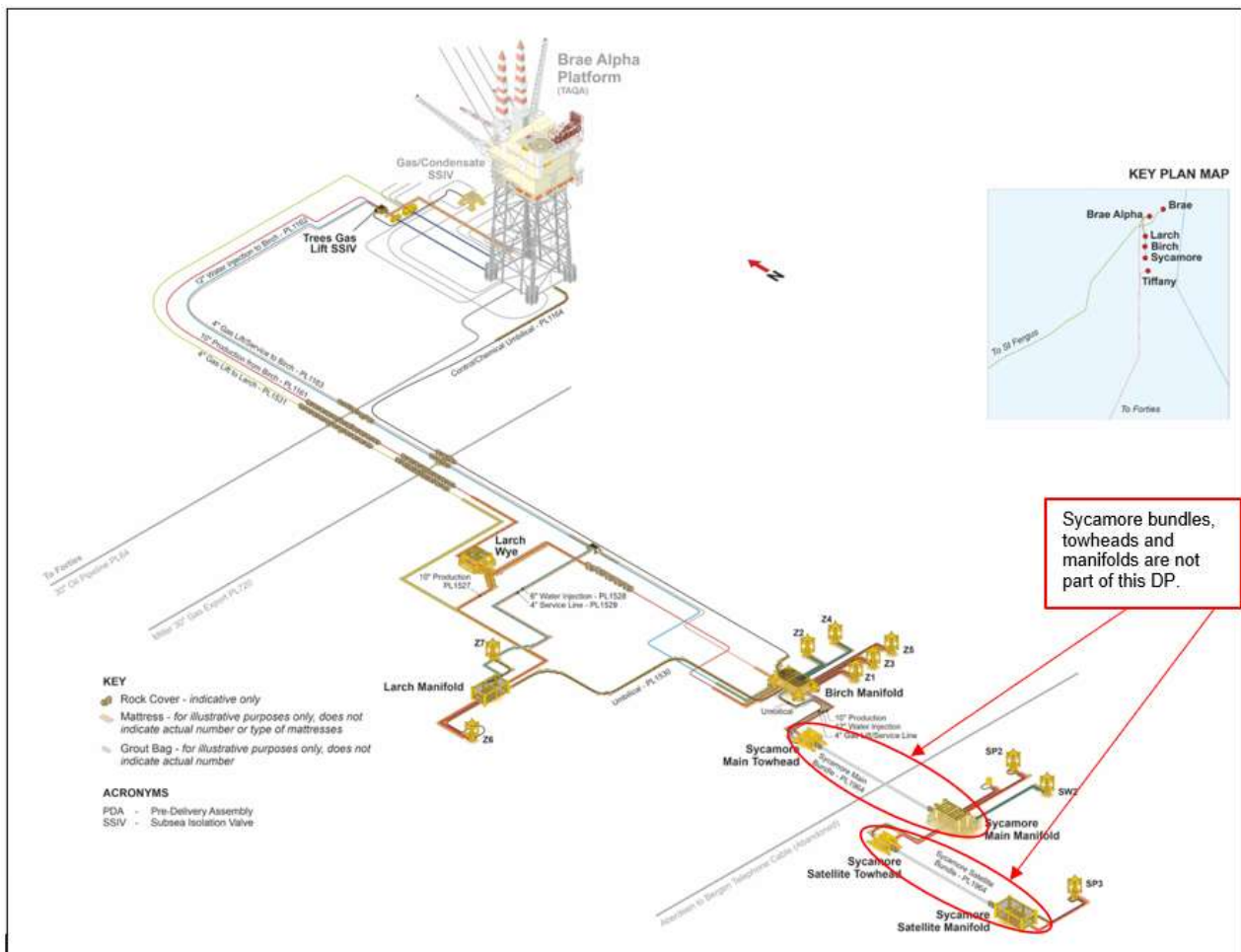


Trees Pipelines Decommissioning Comparative Assessment (Birch, Larch and Sycamore)



March 2026

Final Version

DOCUMENT CONTROL

Document ID:		TREEDC-SPT-Y-0000-REP-0001	
Document Classification:		PUBLIC	
Document Ownership:		Decommissioning	
Date of Document:	19/01/2026	Signature	Date
Prepared by:	D. Marnoch	-	19/12/2026
Reviewed by:	S. Liu	-	19/12/2026
Approved by:	C. Wheaton	-	03/03/2026

REVISION RECORD

Revision No.	Date of Revision	Reason for Issue
A1	12/10/2021	Issued for PDi internal review (2715-PDi-PE-REP-004)
B1	18/10/2021	Issued for Spirit internal review
C1	18/11/2021	Issued for use
C2	20/06/2022	Re-issued for Use
C3	22/07/2022	Re-issued for Use
C4	04/08/2022	Re-issued for Use
C5	11/05/2023	Updated following OPRED comments
C6	23/10/2023	Re-issued for Use
C7	10/05/2024	Re-issued for use. Sycamore bundles and associated structures will be addressed under a separate CA.
C8	25/07/2024	Updated following OPRED comments.
C9	06/09/2024	Issued for Statutory Consultation.
C10	23/10/2025	Final Version
C11	05/12/2025	Updated following OPRED comments
C12	19/01/2026	Updated to incorporate comments from EA
C13	03/03/2026	Issued to OPRED

DISTRIBUTION LIST

Company	No. of copies
Offshore Petroleum Regulator for Environment and Decommissioning	1 electronic
GMG, NFFO, NIFPO, SFF	1 electronic
Section 29 Notice Holders.	1 electronic

TABLE OF CONTENTS

1	Executive Summary	6
1.1	Overview.....	6
1.2	Subsea Facilities.....	6
1.3	Comparative Assessment	6
2	Introduction	9
2.1	Overview.....	9
3	Environmental Setting	11
3.1	Overview.....	11
3.2	Drill Cuttings	11
3.3	Sensitive Habitats and Species.....	11
3.4	Commercial Fishing	12
3.5	Other Commercial Activity	13
4	Subsea Pipelines, Protection and Stabilisation Features	14
4.1	Overview.....	14
4.2	Trenching & Burial Status	15
4.3	Protection and Stabilisation	17
5	Comparative Assessment Methodology	18
5.1	Comparative Assessment Outline	18
5.2	Data and Supporting Studies	18
5.3	Exclusions & Assumptions.....	18
5.4	Evaluation Method	19
6	Comparative Assessment	22
6.1	Pipelines.....	22
6.2	Mattresses and Grout Bags	28
7	Comparative Assessment Recommendations	30
7.1	Pipelines and umbilicals which are trenched to a depth of at least 0.6m TOP.....	30
7.2	Pipelines and umbilicals which are not trenched to a depth of at least 0.6m TOP.....	30
7.3	Stabilisation Features	31
8	Supporting Documents	32
Appendix A	Field Layout Sketches	33
Appendix B	Pipeline Burial Profiles	39
Appendix C	Pipeline Routes and Exposures	47
Appendix D	Impact Assessment Criteria	49
Appendix E	Comparative Assessment results	53
Appendix E.1	Pipelines – Group A	53
Appendix E.2	Pipelines – Group B	57
Appendix E.3	Pipelines – Group C	61
Appendix E.4	Mattresses and Grout Bags.....	66

FIGURES AND TABLES

Figure 2-1: Trees Field Schematic.....	9
Figure 4-1: Trees Pipelines Schematic	14
Figure 4-2: Sketch of typical trench	16
Figure A-1: Brae Alpha Approaches	33
Figure A-2: Forties Crossing.....	34
Figure A-3: Miller Crossing	35
Figure A-4: Larch Wye Approaches.....	36
Figure A-5: Larch Gas Lift (& Production) Manifold & Wells.....	37
Figure A-6: Birch Manifold and Wells.....	38

Table 3-1 Landings (quantity and value) by species type in ICES rectangle 46F1 and 47F1	12
Table 4-1: Pipeline & Umbilical Summary.....	15
Table 4-2 Surveys	16
Pipelines Status Summary	16
Table 4-3 Pipelines Status Summary.....	17
Table 4-4: Pipeline Burial Status in Trenches	17
Table 5.1: Comparative Impact.....	19
Table 5.2: Criteria and sub-criteria	21
Table 6.1.1: Pipelines Decommissioning Options	23
Table 6-2: Pipeline Decommissioning Options Screening.....	24
Table 6-3: Options Data	25
Table 6-4: Group A – Assessment Summary.....	26
Table 6-4: Group B – Assessment Summary.....	27
Table 6-4: Group C – Assessment Summary	28
Table 6-5: Mattresses and Grout Bags – Assessment Summary.....	29

ABBREVIATIONS

Abbreviation	Explanation
BEIS	Department for Business, Energy & Industrial Strategy (now DESNZ)
CA	Comparative Assessment
CNS	Central North Sea
c/w	Complete with
DESNZ	Department for Energy Security and Net Zero
DOC	Depth of Cover
DOL	Depth of Lowering (mean seabed level to top of pipe)
DP	Decommissioning Programme(s)
DSV	Dive Support Vessel
EA	Environmental Appraisal
EIA	Environmental Impact Assessment
EMOBF	Enhanced Mineral Oil-Based Fluid
GL	Gas Lift
GMG	Global Marine Group
ICES	International Council for the Exploration of the Seas
INTOG	Innovation and Targeted Oil and Gas
IRM	Inspection, Repair, Maintenance
JNCC	Joint Nature Conservation Committee
km	kilometre
KP	Kilometre Point
LTOBF	Low Toxicity Oil-Based Fluid
m	metres
MPA	Marine Protected Area
MTO	Material Take-Off
NFFO	National Federation of Fishermen's Organisations
NIFPO	Northern Ireland Fish Producers' Organisation
NORM	Naturally Occurring Radioactive Material
NSTA	North Sea Transition Authority
OD	Outside diameter
OPF	Organic Phase Fluid
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OSPAR	Oslo Paris Convention
PAO	Polyalphaolefin Based Fluid
PDI	Project Development International Limited
PL, PLU	Pipeline (or umbilical) identification numbers
PMF	Priority Marine Feature
PWA	Pipeline Works Authorisation
SBF	Synthetic Based Fluids
SIMOPS	Simultaneous Operations e.g. multiple vessels/activities at the same location
SMM	Sycamore Main Manifold
Spirit Energy	Spirit Energy North Sea Oil Limited
SSM	Sycamore Satellite Manifold
TAQA	TAQA Bratani Limited
Te	Tonne(s)
TOC	Top of Cover i.e. backfill (seabed sediment) on top of the pipe within the trench
UK	United Kingdom
UKBAP	United Kingdom Biodiversity Action Plan
WI	Water Injection

1 EXECUTIVE SUMMARY

1.1 Overview

The Trees development consists of the Birch, Larch and Sycamore fields operated by Spirit Energy North Sea Oil Ltd (Spirit Energy). Birch, Larch and Sycamore Central are subsea developments with a total of 11 wells (7 production, 4 water injection) tied back to the TAQA Bratani Limited (TAQA) operated Brae Alpha Platform which provides for the processing of all Trees reservoirs fluids through the B separation train, dedicated for Trees Field fluids. These fields are located in Block 16/12a in the Central North Sea (CNS).

A comparative assessment (CA) of the pipelines and umbilicals is a key consideration within the Decommissioning Programmes (DP) submitted to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED).

Note that the 2 x bundles in the Trees fields, namely the Sycamore Main bundle and Sycamore Satellite bundle, together with their associated towheads and manifolds, will be covered in a separate CA and DP.

During the Consultation phase for the Trees Decommissioning Programmes, the proposals for the decommissioning of the pipelines and stabilisation materials within the open trenches have been subject to more detailed scrutiny. In order to address the queries, Spirit Energy has performed additional offshore & onshore investigations and attended regular status meetings with the relevant consultees, resulting in this revised Comparative Assessment (CA), together with an updated Environmental Appraisal (EA) [4], both in support of the revised Trees Decommissioning Programmes.

1.2 Subsea Facilities

The pipelines have been installed in open trenches and left to backfill naturally. Trench depths are predominantly in excess of 0.6m from top of pipe (TOP) to mean seabed level, and typically the trench depths are between 1m – 2m deep with the pipelines sitting in the bottom of the trenches. Natural backfill has occurred to an extent within the open trenches but this is generally limited to a depth of cover of ~0.3m with numerous exposures noted along most pipelines. No freespans have been identified and there have been no reports of any snagging issues with fisheries.

Mattresses, grout bags and rock are also present on the pipelines within the trenches, and have been installed for protections, stabilisation and upheaval buckling mitigation (UHB).

Surveys of the facilities indicate that there is a gradual increase in the level of backfill, however future surveys will be required to confirm whether this increase is continuing.

1.3 Comparative Assessment

1.3.1 Pipelines and Umbilicals

For the purposes of the assessment the pipelines were divided into the following groups:

Group A – Pipelines/umbilicals which share a trench and/or are piggybacked

- PL1162, PL1163, PL1530 and ~10.8km of PL1164
- PL1527 & ~2.4km of PL1531
- PL1528 & PL1529

Group B – Rigid single pipelines in individual trenches

- PL1161
- PL1531 (~9.7km section from Brae A to Larch Wye)

Group C – Umbilicals in individual trenches

- PL1164 (~4km section from Brae Alpha to Forties crossing).

The following decommissioning options were identified and assessed.

- Option 1 – Complete Removal by whatever means is most practicable and acceptable.
- Option 2 – Partial Removal - Recover insufficiently trenched and/or backfilled sections (sensitivities performed for extent of recovery required i.e. areas <0.6m TOP trench depth, areas < 0.6m TOP backfill, and exposed areas only).
 - 2a – Cut and lift of pipelines and bundles.
 - 2b – Umbilical recovery onto an Anchor Handler Vessel (AHV)
- Option 3 – Leave *in-situ* with remediation - Remediate insufficiently trenched and/or backfilled sections (sensitivities performed as per Option 2). Remediation options are a) re-trench/backfill b) rock cover.
- Option 4 – Leave *in-situ* without remediation, but possibly with enhanced seabed clearance verification and ongoing monitoring.

In all cases, surface laid pipeline ends will be recovered to the point where they are at the required trench depth, and all rock covered sections e.g. crossings and other locations where rock has been used to provide stabilisation or protection to the pipelines will remain *in-situ*.

Pipelines Decommissioning Proposal

From the CA, and discussions with consultees the preferred option for groups A, B and C is:

- Option 2 – Partial Removal - Recover insufficiently trenched sections i.e. areas <0.6m DOL.
 - 2a – Cut and lift of pipelines and bundles.
 - 2b – Umbilical recovery onto an Anchor Handler Vessel (AHV)

Recovery will be by cut & recovery of the sections (estimated to be 4 areas totalling around 370m length of pipeline.) The remaining pipeline cut ends would be remediated using rock cover to protect against possible snagging.

This option recognises the fact that the existing trench depths are considered to provide adequate protection for fishing activities (fishing is taking place over the pipelines and no snagging events have been recorded to date). The option also minimises the amount of additional rock and hence permanent seabed disturbance resulting from remediation of any longer sections.

This proposal will be reviewed at the time of decommissioning following pre-decommissioning surveys. Subject to review of the data it may be found more suitable to rock cover the sections (Option 3b), to prevent disturbance of any pipelines in shared trenches and to minimise leaving & remediating multiple cut pipeline ends.

The pipelines remaining *in-situ* may be subject to increased monitoring to confirm the pipelines remain stable and do not become a snagging risk. This will be completed to a schedule agreed with OPRED and further remediation will be performed if deemed necessary. Seabed clearance verification may require overtrawl trials to confirm that the *in-situ* trenched pipelines do not pose a hazard for fishing activities.

1.3.2 Mattresses and Grout Bags

Mattresses and grout bags which are exposed within the pipeline trenches will be fully recovered unless any are found to be unsafe for recovery. The contingency option for remediation of mattresses which cannot be recovered is by rock cover. Spirit will consult with OPRED prior to such remediation to demonstrate why recovery has not been possible and to discuss the proposed remediation.

Mattresses and grout bags which are buried under soil or rock will be left *in-situ*. As per the pipelines, they may be subject to increased monitoring to confirm they do not become a snagging risk. This will be completed to a schedule agreed with OPRED and further remediation will be performed if deemed necessary. Seabed clearance verification may require overtrawl trials to confirm that the *in-situ* materials do not become a hazard for fishing activities.

Recovery of the mattresses (within trenches) will expose the pipelines underneath, which may then require remediation / rock cover, if the removal of the mattress has increased the risk of snagging. The risk of snagging will be assessed based on all available information, including, but not limited to, as left survey, legacy inspection programme, and fishing activity; for e.g. the inspection programme will provide ongoing depth of cover data. Once the mattress has been removed, the pipeline below will conform to the preferred approach outlined in section 1.3.1.

2 INTRODUCTION

The purpose of this document is to present a Comparative Assessment (CA) in support of the Trees Decommissioning Programmes (DP), covering the Birch, Larch and Sycamore fields. The CA is performed as required by OPRED Guidance Notes [1] and describes the options considered and the preferred solutions for the decommissioning of the pipelines and associated subsea facilities.

During the Consultation phase for the Trees Decommissioning Programmes, the proposals for the decommissioning of the pipelines and stabilisation materials within the open trenches have been subject to more detailed scrutiny. In order to address the queries, Spirit Energy has performed additional offshore & onshore investigations and attended regular status meetings with the relevant consultees, resulting in this revised Comparative Assessment (CA), together with an updated Environmental Appraisal (EA) [4], both in support of the revised Trees Decommissioning Programmes.

2.1 Overview

The Trees development consists of the Birch, Larch and Sycamore fields operated by Spirit Energy North Sea Oil Ltd (Spirit Energy). Birch, Larch and Sycamore Central are subsea developments with a total of 11 wells (7 production, 4 water injection) tied back to the TAQA Bratani Limited (TAQA) operated Brae Alpha Platform which provides for the processing of all Trees reservoirs fluids through the B separation train, dedicated for Trees Field fluids. These fields are located in Block 16/12a in the Central North Sea (CNS).

