradually over hundreds of years (Thompson, Gall & Northam, 2023), and would therefore have little detrimental effect to the local marine environment. It is considered that as the pipeline is trenched and buried to a sufficient depth the inert material within the seabed does not pose any risk to the environment. This is scored as Very Low (insignificant impact).

Option 2: The assessment for this option is similar to Option 1, the rock protection footprint will however be smaller (20m²). This is scored as Very Low (insignificant impact).

Option 4A: The removal of the pipeline through reverse S-Lay is considered to have a no long-term impact on the conservation objectives of the SAC, and will have no cumulative effects due to being fully removed from the seabed. The depression left on the seabed following the pipeline removal is expected to recover to its original state within a short period of time. This option is scored Very Low (insignificant impact) on conservation objectives and cumulative effects.

Option 4C: This option has the highest score for impacts to conservation objectives and cumulative effects. This is predicted as the use of an MFE would have a larger, relatively longer-term impact on surficial sediments within the SAC than the use of a jetting plough under Option 4A. This could result in the cumulative impact of these operations contributing to a negative impact on the SAC. This is scored as Very Low (insignificant impact).

3.1.5 Technical – Project Failure Risk

Table 3-11 Technical – Project Failure Risk

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Project failure risk	1.0	1.0	3.0	1.4

Option 1: The use of rock placement is a standard operation within the oil and gas industry. This is a routine operation with high confidence of outcomes and very low risk of failure. Option has relatively low risk technical risks, shortest work scope and lowest weather risk. This is scored as Very Low.

Option 2: The use of rock placement and the recovery of spool-pieces from pipelines are all standard operations within the oil and gas industry. These are routine operations with high confidence of outcomes and very low risk of failure. A partial removal options represents a relatively low risk technical option, shortest work scope and lowest weather risk. This is scored as Very Low.

Option 4A: There are a few technical limitations to this option, greater technological challenges due to increased number of activities and to the authors knowledge recovery of full pipelines via reverse S-lay has yet to be performed within the North Sea. Reverse S-lay operations have had limited implementation, with the technique being limited to small sections of pipeline. It is also likely that during the S-lay process, the pipeline may spall during the recovery or handling process, due to pipeline degradation. Longer work scope than Options 1 and 2, therefore slightly increased weather risk. This option has the highest project failure risks. This is scored as Medium.

Option 4C: The use of cut and lift is commonplace for pipeline removal during decommissioning and has a good track record. There are a large number of activities required for complete removal, which increases the likelihood of technical challenges. The requirement of a crane for lifting means this option has both wind and wave restrictions, therefore higher risk of weather affecting project progress, however lower project failure risks than Option 4A. This is scored as Very Low.

3.1.6 Societal – e.g. Commercial Fisheries

Table 3-12 Societal – e.g. Commercial Fisheries

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Commercial fisheries	1.0	1.0	1.1	1.4

Shipping density within the area is moderate (OGA, 2019), with 10 shipping routes passing within 10 nautical miles. Commercial fishing in the area is relatively low, with low quantities of fish landed from the vicinity and fishing effort. A study on fishing activity near Wintershall's pipelines (Wageningen Marine Research, 2019) identified that the Wingate Pipeline is located within a relatively low fishing effort area. Mobile gear is not permitted within the Dogger Bank SAC, only static gear targeting crab and lobster is permitted. The 3km pipeline section outside of the SAC is available to trawling gear. During operations safety exclusion zones will be in place around the vessels and these areas would not be accessible for fishing. Risk to stakeholders and other users considered low for fisheries and shipping.

Option 1: This option includes rock protection of spool pieces which could be seen as snagging risk to fishermen. However, rock protection will be overtrawalable and the use of mobile gear is prohibited within the SAC the likelihood of this occurring is minimised. No impact will occur during the offshore works, as minimal disturbance is anticipated to fishing. Buried, decommissioned, pipelines are not expected to represent a hazard to other users of the sea. Part of the works will include an over-trawlability survey to ensure that the *in-situ* pipeline is over-trawlable and does not present a snagging hazard. There will be limited temporary displacement to fisheries during the legacy monitoring surveys, but the impact is expected to be minimal. This is scored as Very Low (insignificant effect).