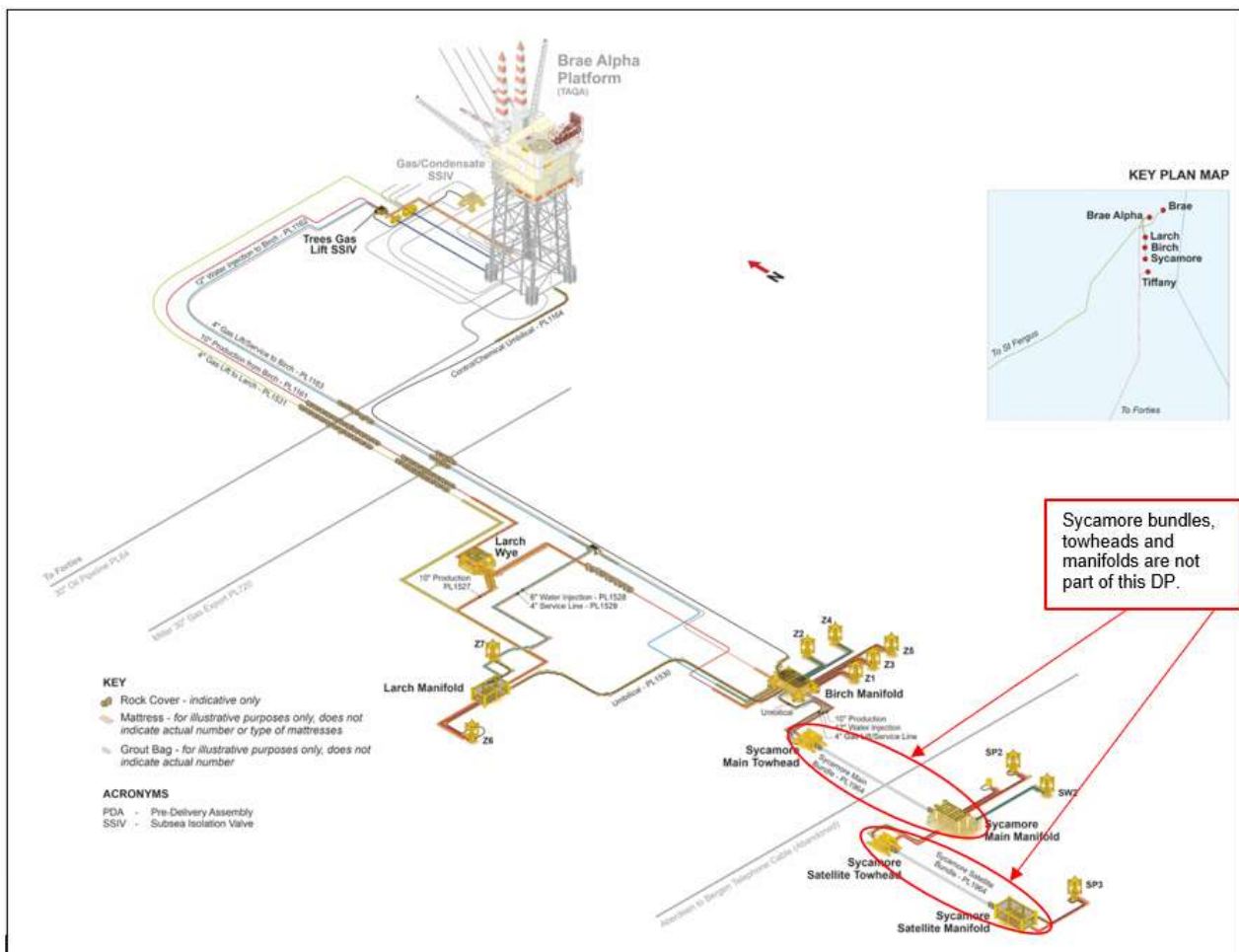


Figure 2-1: Trees Field Schematic

The Birch installation is served by a subsea manifold structure with three production wells and two water injection wells. Birch is tied back to the Brae Alpha platform via a 13.5km 10" production pipeline, 12" water injection pipeline, 4" gas lift/service line and control umbilical. Production from Birch commenced in 1995.

The 10" production pipeline between Birch and Brae Alpha has a Wye piece connection 2.39km downstream of the Birch Manifold which allows the Larch Installation to direct production fluids back to Brae Alpha. The Birch 12" water injection and 4" gas lift/services pipelines also have T-piece connections that facilitate tie-in of the Larch installation. Rigid spools connect the pipelines and wells to the manifold and Brae Alpha Platform.

The Larch field has been developed with single production and water injection wells. The production well is tied-back via a 2.39km 10" production pipeline to the Larch Wye structure into the Wye connection on the Birch pipeline system whilst the 6" injection water & 4" service pipelines to the injection well are tied-back to Brae Alpha via T-pieces in the Birch Lines close to the Larch Wye location. Gas lift is provided to the production well from Brae Alpha by a separate 12.1km 4" pipeline connected to a T-piece in West Brae Gas Lift line and routed through the Larch Manifold near the wells. Controls and chemicals are supplied by the Larch umbilical via the Larch Manifold connected to the Birch manifold. Rigid spools connect the pipelines and wells to the Larch and Birch manifolds and the Wye. Production from Larch commenced in 1998.

The Sycamore subsea facilities consist of two pipeline bundles – Sycamore Main Bundle 4.4km long and Sycamore Satellite Bundle 800m long – with a manifold at one end and a towhead at the other end of each bundle. The bundles were installed, and production commenced in 2003. The Sycamore bundles and associated towheads and manifolds are not included within this CA and will be addressed under a separate CA, EA and DP. The tie-in spools and jumpers between the bundle manifolds, towheads and wells are included within this CA as their removal has no impact on any future decommissioning options for the bundles, manifolds and towheads.

3 ENVIRONMENTAL SETTING

The environmental data and assessment within this CA have been informed from the Environmental Appraisal [4] and the environmental consultants.

3.1 Overview

The Trees fields are located in UKCS blocks 16/12a and 16/7 of the central North Sea (CNS), ca. 209km from Peterhead and in 125m water depth. The fields are located to the south of the Brae A platform, to which they are tied back, and positioned linearly along an approximate north south bearing. The description of the environment within which the Trees fields are located, draws information from a number of different sources, including site specific surveys, and regional surveys, and e.g. fisheries (International Council for the Exploration of the Seas (ICES) rectangle) data (spawning / nursery), bird and marine mammal distribution data.

Spirit Energy conducted a pre-decommissioning environmental survey in March 2022 for the Trees fields at the Birch, Larch, Sycamore and the Brae A locations. This survey is supported by results from two previous surveys of the Trees area. The pre-decommissioning survey comprised a geophysical survey using side-scan sonar and multibeam echosounder, video and still photos taken using drop down camera and benthic grab samples using a dual Van Veen grab. Survey stations were positioned in a cruciform pattern around each field manifold location, with the main axis aligned with the residual current direction.

3.2 Drill Cuttings

The Birch, Larch and Sycamore fields were developed between 1985 and 1997 and in the absence of drilling records it is assumed that oil-based muds and organic phase fluids (OPF) were used in some hole sections with cuttings discharged at all wells drilled prior to the ban on such discharges coming into place. Samples from the drill cuttings piles indicate the presence of low toxicity oil-based fluid (LTOBF), synthetic based fluids (SBF), Polyalphaolefin based fluid (PAO) and enhanced mineral oil-based fluid (EMOBF) in the cuttings. An assessment has been performed and the accumulations found to be below the OSPAR 2006/5 thresholds [5].

3.3 Sensitive Habitats and Species

The Trees field facilities are not located within, or near to, a designated conservation area, the closest of these being 31km away. In terms of habitats or species of conservation interest, the pre-decommissioning survey (Fugro 2022a) recorded sea pens and burrows in sufficient density to indicate the presence of the OSPAR listed threatened and/or declining habitat, sea pens and burrowing megafauna communities. There was no clear pattern of spatial distribution of the two sea pen taxa across the survey areas and burrow types showed a consistently high occurrence throughout all stations in the Trees fields survey (Fugro 2022a).

The PMF broad habitats Burrowed mud and Offshore deep-sea muds, as well as the UKBAP Priority Habitat (JNCC 2019) Mud habitats in deepwater are also likely to be present within the survey area.

These habitats are widely distributed in the CNS and are represented within the UK Marine Protected Area (MPA) network, including the Norwegian Boundary Sediment Plain MPA and Central Fladen MPA, located more than 45km from the Trees fields.

One live adult ocean quahog (*Arctica islandica*) specimen was recovered within a grab sample at the Larch Wye survey area, with possible *Arctica islandica* siphons identified during seabed video and photography analysis at two Larch Wye stations. However, no further specimens were recovered and there was no further video or photographic evidence of adults or aggregations in the survey area.

No other Annex I habitats, OSPAR threatened and/or declining species and habitats, or Scottish biodiversity list species and habitats (OSPAR 2008; JNCC 2019; NatureScot 2020) were observed within the survey areas.

3.4 Commercial Fishing

3.4.1 Fishing Activity

The Trees fields infrastructure is located within ICES rectangle 46F1 and the landings (quantity and value) for this rectangle over the period 2021 to 2023 are shown in Table 2-2 (the Trees fields infrastructure are located close to the border of rectangle 45F1 and, the information relevant to that rectangle is also included).. For ICES rectangle 46F1, for all three years, landings (weight) were dominated by demersal species, with shellfish dominating in terms of value in all three years. In contrast, shellfish was the dominant catch (weight and value) in 45F1, for 2021 and 2022 but demersal landings being greater (for weight) in 2023, although shellfish remained the higher value catch that year. In both rectangles, and throughout this period, pelagic catches have been consistently low.

Nephrops is the dominant shellfish species landed, with haddock, cod, monks/anglers, whiting and saithe accounting for the majority of the landings, although over a dozen other species are also landed.

Both rectangles account for less than 1% of the total UK landings indicating the area is of relatively low importance compared to other areas fished around the UK.

Species Type	2021		2022		2023	
	Liveweight (Te)	Value (£)	Liveweight (Te)	Value (£)	Liveweight (Te)	Value (£)
ICES Rectangle 46-F1						
Demersal	506	878,093	466	715,191	411	625,010
Pelagic	-	-	0	75	0	28
Shellfish	365	1,185,511	384	1,968,250	178	759,287
Total	871	2,063,604	851	2,683,516	589	1,384,325
UK Total	538,343	685,441,244	431,398	684,497,956	545,648	800,550,253
% of UK total	0.2	0.3	0.2	0.4	0.1	0.2
ICES Rectangle 45-F1						
Demersal	671	1,142,680	714	1,094,748	521	755,250
Pelagic	0	3	0	135	0	6
Shellfish	948	3,065,264	844	4,009,086	333	1,505,649
Total	1619	4,207,947	1,558	5,103,969	854	2,260,905
UK Total	538,343	685,441,244	481,398	684,497,956	545,648	800,550,253
% of UK total	0.3	0.6	0.3	0.7	0.2	0.3

Notes: Landing by UK vessels into the UK ports and abroad and foreign vessels into UK. Total from summing all landings and all values from all relevant rectangles in that year and using annual total tab from official statistics spreadsheet. Source: Marine Scotland Data website.

Table 3-1 Landings (quantity and value) by species type in ICES rectangle 46F1 and 47F1

The predominant fishing gear used in the area is twin rig bottom trawl with associated otter boards and a clump weight and to a lesser extent bottom and pelagic seines. Unless there is a shift in target species, the expectation would be these fishing gear types will continue to be used in the Trees and wider area.

Logbooks submitted by fishermen allow an examination of the gears operated and seasonal patterns in fishing effort (Table 3.2). Over the period 2021 to 2023, fishing effort is low to moderate, accounting for less than 1% of the UK total (with exception in the neighbouring rectangle 45F1 in 2022 and 2023), with highest effort typically in spring and summer months, although in 2021 and 2022, higher numbers have also been seen towards the latter part of the year. Consultation with the SFF indicates that the Trees pipeline routes have been regularly fished without any reported snagging incidents.

Year	J	F	M	A	M	J	J	A	S	O	N	D	Total	UK Total	% of UK Total
ICES Rectangle 46F1															
2021	7	20	37	9	6	D	50	194	20	60	25	D	437	105,642	0.4
2022	5	9	13	20	6	165	91	65	72	41	D	D	487	94,467	0.5
2023	D	5	94	17	7	7	15	74	116	-	D	5	416	95,358	0.4
ICES Rectangle 45F1															
2021	4	126	110	111	D	-	221	43	D	121	230	D	972	105,642	0.9
2022	D	D	20	81	D	290	166	135	196	141	D	D	1,037	94,467	1
2023	D	4	237	6	D	-	12	222	75	D	3	-	1,042	95,358	1

Notes: Monthly fishing effort by UK vessels >10m, days fished includes time travelling within rectangles; green = 0-50 days fished, yellow = 51-100, orange = 101-150, blue = 151-200, red = >200, D = disclosive and - = no data. Sources: Marine Scotland Data website

Table 3-2 Number of days fished per month (all gears) in ICES rectangles 46F1 and 45F1

3.5 Other Commercial Activity

Shipping density data shows block 16/12a as having moderate, and block 16/07 having low levels of shipping. Typical vessels in the area are likely to be oil and gas supply and support vessels, the routes of the majority of which are expected to originate from service ports in Peterhead and Aberdeen.

There are no operational, under construction and consented wind farm developers/demonstrators in and around the Trees fields and wider area, the closest of these being the Cerulean Winds Innovation and Targeted Oil and Gas (INTOG) leasing area, 59km away; the Trees area (Larch wye) is close to (2km), and sections of the pipelines traverse through, the INTOG area of search and exclusion NE-d, however, none of the 13 projects offered exclusivity agreements are located within NE-d and it is unknown when, or if this area is to be offered again. The Trees fields are relatively close (ca. 3km) to CS012, an area awarded in the recent North Sea Transition Authority (NSTA) carbon storage licensing round.

4 SUBSEA PIPELINES, PROTECTION AND STABILISATION FEATURES

4.1 Overview

The Trees pipelines have been installed in open trenches and left to naturally backfill. The trenched pipelines have been lowered to a depth of between 1.0m and 2.0m below the mean adjacent seabed level.

Pipeline systems include piggybacked lines and single and multiple lines within trenches. The Trees pipelines are shown schematically in Figure 4-1 with brief descriptions and trench details included in Table 4-1.

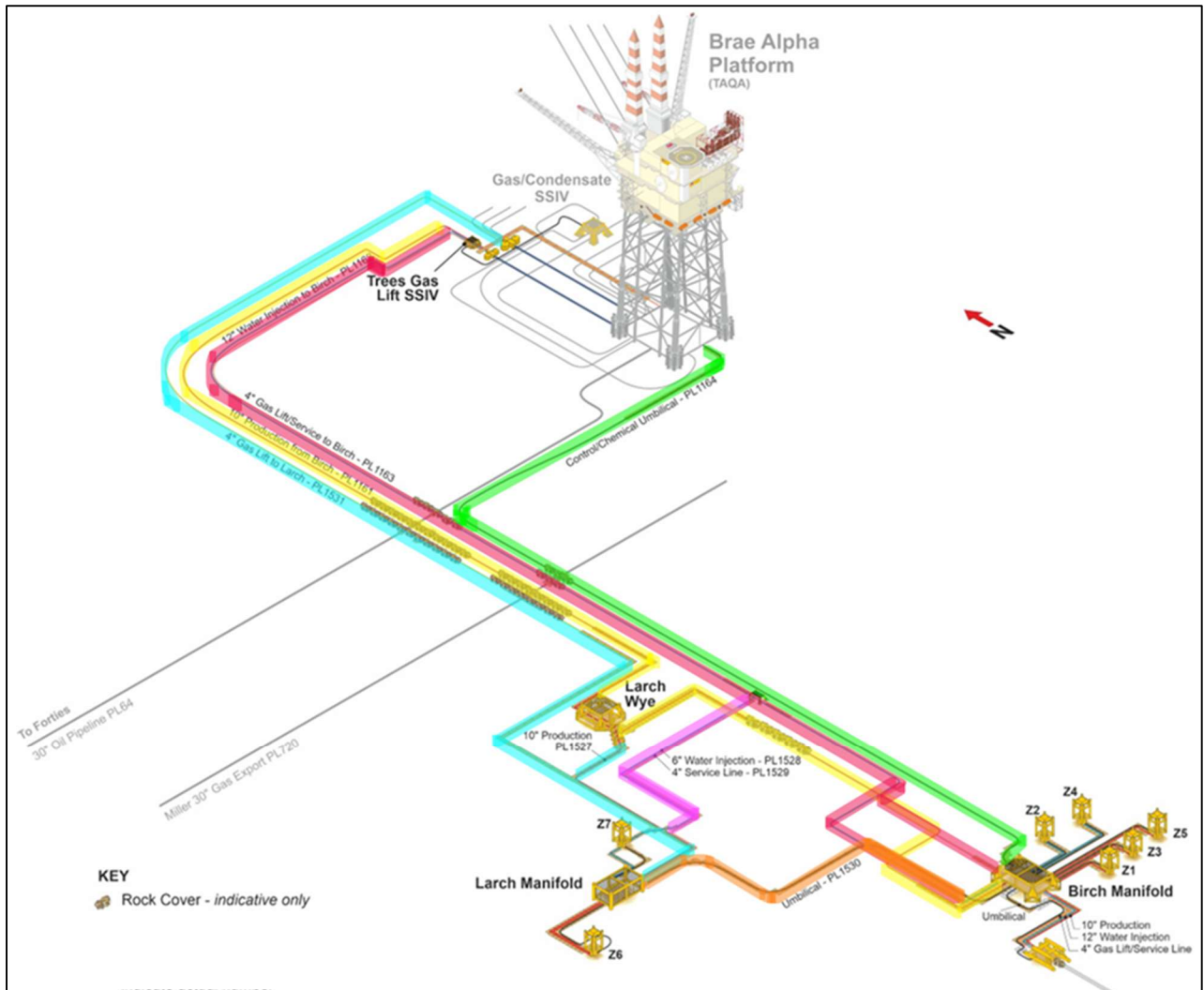


Figure 4-1: Trees Pipelines Schematic

	PL ¹	Pipeline	Trench #	Route
Birch	PL1161	10" Production x 14.3km Trenched and intermittently rock covered. Concrete mattresses at manifold, wye and platform approaches.	1	From Birch Manifold via Larch Wye to Brae A
	PL1162	12" Water Injection x 13.9km (piggybacked with PL1163) Trenched with concrete mattresses at manifold and platform approach.	2	From Birch Manifold to Brae A
	PL1163	4" Gas Lift x 13.9km		
	PL1164	Umbilical x 13.9km (shares Trench #2 with PL1162 & PL1163 from Forties crossing south) Trenched with concrete mattresses at manifold and platform approach. In individual trench from Brae A to Forties crossing.	2 (10.8km) 3 (4km)	From Brae A to Birch Manifold
Larch	PL1527	10" Production x 2.4km Trenched with concrete mattresses at manifold and wye approach c/w piggybacked PL1531. Trenched with spot rock cover.	4	From Larch Manifold to Larch Wye
	PL1531	4" Gas Lift x 12.1km Piggybacked to PL1527 for ~2.4km. Trenched with spot rock cover. Concrete mattresses at manifold, wye and platform approaches.	4 (2.4km) 5 (9.7km)	From Larch Manifold via Larch Wye to Brae A
	PL1528	6" Water Injection x 2.2km (piggybacked with PL1529) Trenched with concrete mattresses at manifold and tee approach.	6	From Larch Manifold to Tee assembly
	PL1529	4" Gas Lift / Service x 2.4km (piggybacked to PL1528)		From Tee assembly to Larch Manifold
	PL1530	Umbilical x 1.8km (shares Trench #2 with PL1162, PL1163 & PL1164) Trenched with concrete mattresses at manifold approaches.	2	From Larch Manifold to Birch Manifold
Notes: 1. The colour coding corresponds to the colours on Figure 4-1				

Table 4-1: Pipeline & Umbilical Summary

4.2 Trenching & Burial Status

A summary of the data used to represent the burial profiles and the assessment of the status of the subsea pipelines is shown in the table below.

Survey Date	Pipeline Nos.	Comments
2010	PL1161, PL1162, PL1163 & PL1164.	Partial details available – no relevant anomalies recorded.
2014	PL1527, PL1528 & PL1531.	Full burial profiles available.
2018	PL1161, PL1162, PL1163, PL1164, PL1527, PL1528 & PL1531.	Full burial profiles and video footage available.

Survey Date	Pipeline Nos.	Comments
2024	PL1161, PL1162, PL1163, PL1164, PL1527, PL1528 & PL1531.	Additional 3-D rendering of 2018 survey data at areas of interest along the pipeline routes.

Table 4-2 Surveys

Following DP consultation comments in Q4 2024, further investigation of the existing survey data and survey video was performed. Additional video surveys and 3-D analysis of some areas of interest along the pipeline routes were produced. The purpose of these was to provide more definitive information regarding the burial status and condition of the pipelines and stabilisation materials and also to inform predictions of their potential future status.

The data has been used to inform the Trees Pipelines Protection and Remediation Assessment [3], extracts of which are included herein.

The trench depths and profiles vary along the pipeline routes and trenches. The majority of the pipelines are in trenches of >0.6m TOP, most being 1m – 2m TOP. Natural backfill has occurred to an extent within the open trenches, being generally limited to a depth of cover of ~0.3m with numerous exposures noted along most pipelines. The exposures are within the trenches and no freespans have been identified.

A review of the survey data and ROV footage between 2014, 2018 and more recent offshore campaigns have indicated that natural backfilling is continuing to take place, albeit slowly. Further pre-decommissioning surveys will be performed to confirm the status.

Figure 4-2 shows a typical profile and includes the range of trench width and depths encountered, together with a description of the nomenclature used in the survey data.

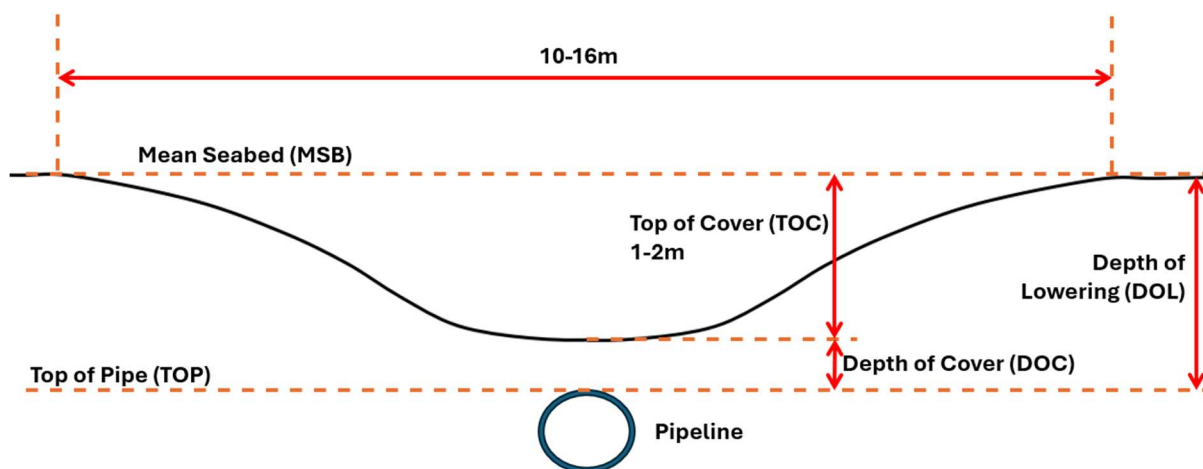


Figure 4-2: Sketch of typical trench

Burial profiles for the pipelines are included in Appendix B, with the pipeline routes charts showing the widespread areas of exposure included in Appendix C.

Pipelines Status Summary	
Pipeline	Trenching & Protection
PL1161	Trenched and mostly rock covered but with areas of exposure.
PL1162 & PL1163	Trenched with partial backfill. Areas of exposure and one area with <0.6m TOP trench depth.
PL1164.1 to PL1164.10	Trenched with partial backfill. Areas of exposure and one area with <0.6m

Pipelines Status Summary	
Pipeline	Trenching & Protection
	TOP trench depth.
PL1527	Trenched with partial backfill and areas of rock cover. Areas of exposure and one area with <0.6m TOP trench depth.
PL1528 & PL1529	Trenched with partial backfill. Areas of exposure.
PL1530.1 to PL1530.5	Trenched with partial backfill. Areas of exposure.
PL1531	Areas of exposure, rock cover and one area with <0.6m TOP trench depth.

Table 4-3 Pipelines Status Summary

Estimates for the lengths of pipelines which may require remediation, for assessment within the CA, are shown in Table 4-4 [3]

	Estimated Lengths (km)			
	Total Length	Less than 0.6m DOC	Exposed	Less than 0.6m DOL
All trenches combined (T1, T2, T3, T4, T5 and T6)	~47	27.5	3.8	<0.4

Table 4-4: Pipeline Burial Status in Trenches

4.3 Protection and Stabilisation

Concrete mattresses and grout bags have been used for protection and stabilisation of the transitions and tie-ins of the Trees pipelines and umbilicals. They have also been used for stabilisation, protection and upheaval buckling (UHB) mitigation at various locations within the pipeline trenches.

Rock has been used to protect and stabilise the pipelines at various locations along their routes including the 2 No. third party pipeline crossings.

The locations of rock and mattresses are shown on the burial charts in Appendix B. Note that grout bags are not shown separately as they are typically associated with mattress locations.

4.3.1 Pipeline crossings

The Trees pipelines cross the 30" Forties oil export pipeline (PL64) and the 30" Miller gas export pipeline (PL720) as shown in Figure A-2 and Figure A-3 respectively.

PL1161, PL1162, PL1163 & PL1531, cross the 30" Forties. Pipeline separation has been achieved using concrete mattresses, with rock berms installed for protection and stabilisation. PL1164 has mattresses on approach to this crossing and is contained within the rock berm where it shares the trench with PL1162 and PL1163 but does not physically cross PL64.

PL1161, PL1162, PL1163, PL1164 and PL1531, cross the Miller 30" gas export pipeline PL720. Pipeline separation has been achieved using concrete mattresses, with rock berms installed for protection and stabilisation.

5 COMPARATIVE ASSESSMENT METHODOLOGY

5.1 Comparative Assessment Outline

A comparative assessment is performed to determine the most preferred decommissioning option for the pipelines and stabilisation features as applicable. Options are examined to determine what (if any) fundamental differences there are and to assess these differences in a logical and transparent manner.

The process is broadly described as follows:

- Data gathering, definition of scope boundaries, and determination of most appropriate CA method.
- Identification of potential decommissioning options (including complete removal).
- Screening of the options to identify the most appropriate to be taken forward to the comparative assessment and identify any further studies required.
- Identification of the appropriate sub-criteria falling under the main criteria of Safety, Environment, Technical, Societal & Economic.
- Perform the CA and determine the recommended/preferred option/s. Internal and external reviews to be included as appropriate.
- Findings to be incorporated into the DP and EA and submitted to OPRED for review/approval.

5.2 Data and Supporting Studies

The following supporting studies have been utilised to inform the CA.

- Material Take-Off (MTO) and Data Book [2]. This records and summarises all the data required, e.g. permits & consents (PWA, S29), inventories, etc for each field.
- Trees Pipelines Protection and Remediation Assessment [3]. This describes the trenching and burial status of the pipelines and identifies any exposures, anomalies or trends that may be relevant to the decommissioning and assesses and provides cost and schedule estimates for recovery and remediation options. It also includes details of any protection and stabilisation e.g. mattresses, grout bags and rock cover.
- Environmental Appraisal [4].

In addition, lessons learned from historical and ongoing Spirit Energy decommissioning projects have been used as guidance.

5.3 Exclusions & Assumptions

Exclusions

The following infrastructure have not been considered in the CA as they will be fully removed in accordance with the Guidance Notes [1]:

- Spools/Jumpers – All spools and jumpers, including electrical/chemical/hydraulic jumpers will be completely recovered for future reuse, recycling or disposal.
- Subsea Structures – All structures will be completely removed from the seabed for either future reuse, recycling or disposal. Any piles holding the structures in place will be cut to a target depth of 3m below the natural seabed level.
- Subsea Trees – All subsea trees shall be removed for either future reuse, recycling or disposal.

Xmas trees and their associated protection structures have been covered under a separate, approved DP [7].

- Rock Cover – It is recognised [1] that the removal of rock cover is unlikely to be practicable therefore it is proposed that all rock cover will remain in place. All pipelines and mattresses that have rock cover are proposed to be *left in-situ* (pending a survey of the rock cover resulting in no areas of exposure or defective/deteriorated rock cover).
- Concrete mattresses and grout bags – All exposed concrete mattresses and grout bags are to be recovered for future reuse, recycling or disposal. Concrete mattresses and grout bags that are buried under rock berms shall remain *in-situ*.

Assumptions

For the purposes of the CA, the following assumptions have been made:

- The pipelines and umbilicals shall be flushed and cleaned (as appropriate) to a cleanliness level agreed with the regulators prior to any pipeline decommissioning operations.
- Minimising the number of cut pipeline or umbilical ends remaining on the seabed is preferred from a safety, environmental and legacy perspective.
- Any pipeline(s) being left in-situ will be subject to at least two legacy burial surveys; however, this may be re-assessed following the post-decommissioning surveys.
- In the long-term, assuming the size and profile or the resulting rock berm is suitable, deposited rock remaining *in-situ* will not present a snagging hazard.
- All decommissioning activities are undertaken by competent contractors and personnel, and all required regulatory approvals and permits are in order. All tasks will have been fully risk assessed as applicable and as such all necessary mitigating measures will already be in place e.g. approved procedures, certified equipment, personal protective equipment, site security measures, etc.
- Environmental impacts e.g. noise and emissions associated with decommissioning vessels' activities are assumed to be proportional to the vessels' operational durations.
- A comparison of the high-level costs, to determine differential orders of magnitude is performed.

5.4 Evaluation Method

With reference to the Guidelines for Comparative Assessments in Decommissioning Programmes [5], evaluation Method A – Narrative / Red – Amber - Green (RAG) is considered to be the most appropriate.

Performance	Comparative impact
Most preferred	Lower / lowest impact
Tolerable	Moderate / average impact
Least preferred / Intolerable	Higher / highest impact

Table 5.1: Comparative Impact

This is a mainly qualitative and narrative assessment, utilising relatively broad-brush comparisons across each decommissioning option and concentrating on key and significant differentiators, however more quantitative data has been developed for the options for the decommissioning of the pipelines and stabilisation features within the open trenches. The assessment is carried out using supporting evidence, generally in terms of comparison of activity type, vessel types and activity durations, seabed disturbance and legacy effects. Results are described in terms of Red (least preferred) Amber (moderate) and Green (most preferred). However, should any areas be

found to require more detailed consideration during the CA, then this will be incorporated.

The assessment criteria are equally weighted to ensure full visibility and clear, unbiased comparison between the options.

The criteria and descriptions/considerations are shown in Table 5.2.

Main Criteria	Sub-Criteria	Description / Consideration
Safety	Project risk to personnel offshore	<p>Risk to project personnel during the execution of the decommissioning operations offshore.</p> <p>These risks may apply to divers, personnel on board construction vessels or onshore personnel receiving and processing any decommissioning and decommissioned equipment.</p> <p>The level of risk will vary depending on the quantity, condition and type of material (including hazardous materials) being recovered, as well as the duration and complexity of the tasks considered.</p>
	Project risk to other users of the sea	Risk to other user of the sea e.g. fisheries and other commercial activities, during the execution of the decommissioning operations offshore.
	Project risk to personnel onshore	Risk to onshore based project personnel during the execution of the decommissioning operations e.g. transportation and waste management activities, onshore deconstruction activities (beach section, cofferdam).
	Project risk to communities / public onshore	Risk to members of the public, commercial, tourism & leisure activities during onshore decommissioning activities e.g. increased traffic, deconstruction site activities and security.
	Residual risk to other users of the sea / onshore communities	<p>Risks from any materials left <i>in-situ</i>. Offshore the primary risk will be to fishermen however commercial and recreational shipping/boating must also be considered if applicable.</p> <p>Onshore the residual risk is to local communities e.g. sudden or eventual exposure of buried facilities, pollution from residual / remaining facilities and contents.</p>
Environmental	Energy use and atmospheric emissions.	The primary sources of energy use and atmospheric emissions are associated with vessel use, the transport and subsequent processing of decommissioned materials, and waste management.
	Seabed disturbance (temporary and long-term)	<p>Decommissioning activities can result in temporary disturbance leading to direct mortality or physical injury to benthic species, and in sediment re-suspension and settlement. Sediment re-suspension can lead to changes in physico-chemical characteristics of benthic sediments and therefore indirectly impact the benthic communities.</p> <p>Temporary disturbance (recovery to the environment is expected to take place within 10 years either with or without remediation) will occur during decommissioning operations due to; pipeline deburial, cutting and removal of spools, stabilisation items & pipelines, anchoring of vessels (if applicable), overtrawl activities, debris recovery, etc.</p> <p>Long-term disturbance (recovery in excess of 10 years) may be due to the addition of any remedial rock placement to protect pipeline ends.</p>
	Noise	<p>Noise will mainly be caused by vessel propulsion / engines and will be proportional to the working duration of the vessels.</p> <p>Underwater noise will also be caused by any equipment deployed for the recovery operations e.g. deburial, pipe cutting, etc.</p>
	Discharges / spills to sea or onshore.	<p>Residual quantities of fluids may be present in the pipeline following flushing and cleaning operations.</p> <p>Vessels and equipment used may discharge quantities of fluids e.g. ROVs, hydraulic cutting equipment.</p> <p>Catastrophic loss of vessel fuel containment due to vessel collision during decommissioning activities will be considered. More vessels working</p>

Main Criteria	Sub-Criteria	Description / Consideration
		simultaneously in close proximity to each other (SIMOPS) will have an increased risk.
	Waste management	A comparison of the quantities of waste generated by the decommissioning activities e.g. reuse, recycling or landfill.
	Legacy impacts	The pipelines and stabilisation material decommissioned <i>in situ</i> , both onshore and offshore, will degrade over time. These materials (metals, concrete and plastics) will be degraded into the surrounding environment, and their potential impacts are therefore considered.
Technical	Technical feasibility / challenge	The technological challenge posed by each decommissioning option will vary depending on the level of unknowns anticipated. Established technology or not, seabed currents, tidal effects & subsea visibility (operational weather windows).
	Track record	The level of industry experience that exists for a particular task and the equipment availability and track record of executed similar scopes.
	Risk of major project failure	The risk of major project failure assesses the likelihood of being unable to complete the decommissioning scope within the planned timeframe / budget / methodology due to the technical challenges associated with the options. The weather sensitivity of each option will be considered. In some cases, certain tasks will carry high weather sensitivity, and these tasks will be on the critical path. Other options may also require specific weather windows for certain tasks.
Societal	Impacts on offshore users.	The effect on fisheries and fishing activity is of particular importance. This is assessed with regard to the level of fishing activity in the area, and the possible short and long-term consequences. Other users of the sea such as shipping and recreation are also considered, as applicable.
	Amenities & Communities (offshore and onshore)	The consequence of the decommissioning options on local amenities and communities should be considered. The effects on local (onshore) communities and employment and regional development opportunities, loss of access to beach areas
Economic	Note: Cost is not used as a prime differentiator, being included for completeness and as a measure of proportionality when considering the other 4 main criteria.	
	Decommissioning cost	The relative costs of the decommissioning options, covering only the activities that are unique to each option.
	Legacy costs	Cost for long term monitoring and potential future remediation activities.

Table 5.2: Criteria and sub-criteria

5.4.1 Decommissioning Options, Screening and Evaluation

Following identification of potential decommissioning options, a high-level screening process is typically performed to rationalise the options and ensure that those selected for the CA are feasible, realistic and include a full removal option.

Each option selected for CA is then assessed against each sub-criterion in turn. To inform and align the meaning of Red, Amber and Green ratings, an impact assessment criteria rating table has been developed and is included in Appendix B. Note that not every impact needs to apply within a criterion for that rating to be selected; the rating considered most relevant to the assessment is selected and the reasoning is recorded.

On completion of the assessment, the results are reviewed to determine if a clear recommendation on the best decommissioning option can be made. This review is performed by the Spirit Energy project leadership team, following internal processes and procedures.

6 COMPARATIVE ASSESSMENT

6.1 Pipelines

For the purposes of the CA the pipelines were divided into 3 groups according to their installation condition e.g. where pipelines share a trench or are piggybacked, the decommissioning options and preferred solutions are applicable to all lines within that trench. The groupings are:

Group A – Pipelines/umbilicals which share a trench and/or are piggybacked

- PL1162, PL1163, PL1530 and ~10.8km of PL1164
- PL1527 & ~2.4km of PL1531
- PL1528 & PL1529

Group B – Rigid single pipelines in individual trenches

- PL1161
- PL1531 (~9.7km section from Brae A to Larch Wye)

Group C – Umbilicals in individual trenches

- PL1164 (~4km section from Brae Alpha to Forties crossing).

Piggybacked lines are considered as a single pipeline, since it is not feasible to recover them individually. Similarly pipelines sharing a trench are grouped together as to attempt recovery of a single line within a shared trench is technically very challenging and attempts are likely to detrimentally affect the status and condition of the other pipeline within the same trench.