Option 2: The assessment for this option is the same as for Option 1.

Option 4A: There will be short-term (temporary) effect on fisheries and shipping vessels whilst the offshore works are being undertaken, this will include a rolling exclusion zone around the vessels operating for the period of 14 days. There would be no legacy monitoring surveys over the pipeline required. This is scored as Very Low (insignificant effect).

Option 4C: There will be short-term (temporary) effect on fisheries and shipping vessels whilst the offshore works are being undertaken, this will include a rolling exclusion zone around the vessels operating for the period of 20 days. There would be no legacy monitoring surveys over the pipeline required. Due to longest duration of operations this option is considered to have the highest displacement for fisheries. This is scored as Very Low (insignificant effect).

3.1.7 Economic – Cost (Capital Expenditure)

Table 3-13 Economic – Cost (Capital Expenditure)

Sub-criteria	Option 1: Leave *in-situ*	Option 2: Partial removal	Option 4A: Full removal via reverse S-Lay	Option 4C: Full removal via Cut and Lift
Cost – Capital expenditure	1.0	1.0	3.1	2.5

Quantitative scoring was used to score the capital expenditure involved with each option.

Option 1: Under this option cost is reduced compared to removal options. Offshore operation costs are limited to rock dumping for three days. This is expected to cost £300,000. Cost of legacy monitoring survey is £8,000, and it is likely that three surveys may be required in total. Onshore costs have not been included. This is scored as Very Low (<£1m).

Option 2: Under this option cost is reduced compared to removal options. Offshore operation costs are limited to rock dumping, removal of spool pieces and section of pipeline cable. This is expected to cost £350,000. Cost of legacy monitoring survey is £8,000, and it is likely that three surveys may be required in total. Onshore costs have not been included. This is scored as Very Low (<£1m).

Option 4A: This option has the highest capital expenditure with estimated costs of £6.4milion for offshore operations, therefore more costly than other options. Onshore costs have not been included. This is scored as Medium (£5-10m).

Option 4C: This option costs £3milion for offshore operations, more economically than Option 4A. Onshore costs have not been included. This is scored as Low (£1-5m).

3.2 Sensitivity Analysis

During the stakeholder CA workshop different weightings to the criteria (e.g. more emphasis on long term environmental criteria) and scoring schemes were assessed to determine any potential changes to overall rankings. In addition two sensitivities to scoring were identified for investigation, these were:

1. Doubling scoring for sub-criteria **risk to other users of the sea** for Options 1 and 2.
    - This was identified to examine the potential influence of higher impact scoring for options in which the pipeline was left *in-situ*. While it was identified that the likelihood of an interaction between the pipeline and other sea users is low, the consequence of an interaction may be high.
2. Basing the criteria score on the maximum of each sub-criteria score, instead of the average score.

Both of these sensitivities do not change the overall ranking of options.

4. CONCLUSION OF COMPARATIVE ASSESSMENT

4.1 Recommendation

The recommended decommissioning option for the Wingate pipeline based on the scoring of the CA is Partial Removal (Option 2).

The CA concludes the following:

- Partial removal is considered the best option in 9 of the 12 sub-criteria.
- Partial removal is assessed as having the lowest safety risk.
- Partial removal and leave *in-situ* are assessed as having the same environmental risk, technical risk, societal impact and similar economic costs.

Table 4-1 Comparative Assessment Summary

	Decommissioning Options			
	Option 1: Leave *in-situ*	**Option 2: Partial removal**	**Option 4A: Full removal via reverse S-Lay**	**Option 4C: Full removal via Cut and Lift**
Overall scoring	13.1	12.8	20.5	19.9
Overall ranking	2	1	3	4

The results presented above are for the following weighting:

- Safety – 26.7%
- Environment (short term) – 13.3%
- Environment - long term – 20%
- Technical – 13.3%
- Societal – 20%
- Economic – 6.7%

The results were checked against all combinations of multipliers and weightings in Tables 2-4 and 2-5, with no change to the ranking and the conclusion in favour of Partial Removal (Option 2).