6.1.1 Pipeline Decommissioning Options

The following decommissioning options were identified:

- Option 1 – Complete Removal by whatever means is most practicable and acceptable.
- Option 2 – Partial Removal - Recover insufficiently trenched and/or backfilled sections (sensitivities performed for extent of recovery required i.e. areas <0.6m TOP trench depth, areas < 0.6m TOP backfill (DOC), and exposed areas only.
 - 2a – Cut and lift of pipelines and bundles.
 - 2b – Umbilical recovery onto an Anchor Handler Vessel (AHV)
- Option 3 – Leave *in-situ* with remediation - Remediate insufficiently trenched and/or backfilled sections (sensitivities performed as per Option 2). Remediation options are a) re-trench/backfill b) rock cover.
- Option 4 – Leave *in-situ* without remediation, but possibly with enhanced seabed clearance verification and ongoing monitoring.

In all cases, surface laid pipeline ends will be recovered to the point where they are at the required trench depth, and all rock covered sections e.g. crossings and other locations where rock has been used to provide stabilisation or protection to the pipelines will remain *in-situ*.

Prior to commencement of decommissioning activities, the burial status of each pipeline will be verified to provide an accurate and current understanding of seabed conditions. Should the results of these surveys indicate that rock remediation represents the most appropriate solution for specific sections, this approach will be implemented in line with the applicable permitting requirements. While a number of factors may lead to the selection of rock remediation, the most probable driver is that the pipeline condition is poorer than originally anticipated. This is to be considered for all options including Options 1 and 2 which involve removal as the predominant remediation approach.

Table 6.1.1: Pipelines Decommissioning Options

Pipeline or Group (as per PWA)	Condition of line/group (Surface laid/Trenched/Buried/ Spanning)	Whole or part of pipeline/group	Decommissioning Options* considered
PL1161	Trenched and mostly rock covered but with areas of exposure and mattresses.	Whole / Group B	1, 2, 3b, 4
PL1162 & PL1163	Trenched with partial backfill. Areas of exposure and mattresses.	Whole / Group A	1, 2, 3b, 4
PL1164.1 to PL1164.10	Trenched with partial backfill. Areas of exposure and mattresses.	Whole / Group A & C	1, 2a, 2b, 3b, 4
PL1527	Trenched with partial backfill, Areas of exposure, rock cover and mattresses.	Whole / Group A	1, 2, 3b, 4
PL1528 & PL1529	Trenched with partial backfill, Minimal areas of exposure. Some mattresses.	Whole / Group A	1, 2, 3b, 4
PL1530.1 to PL1530.5	Trenched with partial backfill, Areas of exposure.	Whole / Group A	1, 2, 3b, 4
PL1531	Trenched with partial backfill and areas of rock cover and mattresses	Whole / Group A	1, 2, 3b, 4
Note: While option 2 is considered for all pipelines, this predominantly refers to 2a. 2b can only be considered for Group C due to bending restraints.			

6.1.2 Options Screening

A high-level screening of the options was performed to ensure that unfeasible or highly unfavourable options were not carried forward to the CA. The options are described further below. Options which were screened to feasible, and hence taken forward to the CA, have been shaded in green.

Option	Description	Comments
1. Complete removal. Reverse installation.	Recovery by reverse reeling or reverse S-lay through the seabed. Divers install pipeline recovery clamp and hold back anchor. S-lay / Reel lay vessel then recovers pipelines onto deck or onto reels. Buried pipe is pulled directly through backfill / rock berm, or operations are stopped and restarted to avoid rock berms and areas where backfill is too deep.	Not feasible for Group A pipelines since there are piggyback lines and multiple pipelines within trenches. Piggybacked pipelines are generally not suitable for reverse reeling due to their asymmetric configuration, which leads to non-uniform bending behaviour during reeling operations and results in significant differential strain between the host pipe and the piggyback line. During reverse plastic bending, the eccentrically attached piggyback line is subjected to elevated tensile and compressive strains that can exceed acceptable limits, creating a high risk of local instability, detachment, or uncontrolled deformation. These effects place excessive loads on piggyback supports, clamps, and attachment welds, increasing the likelihood of sudden release, snagging, or loss of control during handling. In addition, piggybacked pipelines are incompatible with standard reeling equipment, which is designed for single, axisymmetric pipes, leading to uneven contact, point loading, and increased risk to personnel and equipment. As piggybacked systems are not technically qualified for reverse reeling and present elevated operational and safety risks during recovery, reverse

Option		Description	Comments
			reeling is not considered a feasible decommissioning method. Not feasible for Group B or C due to areas of rock which are too risky to pull through rock as high risk of pipeline breaking. To start/stop activates to avoid the rock or areas of deep backfill would also increase safety risks, risks of project failure and remedial rock to cover pipeline cut ends.
1	Complete removal. Cut & Lift	Excavate pipelines using mass flow excavator to remove backfill then cut & lift to construction vessel. Cutting equipment deployed from a CSV to the pipelines location where they are cut into recoverable lengths and lifted onto the vessel deck, for transportation onshore.	Feasible option for all Groups.
2	Partial Removal. Recover insufficiently trenched and/or backfilled sections a) Cut & Lift b) Recover onto anchor handling vessel	a) Excavate pipelines using mass flow excavator to remove backfill then cut & lift to construction vessel. Cutting equipment deployed from a CSV to the pipelines location where they are cut into recoverable lengths and lifted onto the vessel deck, for transportation onshore. Remaining pipeline cut ends will be remediated using rock. b) Excavate pipelines using mass flow excavator to remove backfill. Recover pipelines on anchor handling vessel drums. Remaining pipeline cut ends will be remediated using rock.	a) Feasible option for all Groups. b) Feasible only for Group C due to diameter and bending radius constraints.
3	Leave in-situ. Remediate insufficiently trenched and/or backfilled sections with remediation by a) re-trench/backfill	a) re-trench/backfill Use mass flow excavator to cover the lines using existing trench material Alternatively mobilise trenching vessel to re-trench and backfill the pipelines.	a) Investigations indicate that mass flow excavator is unlikely to achieve the remediation required and may detrimentally affect the exiting trenches/burial. Re-trenching and backfilling the lines is not feasible. Multiple start/stops would be required over areas of existing rock cover. Technically it is unlikely to be successful and runs high risk of failure, escalating offshore durations, disturbance to the seabed and costs.
3	b) rock cover	b) rock cover Deploy fallpipe rockdump vessel to cover pipelines.	b) Feasible for all options
4.	Leave <i>in-situ</i>	Leave pipelines <i>in-situ</i> with no intervention.	Not in accordance with Regulations. Not considered a responsible option due to residual snagging risk of areas not trenched to at least 0.6m TOP.

Table 6-2: Pipeline Decommissioning Options Screening

6.1.3 Assessment Data

A summary of the key data used to inform the CA, are shown in Table 6-3. Note that no contingencies e.g. weather downtime, vessel transits, interim mob/demob, rockdumping overage, etc have been included and so the data is only suitable for comparative purposes, not for project planning. It is assumed that for any location requiring rock cover remediation, 0.6m of cover will be applied regardless of the level of cover already present. Bundles are assumed to be cut and recovered individually.

Option		Estimates		
		Group A	Group B	Group C
1	Complete removal. Cut & Lift	Vessel days: >200 days Length recovered: 48,000m Decommissioning Cost >£29MM	Vessel days: >90 days Length recovered: 23,000m Decommissioning Cost >£13MM	Vessel days: >13 days Pipeline Length recovered: 4,000m Decommissioning Cost >£2MM
2	Partial Removal. a) Cut & Lift <0.6m DOC	Vessel days: >170 days Length recovered: 43,000m Decommissioning Cost >£26MM	Vessel days: >36 days Length recovered: 11,000m Decommissioning Cost >£3MM	(b) AHV recovery Vessel days: >0.5 days Length recovered: 4000m Decommissioning Cost >£0.1MM
	Partial Removal. a) Cut & Lift <0.6m DOC b) Group C - Recover onto anchor handling vessel	Vessel days: >2.5 days Length recovered: 650m Decommissioning Cost >£0.5MM	Vessel days: >0.5 days Length recovered: 100m Decommissioning Cost >£0.1MM	
3	Leave in-situ. Remediate by b) rock cover	Vessel days: >1 days Rock volume required: 2,500te Decommissioning Cost >£0.3MM	Vessel days: >0.5 days Rock volume required: 1,000te Decommissioning Cost >£0.1MM	Vessel days: >0 days Rock volume required: 0te Decommissioning Cost >£0MM

Table 6-3: Options Data

6.1.4 Pipelines Assessment Summary

The assessment tables completed during the CA are included within Appendix E and should be referenced for complete details of the justification for the selection of RAG. The summarised tables showing the selections are included in the Tables below.

Group A - Pipelines/umbilicals which share a trench and/or are piggybacked

Main Criteria	Sub-Criteria	1. Complete Removal – Cut & Lift	2a. Partial Removal – Cut & Lift		3b. Leave <i>In- situ</i> – Rock <i>remediation</i>
			<0.6m DOC	<0.6m DOL	
Safety	Project risk to personnel offshore	Red	Red	Yellow	Green
	Project risk to other users of the sea	Red	Red	Yellow	Green
	Project risk to personnel onshore	Red	Red	Yellow	Green
	Project risk to communities / public onshore	Yellow	Yellow	Green	Green
	Residual risk to other users of the sea	Green	Red	Yellow	Yellow
Environmental	Energy use and atmospheric emissions.	Red	Red	Yellow	Green
	Seabed disturbance (temporary and long-term)	Yellow	Red	Yellow	Yellow
	Noise	Red	Yellow	Green	Green
	Discharges / spills to sea or onshore.	Yellow	Yellow	Green	Green
	Waste management	Red	Yellow	Green	Green
	Legacy impacts	Green	Yellow	Yellow	Yellow
Technical	Technical feasibility / challenge	Red	Red	Yellow	Green
	Track record	Yellow	Yellow	Green	Green
	Risk of major project failure	Red	Red	Green	Green
Societal	Impacts on offshore users	Green	Yellow	Yellow	Yellow
	Amenities & Communities	Green	Green	Green	Green
Economic	Decommissioning cost	Red	Yellow	Green	Green
	Legacy costs	Green	Yellow	Yellow	Yellow
Preferred decommissioning option		2a (<0.6m DOL)			

Table 6-4: Group A – Assessment Summary

Group B - Rigid single pipelines in individual trenches

Main Criteria	Sub-Criteria	1. Complete Removal – Cut & Lift	2a. Partial Removal – Cut & Lift		3b. Leave <i>In- situ</i> – Rock <i>remediation</i>
			<0.6m DOC	<0.6m DOL	
Safety	Project risk to personnel offshore	Red	Red	Yellow	Green
	Project risk to other users of the sea	Red	Red	Yellow	Green
	Project risk to personnel onshore	Red	Red	Yellow	Green
	Project risk to communities / public onshore	Yellow	Yellow	Green	Green
	Residual risk to other users of the sea	Green	Red	Yellow	Yellow
Environmental	Energy use and atmospheric emissions.	Red	Red	Yellow	Green
	Seabed disturbance (temporary and long-term)	Yellow	Red	Yellow	Yellow

Main Criteria	Sub-Criteria	1. Complete Removal – Cut & Lift	2a. Partial Removal – Cut & Lift		3b. Leave <i>In-situ</i> – Rock remediation
			<0.6m DOC	<0.6m DOL	
	Noise	Red	Yellow	Green	Green
	Discharges / spills to sea or onshore.	Yellow	Yellow	Green	Green
	Waste management	Red	Yellow	Green	Green
	Legacy impacts	Green	Yellow	Yellow	Yellow
Technical	Technical feasibility / challenge	Red	Red	Yellow	Green
	Track record	Yellow	Yellow	Green	Green
	Risk of major project failure	Red	Red	Green	Green
Societal	Impacts on offshore users	Green	Yellow	Yellow	Yellow
	Amenities & Communities	Green	Green	Green	Green
Economic	Decommissioning cost	Red	Yellow	Green	Green
	Legacy costs	Green	Yellow	Yellow	Yellow
Preferred decommissioning option		2a (<0.6m DOL)			

Table 6-5: Group B – Assessment Summary

Group C - Umbilicals in individual trenches

Main Criteria	Sub-Criteria	1. Comple t e Removal – Cut & Lift	2a. Partial Removal – Cut & Lift		2b. Recover onto AHV	3b. Leave <i>In-situ</i> – Rock remediat ion
			<0.6m DOB	<0.6m DOL		
Safety	Project risk to personnel offshore	Red	Red	Yellow	Red	Green
	Project risk to other users of the sea	Red	Red	Yellow	Yellow	Green
	Project risk to personnel onshore	Red	Red	Yellow	Red	Green
	Project risk to communities / public onshore	Yellow	Yellow	Green	Yellow	Green
	Residual risk to other users of the sea	Green	Red	Yellow	Green	Yellow
Environment al	Energy use and atmospheric emissions.	Red	Red	Yellow	Yellow	Green
	Seabed disturbance (temporary and long-term)	Yellow	Red	Yellow	Yellow	Yellow
	Noise	Red	Yellow	Green	Green	Green
	Discharges / spills to sea or onshore.	Yellow	Yellow	Green	Green	Green
	Waste management	Red	Yellow	Green	Red	Green
Technical	Legacy impacts	Green	Yellow	Yellow	Green	Yellow
	Technical feasibility / challenge	Red	Red	Yellow	Yellow	Green
	Track record	Yellow	Yellow	Green	Yellow	Green
Societal	Risk of major project failure	Red	Red	Green	Yellow	Green
	Impacts on offshore users	Green	Yellow	Yellow	Green	Yellow
Economic	Amenities & Communities	Green	Green	Green	Green	Green
	Decommissioning cost	Red	Yellow	Green	Green	Green
Economic	Legacy costs	Green	Yellow	Yellow	Green	Yellow

Main Criteria	Sub-Criteria	1. Complete Removal – Cut & Lift	2a. Partial Removal – Cut & Lift		2b. Recover onto AHV	3b. Leave <i>In-situ</i> – <i>Rock remediation</i>
			<0.6m DOB	<0.6m DOL		
Preferred decommissioning option			2b			

Table 6-6: Group C – Assessment Summary

Referring to the above table Options 3b and 2a score similarly for Groups A and B. 2a is selected as the preferred option as OPRED and SFF have stated that rock remediation is not preferred due to seabed disturbance thus leaving 2a is the preferred option generally. It should be noted that 2b is still a preferred option but only relevant to Group C which is PL1164

Upon review of the pre-decommissioning survey once conducted, some areas may be more suited to rock cover when considering complexity, neighbouring infrastructure/pipelines/length of pipelines needing remediation. With both options scoring the same it makes sense to leave option 3b as an alternative option which can be looked at in the event any location which needs remediation not being suited to option 2a. To the best ability a solution that works for all pipelines is desired but not always possible so it is recommended that option 2 is adopted where possible and Option 3b may be looked at if required.

6.2 Mattresses and Grout Bags

There are approx. 568 mattresses and numerous grout bags associated with spools and pipeline ends that are in the DP for recovery. The items assessed in this CA are for approx. 118 additional mattresses & associated grout bags covering the pipelines within the pipeline trenches.

The option of leaving all mattresses within trenches in-situ has already been discounted and so the remaining options are:

- Complete removal of all mattresses
- Complete removal of mattress completely or partially exposed i.e. visible
- Complete removal of mattress completely or partially exposed i.e. visible Remediate using rock cover if it is not possible to remove the mattress.

The options do not currently consider any differences in approach for DOL or DOC of the underlying pipelines.

Options are not treated in isolation, but take account of the fact they will be part of the wider full-field decommissioning

The assessment table for mattresses completed during the CA are included within Appendix E and should be referenced for complete details of the justification for the selection of RAG. The summarised tables showing the selections are included in the Tables below.

Main Criteria	Sub-Criteria	1. Complete Removal of all mattresses	2. Complete removal of mattresses exposed or partially exposed	3. Complete removal of mattresses exposed or partially exposed with option to rock cover
Safety	Project risk to personnel offshore			
	Project risk to other users of the sea			
	Project risk to personnel onshore			
	Residual risk to other users of the sea			
Environmental	Energy use and atmospheric emissions.			
	Seabed disturbance (temporary and long-term)			
	Noise			
	Discharges / spills to sea or onshore.			
	Waste management			
	Legacy impacts			
Technical	Technical feasibility / challenge			
	Track record			
	Risk of major project failure			
Societal	Impacts on offshore users			
	Amenities & Communities			
Economic	Decommissioning cost			
	Legacy costs			
Preferred decommissioning option		3		

Table 6-7: Mattresses and Grout Bags – Assessment Summary

7 COMPARATIVE ASSESSMENT RECOMMENDATIONS

The recommendations and preferred options from the comparative assessment are summarised below.

It was found that the assessment of the pipelines in groupings of Group A, Group B and Group C, did not result in any differences to the preferred option.

7.1 Pipelines and umbilicals which are trenched to a depth of at least 0.6m TOP

Pipelines and umbilicals that are trenched to a depth of at least 0.6 metres Top of Pipe (TOP) are proposed to be left in-situ, as they are considered sufficiently lowered to prevent snagging risks. Where pipeline ends are exposed down to this trench depth, they will be recovered, and the remaining cut ends will be protected using nominal quantities of rock to eliminate potential hazards. To verify that these in-situ trenched sections do not pose a risk to fishing activity, overtrawl trials will be proposed. In addition, ongoing monitoring will be conducted in line with a schedule agreed with OPRED to ensure the pipelines remain stable over time. If any issues are identified, further remediation will be carried out as necessary.

The proposed approach meets all relevant regulatory requirements, industry guidelines, and incorporates feedback from the Scottish Fishermen's Federation (SFF), making it the preferred option identified through the Comparative Assessment. Trenches are generally deeper than the minimum threshold, typically ranging between 1 and 2 metres Top of Pipe (TOP), which is considered sufficient to prevent snagging risks. No snagging incidents have been reported to date, and no freespans have been identified; however, any discovered will be addressed through remediation. All pipelines will be flushed and cleaned to a permitted standard prior to decommissioning, ensuring that neither trenched nor rock-covered sections pose a hazard. Additionally, no third-party pipeline crossings will be affected. Rock placement at cut ends is expected to in order to reduce snagging risks to fishing vessels. The degradation of buried or trenched pipelines is expected to occur slowly over time and is not anticipated to present an environmental or safety risk. Any anomalies identified through ongoing monitoring will be remediated as needed. Overall, this option offers the lowest safety risk to personnel, reduces vessel emissions, minimises disturbance to the seabed, and presents a lower cost impact compared to alternative approaches.

7.2 Pipelines and umbilicals which are not trenched to a depth of at least 0.6m TOP

Sections of pipelines and umbilicals that are not trenched to a minimum depth of 0.6 metres Top of Pipe (TOP) will be recovered, and any resulting cut ends will be remediated using rock placement to eliminate potential snagging hazards. Prior to the start of decommissioning activities, the burial status of each pipeline will be confirmed to ensure an accurate and up-to-date understanding of the current seabed conditions. If, following these surveys, rock remediation is found to be the more appropriate option for certain sections, it will be undertaken in accordance with the relevant permitting process. There are several reasons why rock remediation would be preferred but the most likely one is that the condition of the pipeline is worse than expected. Estimates of rock placement and seabed disturbance for both recovery and in-situ remediation scenarios have been accounted for within the Environmental Appraisal.

The proposed approach complies with regulatory requirements, relevant guidelines, and feedback from the SFF, and is the preferred solution identified by the CA. Remedial dredging has been ruled out due to its high risk of failure and the potential negative impact on the burial status of nearby pipelines. All pipelines will be flushed and cleaned to a permitted standard before decommissioning begins. While the recovery of certain pipeline sections is currently the preferred option, this will be reassessed based on pre-decommissioning survey data. If conditions warrant, rock covering may

be considered a more suitable alternative, as remediating multiple cut ends is not the preferred approach.

7.3 Stabilisation Features

A total of nine pipeline structures, including crossover assemblies, support structures, and wye pieces, will be fully recovered, with any piles cut 3 metres below the seabed. These, along with 568 exposed concrete mattresses, 5,300 grout bags, and 18 protection covers, will be brought to shore for reuse, recycling, or disposal. In cases where removal of mattresses proves difficult, OPRED will be consulted. The 38,168 tonnes of deposited rock will be left in place.

8 SUPPORTING DOCUMENTS

- [1] Guidance Notes – Decommissioning of Offshore Oil and Gas Installation and Pipelines, OPRED, November 2018
- [2] TREEDC-SPT-Z-0000-MTO-0001, Trees Decommissioning MTO and Data Book for Decommissioning Programmes.
- [3] TREEDC-PDI-Y-0000-TCN-0001 (2715-PDi-PE-TN-009), Trees Pipelines Protection and Remediation Assessment.
- [4] TREEDC-PDI-S-0000-REP-0001, Trees Decommissioning Environmental Appraisal (Birch, Larch and Sycamore)
- [5] OEUK (2015) OGUK Guidelines for Comparative Assessment in Decommissioning Programmes. Issue 1 October 2015
- [6] Trees Fields Decommissioning – Drill Cuttings Screening Assessment. Hartley Anderson Limited Report No.: J-PDI-492, April 2023
- [7] TREEDC-SPT-F-0000-PRG-0002, Rev C1. Trees Protection Cages Decommissioning Programmes (Birch, Larch and Sycamore).