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16 Wintershall, (2024). Wingate Decommissioning Programmes Document (Draft).

APPENDIX A

Stakeholder CA Workshop Minutes

Project	Wingate Comparative Assessment		
Subject	Stakeholder CA Workshop Meeting Minutes		
Date and Time	28/11/2023 9:30-12:45	**Venue**	Teams Meeting
Level of Issue	Final	**File Reference**	P1841_AHNOV31_Rev1
Attendees	Name (& initials)	Company / Project Role	
	Emma Langley (EL)	Intertek Energy & Water / Project Manager	
	Alistair Bird (AB)	Intertek Energy & Water / CA Facilitator	
	Rob Daniels (RD)	Intertek Energy & Water / Junior Consultant	
	Ruben Geertsma (RG)	Wintershall / Decommissioning & Reuse Project Engineer	
	Yvonne van den Berg (YvdB)	Wintershall / Decommissioning & Reuse Manager	
	James Wardrop (JW)	Wintershall / Pipeline Engineer	
	Harry Segeren (HS)	Wintershall / Decommissioning & Reuse Project Manager	
	Jeroen Kneepkens (JK)	Wintershall / Sr. Environment & Regulatory Affairs Advisor	
	Camiel van Soest (CvS)	Wintershall / Asset Manager	
	Mike Roach (MR)	National Federation of Fishermen's Organisations (NFFO) / Deputy Chief Executive	
	Mark Johnston (MJ)	Department for Energy Security and Net Zero (DESNZ) / Environmental Manager	
	Fiona Livingston (FL)	DESNZ / Senior Decommissioning Manager	
	Sam Pattie (SP)	DESNZ / Decommissioning Manager	
	James Rutherford (JR)	Health and Safety Executive / Specialist Risk Assessor (Pipelines)	
Distribution	Name (& initials)	Company / Project Role	
(As above and)	Daisy Leadbeater (DL)	Joint Nature Conservation Committee (JNCC)	
	Thomas Fey (TF)	JNCC	
	Chris Lauffer (CL)	Wintershall / Pipeline Engineer	
	Ulrich Tiefes (UT)	Wintershall / Pipeline Manager	

1. MINUTES

Item	Description	Action
1	**Introductions** Quick introductions to who was in the meeting and roles in Project and to set out the agenda of the meeting. MR noted had to leave meeting at 10:30.	
2	**Wingate overview**	

Item	Description	Action
	RG briefly described the Wingate platform, the area and overview of the location and the decommissioning plan. Cessation of Production (CoP) planned for Q2 2025. The pipeline is to be flushed/disconnected in Q3-4 in 2025, with the platform removal taking place between 2025 – 28 (see presentation for more information).	
3	**Scope of CA and objectives for the workshop** RG ran through the scope of the CA and the objectives of the workshop. Purpose of CA is to evaluate the best decommissioning option for the UK sections of the Pipeline. Only elements of the options which are different will be assessed in the CA. Depth of Burial graph shared – shows burial to around 0.8 metres for pipeline length. RG stated the CA started with eight different options considered, with two being re-use, leave in-situ, and five involving some recovery to shore, of which three being full removal. Out of these eight, RG stated that four were taken forward for full CA (leave in-situ, partial removal, reverse s-lay and cut and lift). RG then went through each of the four options that were taken forward.	
4	**Run through of the assessment criteria** EL picked up from RG, stating the assessment criteria, for the options and what each criteria assessed. EL stated that the JNCC wanted to emphasis long-term impacts on the Dogger Bank SAC, which is why Intertek (INTK) have split environment impacts into both short and long term. MR queried whether the sub-criteria for Societal (commercial fisheries) covers impacts from the operations or the future impacts, e.g., displacement would be impact during the operations and snagging risk would be a future hazard. AB confirmed that risks to fisheries (snagging etc) has been assessed separately, under the "risk to other users of the sea" sub-criteria.	
5	**Introduction to the workbook** AB stated that the workbook scores has been discussed and reviewed at an internal CA workshop with Wintershall (WINZ) and INTK. The inputs from JNCC have been included in the scoring following JNCC's review of draft CA document. AB began by briefly explaining the scoring system (being between 1 and 5), with relative scores using decimals (for example scoring of 2, with relative scoring against other options being scored at 2.3). AB also explained the different weightings (A-F) with Option A being an even weighting, with B-F being weighted towards different criteria e.g. commercial fishing, long-term environmental impacts etc. AB also summarised scoring schemes.	
6	**Review of the CA scoring and discussion for the Safety and Societal sub-criteria** AB and RG WINZ stated that surveys and technical study have been undertaken to confirm that the pipeline is not near the surface, therefore likelihood of fishing vessels equipment snagging on exposed pipeline will be low/zero. AB stated that for the Option 2, the safety scorings were scored as 1, for multiple reasons, but also due to fishing effort being low around the pipeline location. MR confirmed that no mobile gear is allowed within the Dogger Bank SAC, where only static gear is allowed. MR also stated that rock dump on pipeline/spool pieces may have an effect on static gear, depending on the gradient of the rock dump.	

Item	Description	Action
	MR queried whether a 500m rolling exclusion zone will be in place around the vessels during operations or whether there would be a 500m exclusion around the whole pipeline. JW from WINZ stated that there would likely be a rolling exclusion zone, as a full pipeline exclusion would not be needed. MR stated that displacement would therefore be minimal. AB stated that the scoring for safety to fishing vessels is low due to the SAC fishing restrictions and the exclusion zones, therefore risk to other users would be minimal. MR stated that mitigation will be required to minimise the risk if the pipeline is to be left in-situ, as it can be a hazard. MR continued by stating that it is preferred that anything that is put onto the seabed is removed when decommissioning, although is aware that this may not always be possible. MR also stated that modelling of the North Sea during storm surges shows that the sediment movement can expose pipelines, depending on the water characteristics (depth etc.) therefore continuous monitoring will be required. AB and WINZ stated that there is a survey booked for next year. JW stated that if there is more spans or areas of lower coverage, they will include more inspections, as required. JW also stated that the next survey is next year (2026) and another every 4 years until decommissioned, then every 5 years after decom (unless more surveys required). FL stated that OPRED require an overtrawlability survey after decommissioning and then will take a view of frequency of when surveys will be required based on the latest survey information. JW agreed and stated that the likelihood of span occurring and likelihood of snagging are low, which is how survey frequencies were assessed. MR stated that MMO hold onto data where fisheries snag on hazards, and likelihood increases when outside of the Dogger Bank SAC (the 3km of pipeline outside SAC). All agreed that scoring does not need to change, as the likelihood is low. MR stated that whilst the likelihood is low, the consequences are high, scoring table doesn't account for consequences. AB stated that INTK can address this in the report by undertaking sensitivity and doubling scores to see how affects the overall ranking. JW questioned whether we could look at education regarding H&S risks. MR stated that there is safety training and incidents have declined in recent decades and most commercial fisheries are going through new training and legislation is also driving a change too. Aim to help to determine that in these events the worst case doesn't occur. JW questioned the cost of damage/loss of fishing gear, MR stated that it entirely depends on the gear, e.g. up to £10,000 for trawling gear. AB applied higher weightings towards fisheries to show MR that didn't impact the ranking of options. MR left meeting. AB continued through the rest of the safety sub-criteria. JR stated that activities relating to leave in-situ are not normal operations and therefore would suggest higher score. AB confirmed that activities common to all options are not assessed in the CA and asked if rock dump are removal of spool pieces would be classed as routine ops. JR stated that dependant on the contractor used. If used particular contractors this would be a routine activity. Confirmed that it will be up to WINZ to determine contractors and acceptable levels of risk. Scores remained the same. AB stated that the risk to personnel onshore can include different elements due to the potential contamination. In addition removal of pipeline will require more	INTK to report on sensitivity analysis of doubling the Other users safety score (20231128_01)