APPENDIX A FIELD LAYOUT SKETCHES

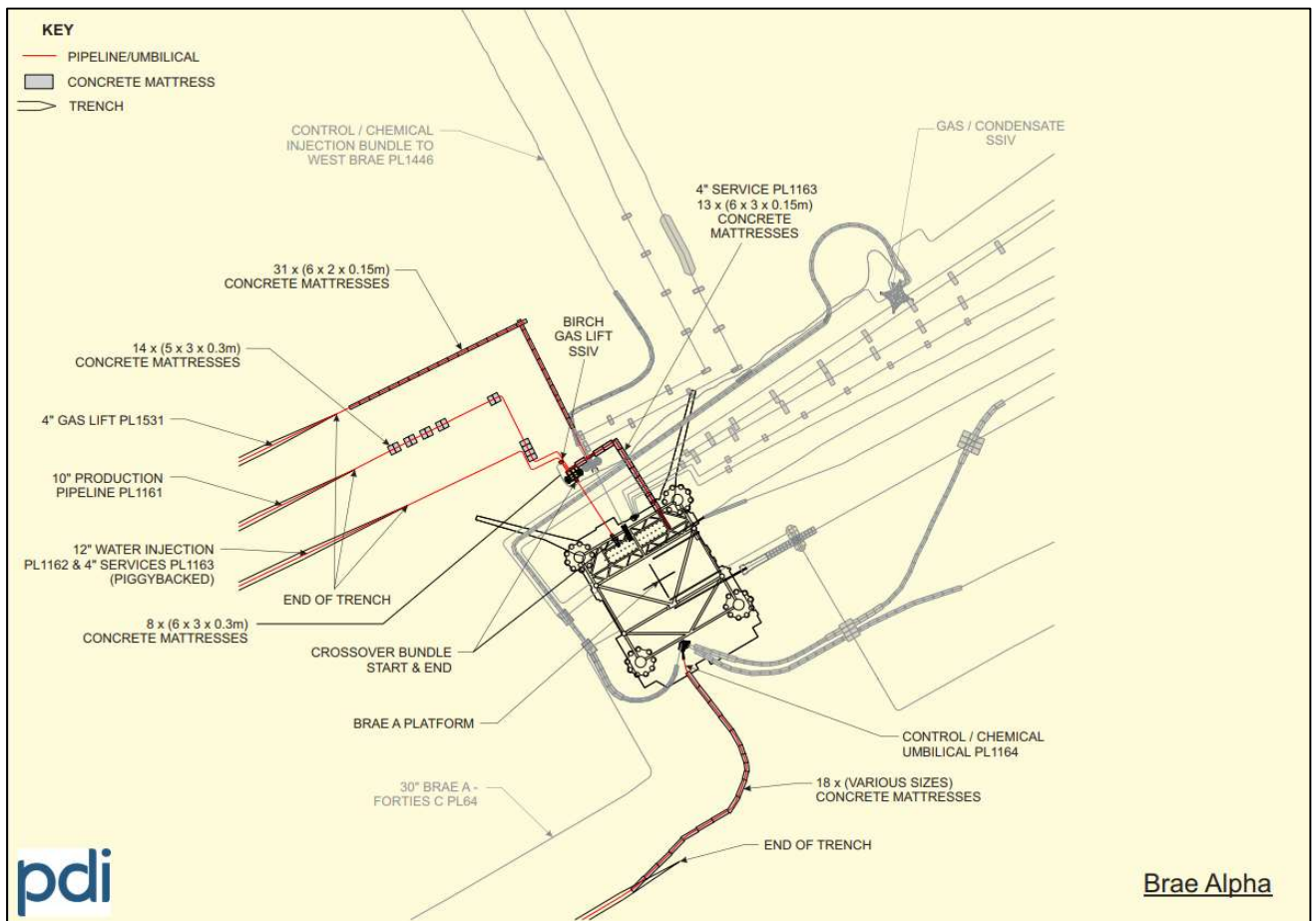


Figure A-1: Brae Alpha Approaches

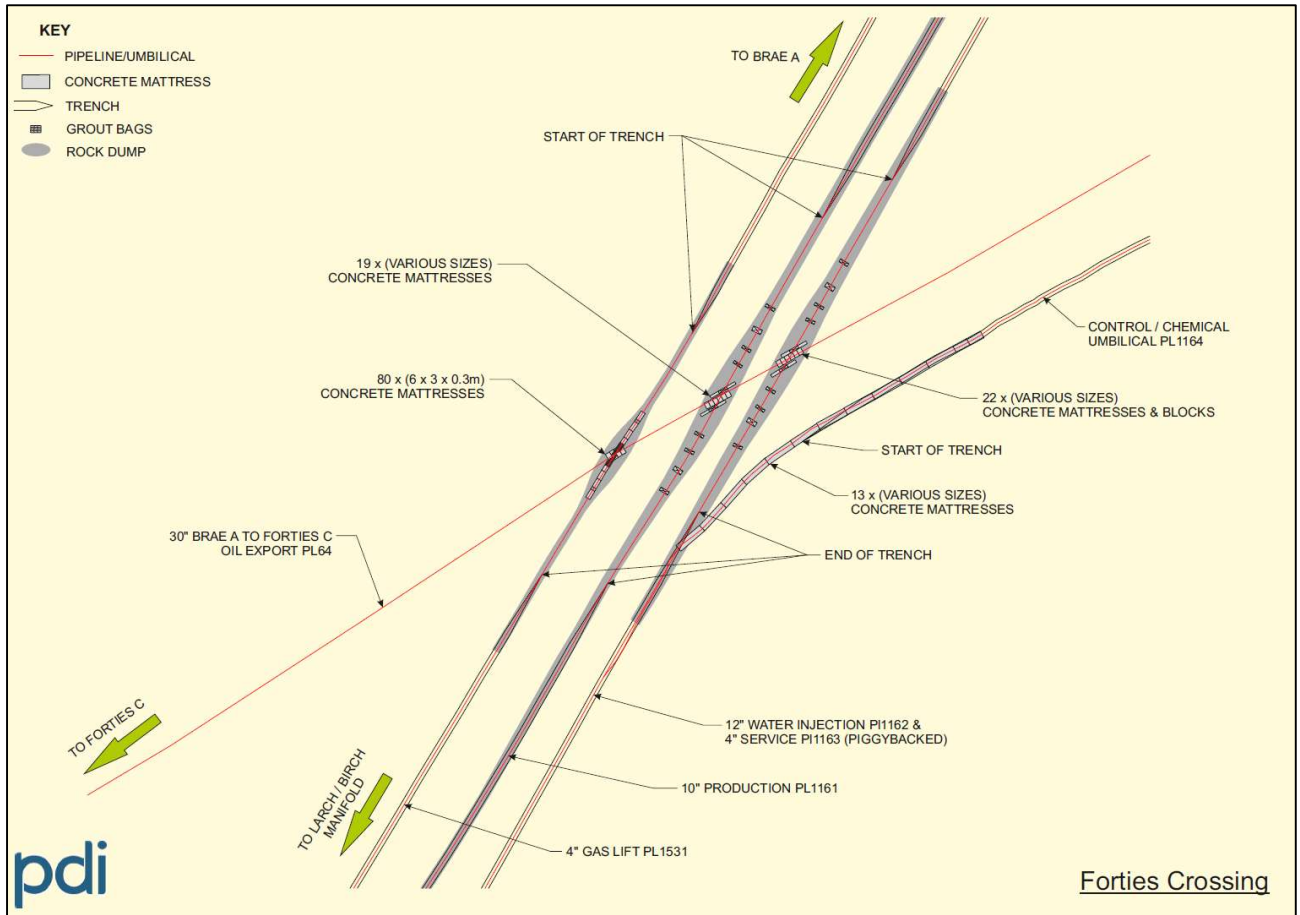


Figure A-2: Forties Crossing

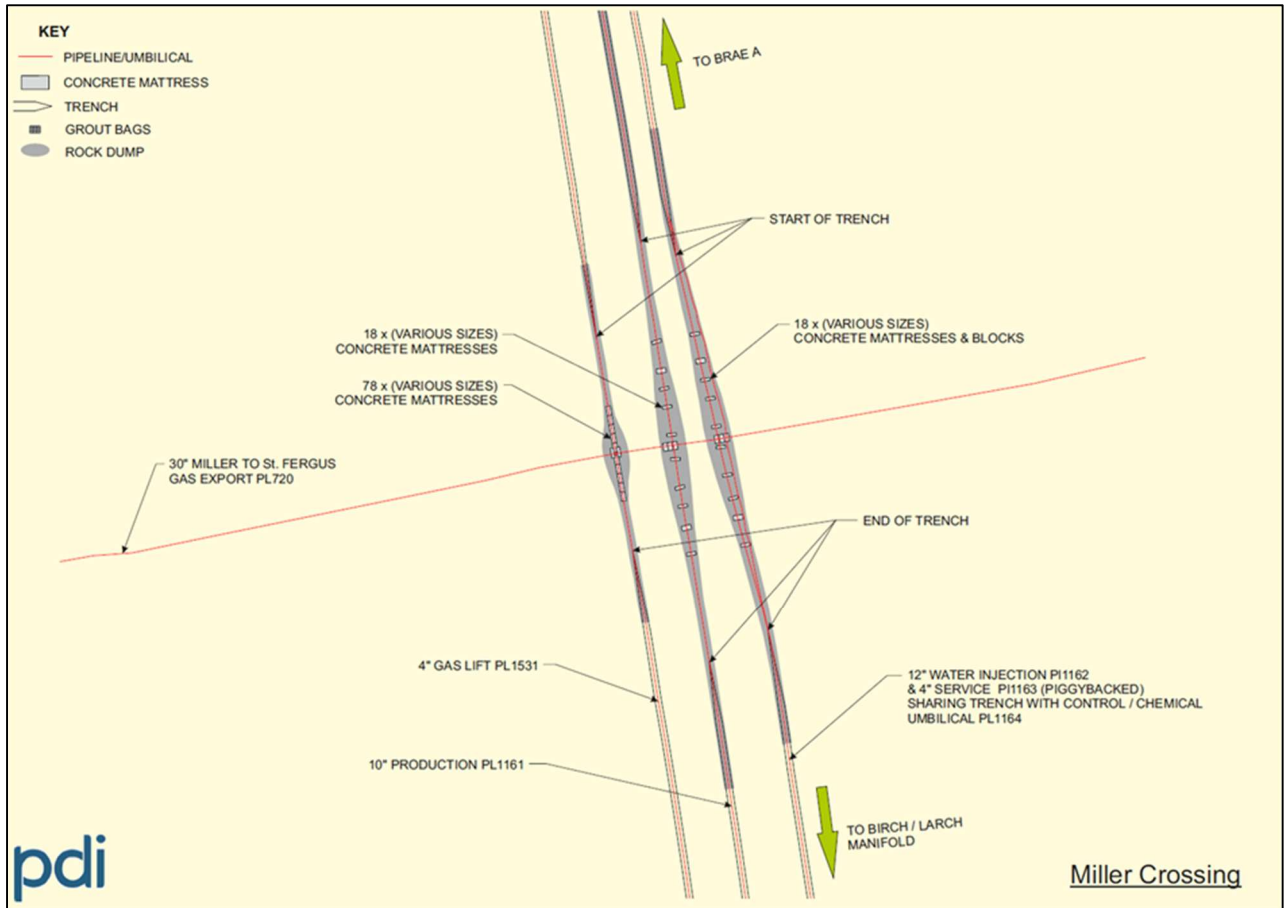


Figure A-3: Miller Crossing

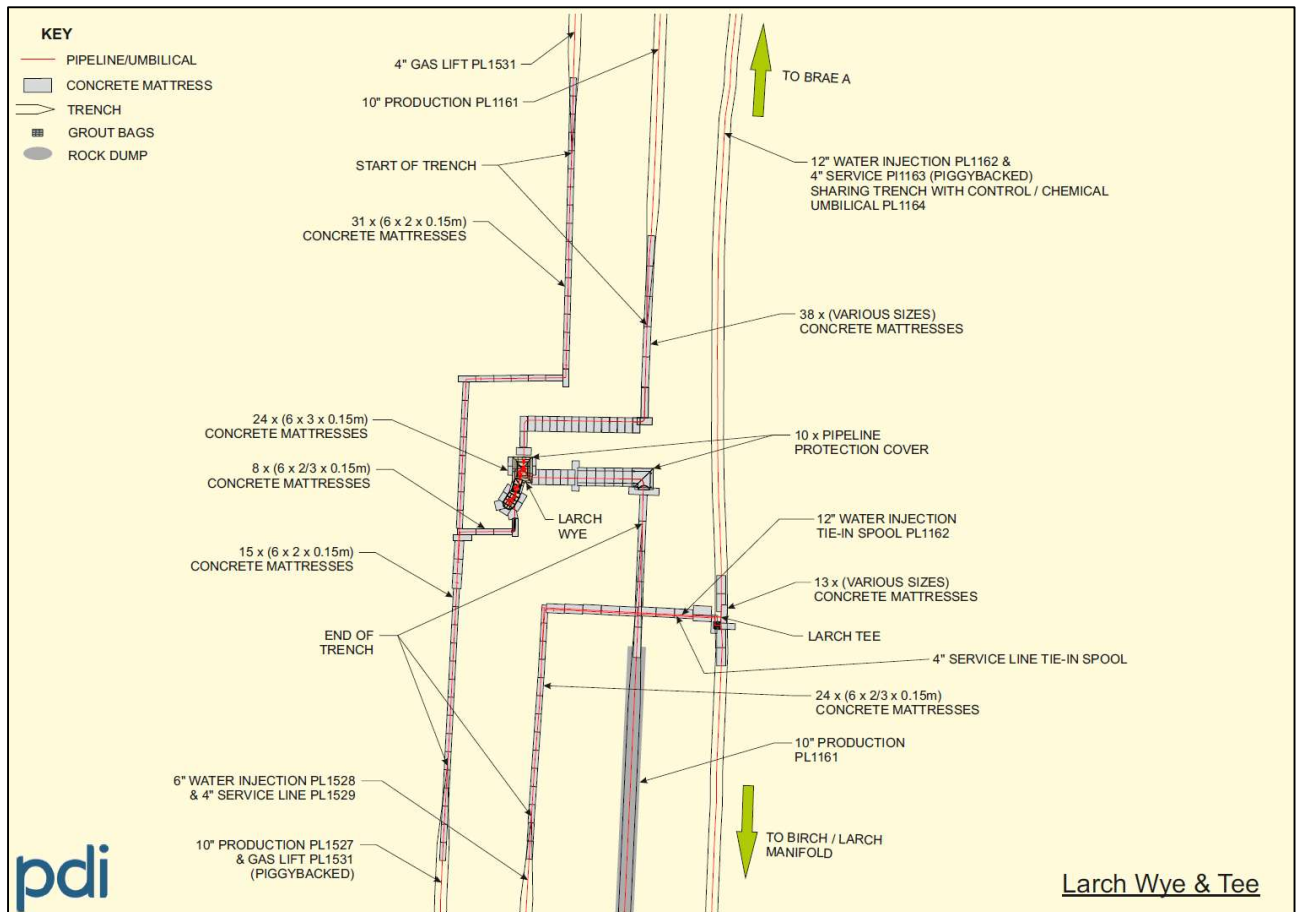


Figure A-4: Larch Wye Approaches

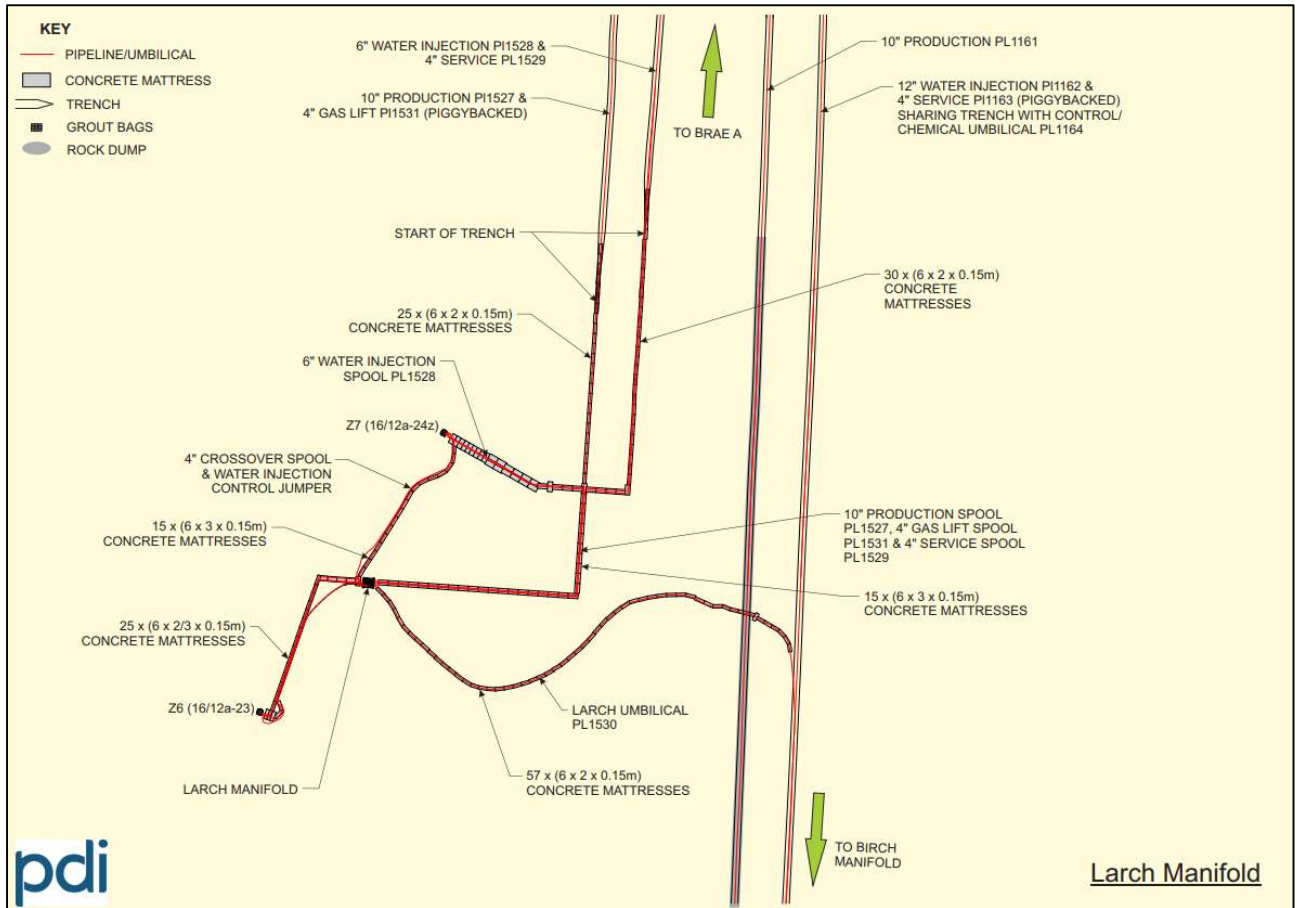


Figure A-5: Larch Gas Lift (& Production) Manifold & Wells

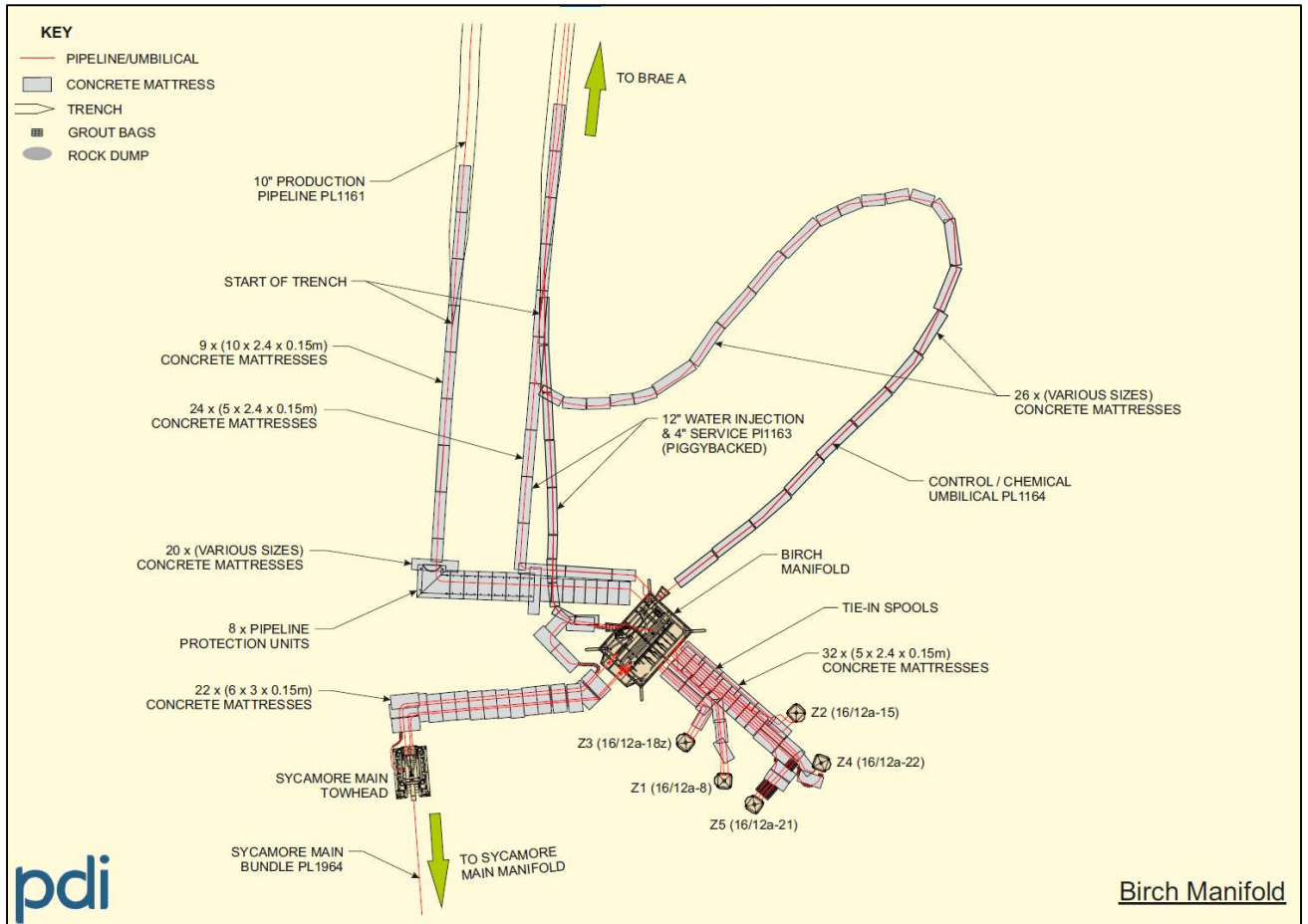
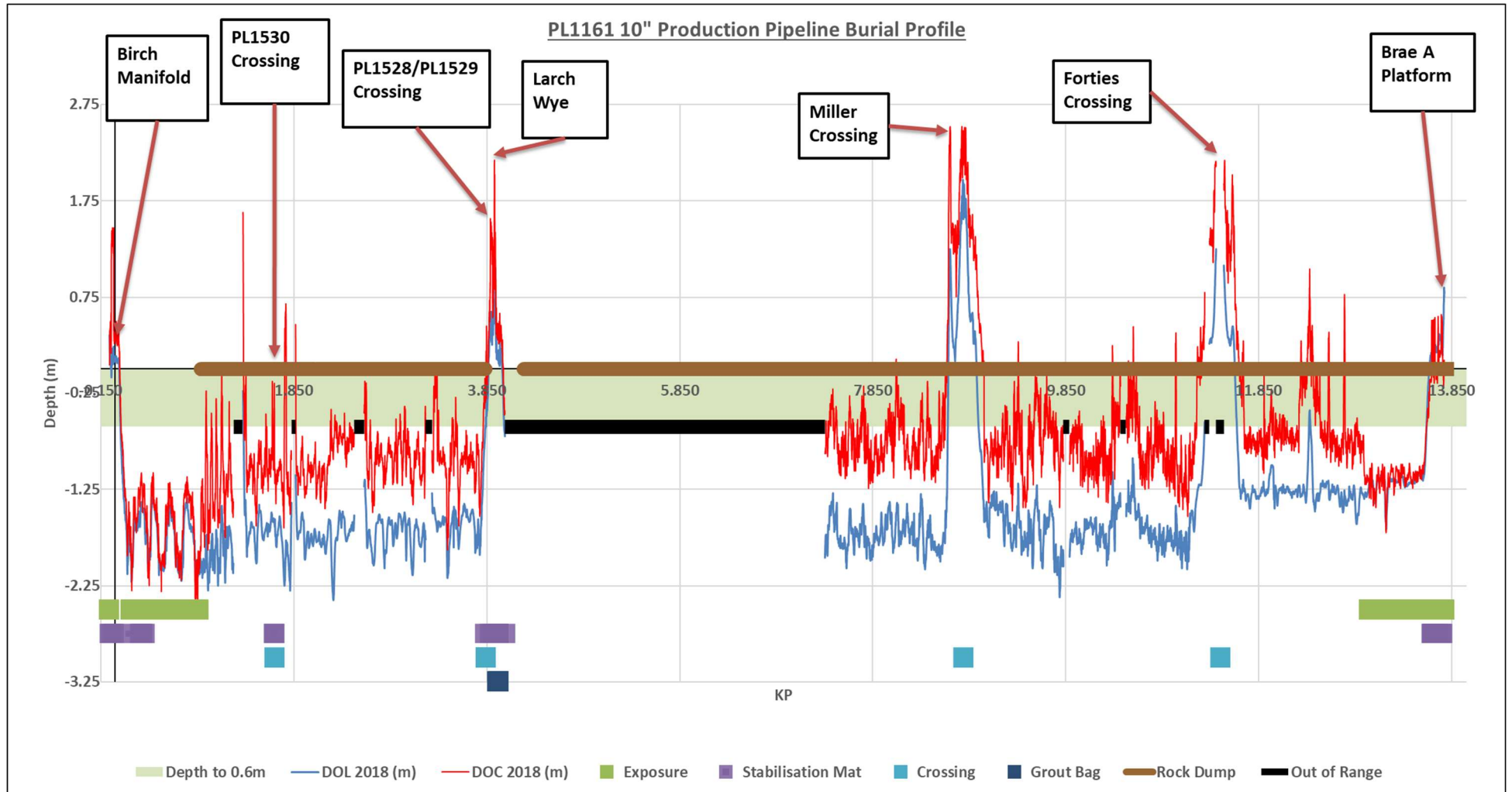
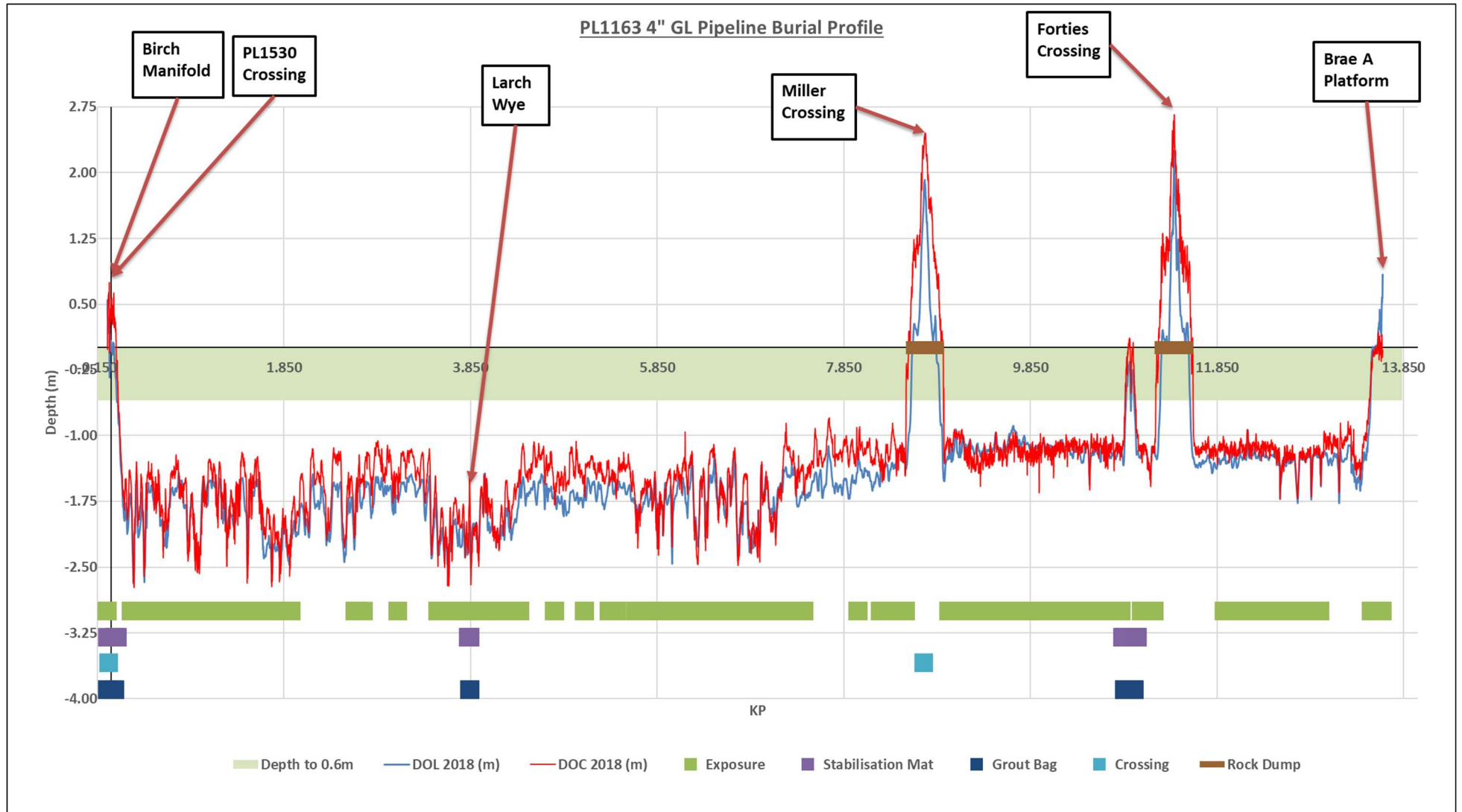


Figure A-6: Birch Manifold and Wells

APPENDIX B PIPELINE BURIAL PROFILES



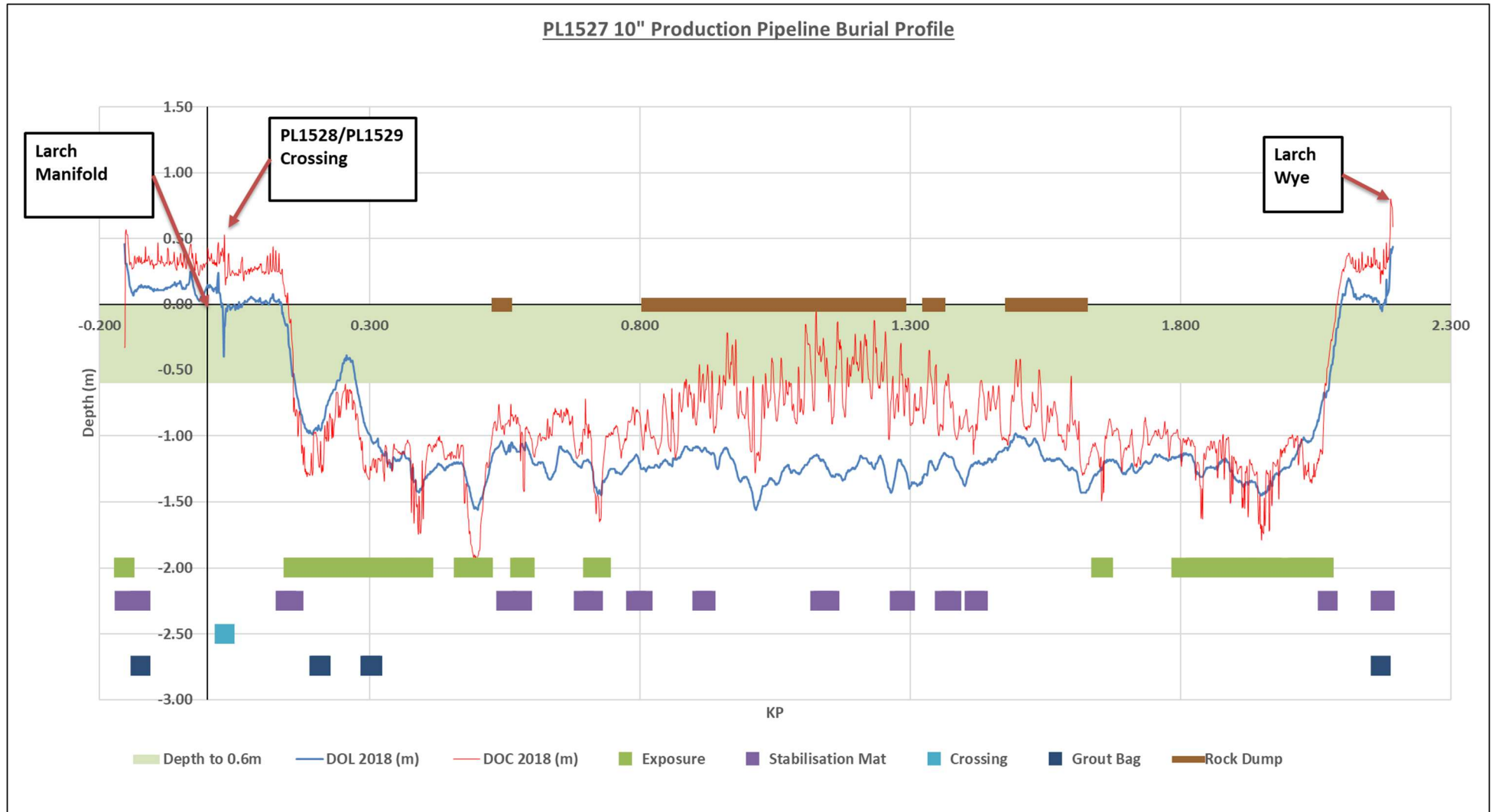




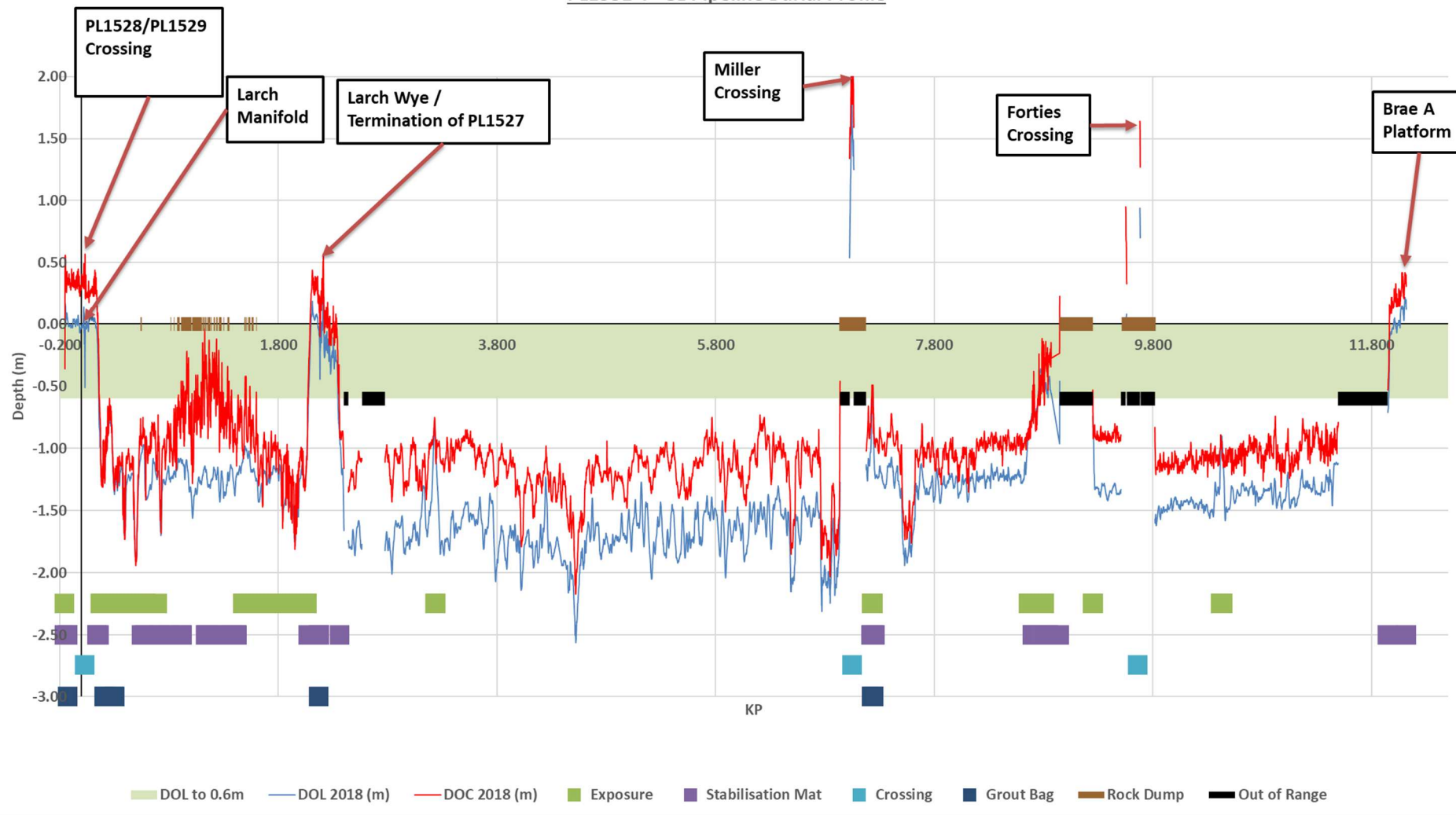
PL1164 Control / Chemical Umbilical Burial Profile

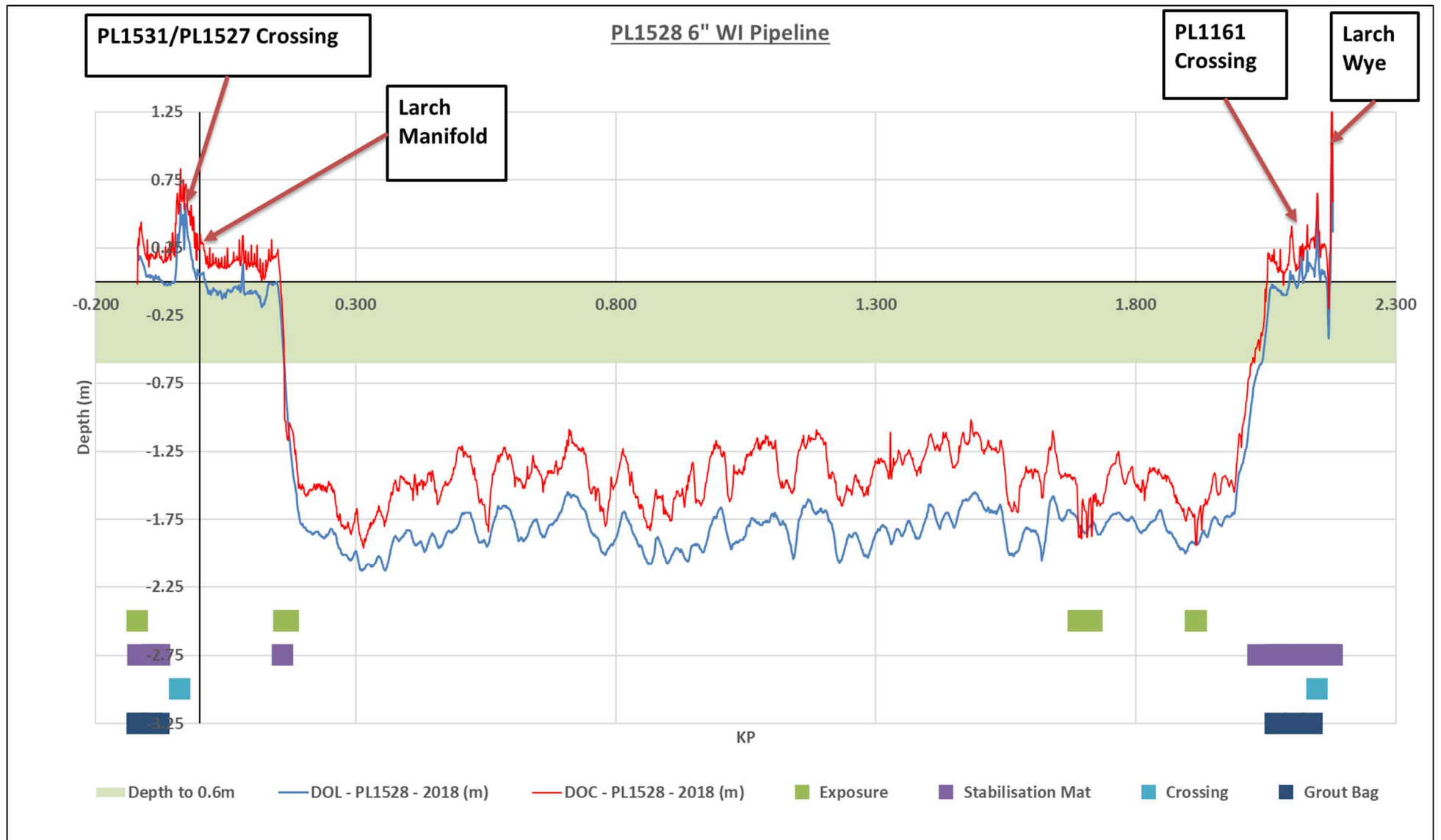


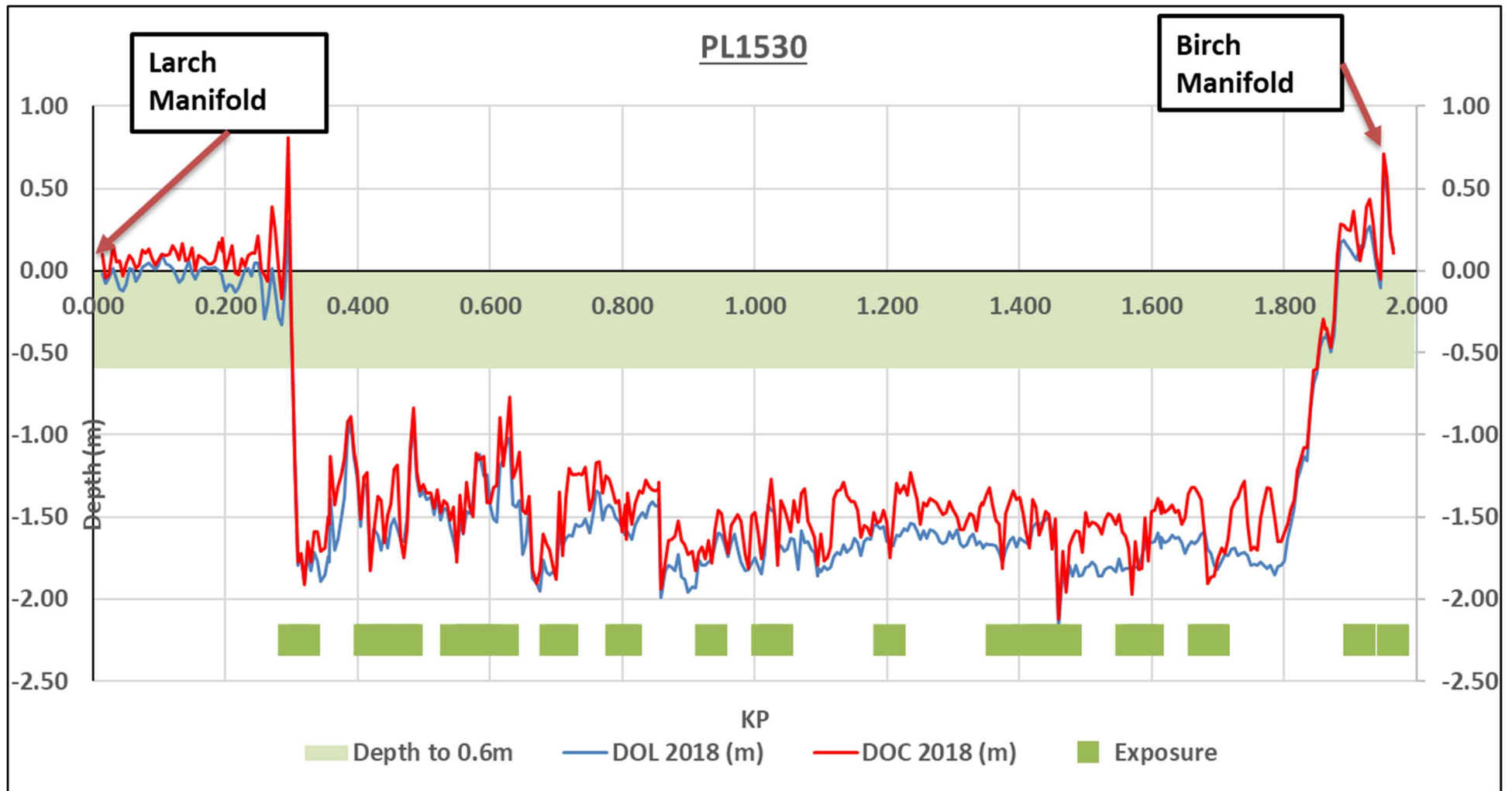
PL1527 10" Production Pipeline Burial Profile



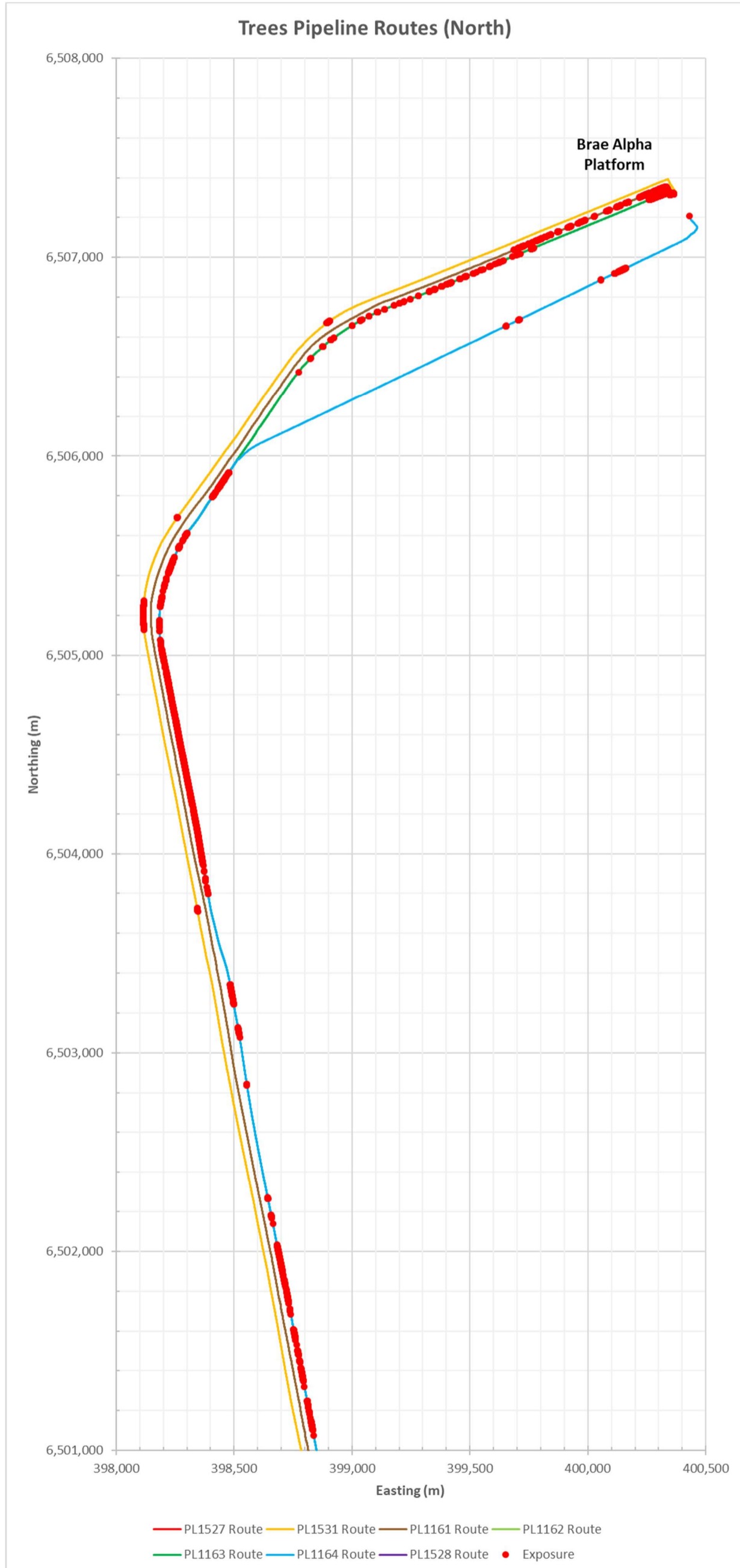
PL1531 4" GL Pipeline Burial Profile



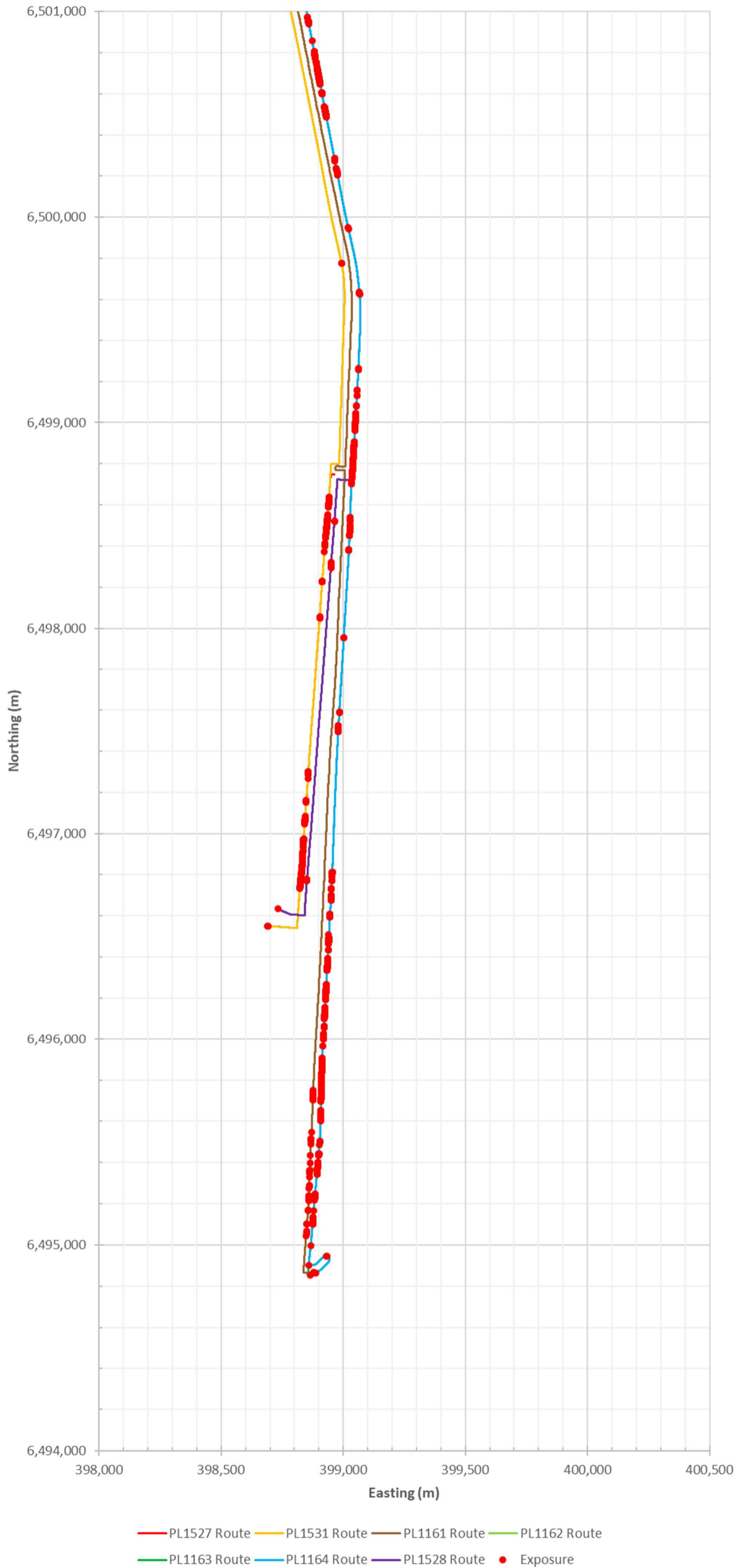




APPENDIX C PIPELINE ROUTES AND EXPOSURES



Trees Pipeline Routes (South)