Item	Description	Action
	handling, therefore there will be more risks. JR mentioned that once the pipeline is removed, HSE no longer required, this is more the Environment Agency's (EA) remit. JR stated that the best option for fisheries would be removal. Identified the risks that pipeline corrodes into the seabed and leaves trench, also want to ensure that pipeline sections don't float up to the sea surface. Occurred recently in North Sea when abandoned pipelines have floated to the surface after storms etc. JW asked if can provide reasoning for this but JR advised cannot disclosed information as still undergoing investigations. AB confirmed INKT will provide more details on what monitoring and mitigation is planned in the report. JR left the meeting.	INTK to provide more details on the planned monitoring and mitigation in report (20231128_02).
7	**Review of the CA scoring for environmental, technical and economic** AB summarised the feedback from JNCC on the environmental sub-criteria and that this has been incorporated into scores. Noting that one of the environmental sub-criteria (materials recovery) hasn't received comment. Looking at these emissions, JW questioned whether we could bundle CO_2 emissions and CO_2 savings together and potentially subtract emissions saved dur to recovery from the emissions for operations? AB stated that the emissions saved are approximately half of the fuel emissions, so scoring was reduced to 1.2. AB continued by moving onto the project failure risk sub-criteria and stated that reverse S-lay is outside the North Sea experience which is why the scoring is slightly higher. No comments were made on the scoring. The cost sub-criteria it was noted that in-situ options were given a relatively low score, with slightly higher scoring for removal options due to increased vessel usage and costs. FL queried whether future costs for future surveys was included, in which JW stated that it was cost for decommissioning activities, and cost was factored from cost per km. EL also stated options 1 and 2 included costs for one survey. This was a bundled survey. RG queried whether S-Lay should be higher scoring due to it not being a routine operation, of which everybody agreed, and scoring was increased to 3.	
8	**Weightings** AB gave an overview of the weightings section. MJ queried whether these weightings have been discussed with JNCC, AB & EL confirmed. AB stated that in-situ options are almost the same scoring, with option 2 coming out as the preferred option in all weightings. As JNCC are focusing on long-term impacts, balanced weightings applied - option 2 is still the preferred option. No questions from other parties, all agreed. AB advised that the weightings currently took the average score for each criteria, this will be revised to take the maximum to check no differences to rankings. AB asked if were any other weightings to review. FL advised that didn't have any comments, but it was good to see different scoring weights were considered.	INTK to revised basis for the category scoring to the maximum of the criteria scores instead of the average (20231128_03).
9	**Next steps** AB and EL stated that the next steps are for INTK to update the draft CA and circulate mid-December for comments. Review comments will be required mid-January. EL advised that plan was to finalise the CA, EA and decom program in January/February. These will be sent to OPRED for review prior to finalisation.	INTK to revise draft CA report and circulate for review mid-

Item	Description	Action
	EL asked if OPRED wanted to see draft in December too. FL confirmed would like to receive this for information. EL will send draft CA to FL & SP directly (and other stakeholders) in December. MJ queried whether there has been any concerns in the past regarding exposures or scouring of pipeline, of which JW stated that there was only 1 DoB survey, the others have been visual surveys, and found no spans or exposures, and can check whether WINZ survey in 2026 is DoB or just visual.	December (20231128_04).

2. ACTIONS

No.	Description	Responsible	Deadline
20231128_01	INTK to report on sensitivity analysis of doubling the Other users safety score.	AB	11/12/23
20231128_02	INTK to provide more details on the planned monitoring and mitigation in report.	EL	18/12/23
20231128_03	Revised basis for the category scoring to the maximum of the criteria scores instead of the average.	AB	11/12/23
20231128_04	INTK to revise draft CA report and circulate for review mid-December.	EL	18/12/23