APPENDIX D IMPACT ASSESSMENT CRITERIA

Main Criteria	Sub-Criteria	Impact Assessment Criteria		
		Lowest	Moderate	Highest
Safety	Project risk to personnel offshore	<p>Slight injury or health effect i.e. (Potential for first aid case).</p> <p>Minimal materials handling/lifting activities on vessel deck during removal.</p> <p>Minimal contaminated/hazardous materials or marine growth.</p> <p>No, or minimal diving activities anticipated.</p>	<p>Major injury or health effect i.e. (Lost workday case or restricted workday case, injury resulting in permanent partial disability or occupational illness with irreversible health effects resulting in permanent partial disability).</p> <p>Some materials handling/lifting activities on deck during removal. Standard lifting ops.</p> <p>Some contaminated/hazardous materials or marine growth, requiring segregation or treatment on deck.</p> <p>May required some diving activities, some standard operations.</p>	<p>Fatality or multiple major injuries with long term effects.</p> <p>Significant materials handling/lifting activity on deck or barge during removal. Extensive multiple materials handling activities on vessel deck during removal. Complex lifts.</p> <p>Large quantity of contaminated/hazardous materials or marine growth requiring segregation or treatment on deck.</p> <p>Significant diving activities or non-standard operations.</p>
	Project risk to other users of the sea	<p>Slight injury or health effect i.e. (No major treatment required or first aid case).</p> <p>Most project activity within existing exclusion zone of facility.</p> <p>Minimal additional vessel transits to and from shore.</p>	<p>Major injury or health effect i.e. (Lost workday case or restricted workday case).</p> <p>Some project activity outside existing exclusions zones but for short durations.</p> <p>Some additional vessel transits to and from shore.</p>	<p>Potential for fatality / fatalities, injury which results in permanent total disability or occupational illness (including cancer) with irreversible health effects resulting in permanent disability.</p> <p>Extensive high level of preparatory activity to be completed prior to start of removal activity.</p> <p>Vast majority of project activity outside existing safety zones for most of project duration.</p> <p>Multiple transits to and from the shore.</p>
	Project risk to personnel onshore	<p>Slight injury or health effect i.e. (No major treatment required or first aid case).</p> <p>No, or minimal infrastructure returned as waste. Minimal break-up of materials required before recycling/disposal.</p> <p>No contaminated/hazardous materials to be returned.</p>	<p>Major injury or health effect i.e. (Lost workday case or restricted workday case).</p> <p>Moderate volume of infrastructure returned as waste. Some break-up and double handling of materials required.</p> <p>Some contaminated/hazardous materials may require processing.</p>	<p>Fatality or multiple major injuries with long term effects.</p> <p>Significant volume of infrastructure returned as waste. Multiple lifting, transportation and break-up of materials required.</p> <p>Large(-est) quantity of contaminated / hazardous materials requiring specialised</p>

Main Criteria	Sub-Criteria	Impact Assessment Criteria		
		Lowest	Moderate	Highest
				processing.
	Project risk to communities / public onshore	Existing disposal/processing sites – no or minimal increase in normal activities e.g. noise, traffic, odours. Lowest timescale for operations	Existing disposal/processing sites – some increase in normal activities e.g. noise, traffic, odours.	New disposal/processing site required, or significant increase in normal activities e.g. noise, traffic, odours. Highest timescale for operations.
	Residual risk to other users of the sea	No additional risk.	Potential snagging hazard if protection deteriorates or is removed. Minor damage or loss of fishing gear.	Potential for multiple snagging events – loss of fishing gear or damage to vessel - potential fatality or permanent disability injury/illness.
Environmental	Energy use and atmospheric emissions.	Lowest CO ² emissions. Single vessel operating for short duration or intermittently during project.	Medium CO ² emissions. Single vessel operating for extended duration, with other vessels intermittently during project.	Highest CO ² emissions. Multiple vessels operating for extended duration.
	Seabed disturbance (temporary and long-term), including effects on protected areas.	No, or lowest disturbance to seabed. Rapid natural remediation. No sensitive/protected areas damaged.	Seabed disturbance resulting from removal operations. Localised and reversible damage to sensitive/protected areas. Natural remediation occurs over time. Change in habitat or species beyond natural variability with recovery likely within 1-2 years following cessation of activities. Impact on status of locally important sites or species.	Increased corridor of seabed disturbance. Increased disturbance from cutting and lifting activities. Irreversible or chronic damage to sensitive/protected areas.
	Noise	Lowest duration of offshore activities. Lowest number of cutting activities. No use of explosives.	Multiple vessels for limited duration. Standard cutting activities requiring no, or minimal duration special mitigations.	Multiple vessels on DP and/or longest duration of offshore activities. Highest number of cutting activities. Potential use of explosives – special mitigations required.
	Discharges / spills to sea or onshore.	No vessel SIMOPS. Very low risk of loss of containment.	Intermittent SIMOPS. Moderate Increased risk of loss of containment.	Continuous SIMOPS for project duration, increased risk of vessel collisions. Higher increased risk of loss of containment.

Main Criteria	Sub-Criteria	Impact Assessment Criteria		
		Lowest	Moderate	Highest
			Some planned discharges from flushing and cleaning activities, moderate risk of spills and discharges.	Potential for unplanned hydrocarbon or contaminated discharges.
	Waste management	Minimal or lowest materials returned to shore. No, or negligible items to landfill.	Majority of recovered items can be reused or recycled.	Highest quantity of materials returned to shore for cleaning, processing, recycling or landfill. Highest quantity of items to landfill.
	Legacy impacts	Zero, or minimal materials left <i>in-situ</i> . Persistence and impact of materials remaining is negligible.	Materials are recovered and returned to shore in accordance with regulatory requirements. Some additional materials added for protection or stabilisation. Persistence and impact of materials remaining or added is limited.	Nearly all materials are left in situ. Significant additional materials added for stabilisation or protection. Persistence of materials remaining is greatest, with highest detrimental impact, particularly in protected or sensitive sites.
Technical	Technical feasibility / challenge	Existing, proven equipment used for specific task for which it was designed. General operations relying only on ability to launch ROVs / Vessel Crane / station keeping. No or minimal operations requiring special weather windows.	Regular Construction task requiring detailed procedures. Existing proven equipment used for new application. Requires specific weather window for small number of tasks.	No (or limited) industry experience of operation. Technology research and development required to perform task. Requires strict weather windows for prolonged period or for multiple tasks.
	Track record	Proven track record of executing the work scope	Some track record, but not a frequent or standard operation.	No or minimal track record. Similar operation may have been performed previously but for significantly different project parameters.

Main Criteria	Sub-Criteria	Impact Assessment Criteria		
		Lowest	Moderate	Highest
	Risk of major project failure	<p>High level of confidence that schedule slippage can be accommodated within contingency and float in the plan.</p> <p>High level of confidence that cost increases can be accommodated by contingency/ UAP budget allocation.</p> <p>Slippage to schedule and growth in cost is anticipated to be minor.</p> <p>Assets and equipment are immediately available to facilitate recovery and stabilise the situation after an incident.</p> <p>Speed of recovery is anticipated to be swift.</p> <p>Limited impact on planned campaign schedule is anticipated, as remaining planned activities can continue in the interim.</p>	<p>Less confidence in cost and schedule, however, moderate level of delay and cost overrun is anticipated as worst case.</p> <p>Assets and equipment are available in a reasonable timeframe from onshore to stabilise the situation after an incident.</p> <p>Speed of recovery is anticipated to be longer due to some re-engineering of activities being required.</p> <p>Considerable impact on the planned campaign schedule is anticipated, as remaining planned activities cannot continue in the interim.</p>	<p>Significant delays are possible if upsets occur pushing removals phase into a separate season and increased costs overrun possible.</p> <p>Re-engineering required to develop new procedures and identify assets and equipment to stabilise the situation after an incident.</p> <p>Speed of recovery is anticipated to be slow due to re-engineering and procurement of new equipment.</p> <p>Significant impact on the entire project schedule and company reputation.</p> <p>High risk of being unable to execute work via the base case methodology.</p>
Societal	Impacts on offshore users	No impact on the fishing industry. Return of fishing grounds with no restrictions.	Potential impact on area with low fishing activity. Area to be charted and marked. No effect on employment.	Major impact on fishing industry with key fishing grounds affected long term and resulting in loss of employment.
	Amenities and Communities	No impact or positive impact.	Temporary disruption to local services / amenities.	Longer term disruption to local services/amenities. Pollution of near shore or beaches or damage to existing infrastructure / environment.
Economic	Decommissioning cost	Lowest cost.	Mid-range cost.	Highest cost.
	Legacy costs	No ongoing liability.	Ongoing survey scope as per OPRED requirements.	Survey scope frequency unknown and future remedial work is possible.

APPENDIX E COMPARATIVE ASSESSMENT RESULTS

Appendix E.1 Pipelines – Group A

Criteria		Option 1	Option 2a		Option 3b
Main	Sub-				
Option Description & Data		Complete removal	Partial removal		Leave <i>in-situ</i> with remediation
		Removal of areas of pipelines not already under rock. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.	Recover insufficiently trenched and/or backfilled sections, or exposed areas only. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.		Leave pipelines <i>in-situ</i> and remediate sections with rock. (Either fallpipe rockdump vessel or rock bags from CSV)
			<0.6m backfill or exposed	<0.6m DOL	
Safety	Project risk to personnel offshore	Significant manual handling of equipment and recovered items. Handling of piggyback lines and ancillaries increases the risks to personnel.	Significant manual handling of equipment and recovered items. Handling of piggyback lines and ancillaries increases the risks to personnel.	Limited manual handling of equipment and recovered items. Relatively short lengths of line being recovered.	Standard rockdumping operations.
	Project risk to other users of the sea	Significant duration of vessels in the field, which will disrupt area for fishing activities.	Potentially significant duration of vessels in the field.	Short duration of vessels in the field.	Minimal offshore duration.
	Project risk to personnel onshore	Significant quantities of materials returned to shore. Risks increased due to volume of materials; however, it should be standard operations.	Potentially significant quantities of materials returned to shore.	Relatively low quantities of materials returned onshore.	Minimal onshore works (demob activities only).
	Project risk to communities / public onshore	Highest quantity of materials returned for processing, which will involve multiple trucks. Licenced disposal site will be used.	Potentially significant quantities of materials returned to shore. Licenced disposal site will be used.	Relatively low quantities of materials returned onshore. Licenced disposal site will be used.	No materials returned onshore.

Main	Criteria		Option 1	Option 2a	Option 3b	
	Sub-					
		Residual risk to other users of the sea	Pipelines are recovered and so there should be no remaining risks.	Pipelines remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard. Additional snagging hazard from multiple cut pipeline ends, albeit remediated.	Pipelines remain in-situ and may become exposed through life, potentially becoming a snagging hazard. Additional snagging hazard from a few cut pipeline ends, albeit remediated.	Pipelines remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard.
Environmental		Energy use and atmospheric emissions.	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials.	Varying energy usage / emissions depending on option.	Some additional offshore time but limited.	Minimal operational durations.
		Seabed disturbance	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. Not an environmentally sensitive area.	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. May be multiple areas of remedial rock over pipeline cut ends. Not an environmentally sensitive area.	Some seabed disturbance due to cutting and recovery operations, plus permanent seabed disturbance due to rock, over cut pipeline ends.	Permanent seabed disturbance due to rock, however short areas affected and not within sensitive areas.
		Noise	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Varying duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Some additional durations for offshore operations, but limited.	Short duration for operations.
		Discharges / spills to sea or onshore.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Long duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Varying duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. May be some SIMOPS but will be managed under standard operating procedures	Short duration for operations and minimal equipment required.
		Waste	Highest quantity of materials returning to shore for processing.	Varying quantities of waste for processing	Limited quantities of material returning onshore.	No materials returning onshore.

Main	Criteria		Option 1	Option 2a	Option 3b
	Sub-				
	Legacy impacts	No materials left <i>in-situ</i>	Varying quantities of pipeline material left on the seabed. Potential for release of residual hydrocarbons etc.as pipelines degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal	Majority of pipeline materials left on the seabed.	100% of pipeline material left on the seabed. Potential for release of residual hydrocarbons etc.as pipelines degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal.
Technical	Technical feasibility / challenge	Standard operation but not usual for multiple lines within a trench and the total pipelines lengths to be recovered by cut & recovery. Challenges over reliability and efficiency of cutting equipment.	Standard operation but not usual for multiple lines within a trench and the total pipelines lengths to be recovered by cut & recovery. Challenges over reliability and efficiency of cutting equipment.	Limited length of pipelines being recovered.	Standard operations.
	Track record	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation. Limited number of cuts.	Standard operations.
	Risk of major project failure	High risk of schedule extensions, leading to additional campaigns and cost overruns.	High risk of schedule extensions, leading to additional campaigns and cost overruns.	Limited risk of failure or overruns.	Very low risk of any issues.
Societal	Impacts on offshore users	This option will have a positive impact on the fishing industries as it will clear the existing fishing areas.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.
	Amenities & Communities	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the	Minimal impacts.	No impacts anticipated.

Main	Criteria		Option 1	Option 2a		Option 3b
		Sub-				
			transport of material to disposal/recycling facilities. Positive/negative balance.	transport of material to disposal/recycling facilities. Positive/negative balance.		
Economic	Decom cost		Highest cost	Varying costs which could be significant.	Some additional cost, but not significant.	Lowest cost
	Legacy costs		No ongoing monitoring required.	Ongoing monitoring and potential for future remediation requirements.	Ongoing monitoring and potential for future remediation requirements.	Ongoing monitoring and potential for future remediation requirements.

Appendix E.2 Pipelines – Group B

Criteria		Option 1	Option 2a		Option 3b
Main	Sub-		Option 2a		
Option Description & Data		Complete removal	Partial removal		Leave <i>in-situ</i> with remediation
		Removal of areas of pipelines not already under rock. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.	Recover insufficiently trenched and/or backfilled sections, or exposed areas only. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.		Leave pipelines <i>in-situ</i> and remediate sections with rock. (Either fallpipe rockdump vessel or rock bags from CSV)
			<0.6m backfill or exposed	<0.6m DOL	
Safety	Project risk to personnel offshore	Significant manual handling of equipment and recovered items.	Significant manual handling of equipment and recovered items.	Limited manual handling of equipment and recovered items. Relatively short lengths of line being recovered.	Standard rockdumping operations.
	Project risk to other users of the sea	Significant duration of vessels in the field, which will disrupt area for fishing activities.	Potentially significant duration of vessels in the field.	Short duration of vessels in the field.	Minimal offshore duration.
	Project risk to personnel onshore	Significant quantities of materials returned to shore. Risks increased due to volume of materials; however, it should be standard operations.	Potentially significant quantities of materials returned to shore.	Relatively low quantities of materials returned onshore.	Minimal onshore works (demob activities only).
	Project risk to communities / public onshore	Highest quantity of materials returned for processing, which will involve multiple trucks. Licenced disposal site will be used.	Potentially significant quantities of materials returned to shore. Licenced disposal site will be used.	Relatively low quantities of materials returned onshore. Licenced disposal site will be used.	No materials returned onshore.
	Residual risk to other users of the sea	Pipelines are recovered and so there should be no remaining risks.	Pipelines remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard.	Pipelines remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard.	Pipelines remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard.

Main	Criteria		Option 1	Option 2a	Option 3b	
	Sub-					
				Additional snagging hazard from multiple cut pipeline ends, albeit remediated.	Additional snagging hazard from a few cut pipeline ends, albeit remediated.	
Environmental	Energy use and atmospheric emissions.	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials.	Varying energy usage / emissions depending on option.	Some additional offshore time but limited.	Minimal operational durations.	
	Seabed disturbance	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. Not an environmentally sensitive area.	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. May be multiple areas of remedial rock over pipeline cut ends. Not an environmentally sensitive area.	Some seabed disturbance due to cutting and recovery operations, plus permanent seabed disturbance due to rock, over cur pipeline ends.	Permanent seabed disturbance due to rock, however short areas affected and not within sensitive areas.	
	Noise	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Varying duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Some additional durations for offshore operations, but limited.	Short duration for operations.	
	Discharges / spills to sea or onshore.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Long duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Varying duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. May be some SIMOPS but will be managed under standard operating procedures.	Short duration for operations and minimal equipment required.	
	Waste	Highest quantity of materials returning to shore for processing.	Varying quantities of waste for processing	Limited quantities of material returning onshore.	No materials returning onshore.	
	Legacy impacts	No materials left <i>in-situ</i>	Varying quantities of pipeline material left on the seabed.	Majority of pipeline materials left on the seabed.	100% of pipeline material left on the seabed. Potential for release of	

Main	Criteria		Option 1	Option 2a	Option 3b
	Sub-				
			Potential for release of residual hydrocarbons etc.as pipelines degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal		residual hydrocarbons etc.as pipelines degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal.
Technical	Technical feasibility / challenge	Standard operation Challenges over reliability and efficiency of cutting equipment.	Standard operation Challenges over reliability and efficiency of cutting equipment.	Limited length of pipelines being recovered.	Standard operations.
	Track record	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation. Limited number of cuts.	Standard operations.
	Risk of major project failure	High risk of schedule extensions, leading to additional campaigns and cost overruns.	High risk of schedule extensions, leading to additional campaigns and cost overruns.	Limited risk of failure or overruns.	Very low risk of any issues.
Societal	Impacts on offshore users	This option will have a positive impact on the fishing industries as it will clear the existing fishing areas.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	Pipelines will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.
	Amenities & Communities	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the transport of material to disposal/recycling facilities. Positive/negative balance.	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the transport of material to disposal/recycling facilities. Positive/negative balance.	Minimal impacts.	No impacts anticipated.

Main	Criteria		Option 1	Option 2a		Option 3b
		Sub-				
Economic		Decom cost	Highest cost	Varying costs which could be significant.	Some additional cost, but not significant.	Lowest cost
		Legacy costs	No ongoing monitoring required.	Ongoing monitoring and potential for future remediation requirements.	Ongoing monitoring and potential for future remediation requirements.	Ongoing monitoring and potential for future remediation requirements.

Appendix E.3 Pipelines – Group C

Criteria		Option 1	Option 2a		Option 2b	Option 3b
Main	Sub-					
Option Description & Data		Complete removal	Partial removal			Leave <i>in-situ</i> with remediation
		Removal of areas of pipelines not already under rock. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.	Recover insufficiently trenched and/or backfilled sections, or exposed areas only. MFE will be required to clear any existing backfill material, then cut & lift of pipeline sections. Remedial rock on remaining cut pipeline ends.	<0.6m backfill or exposed	<0.6m DOL	Recover umbilical section onto Anchor handling vessel and remediate cut pipeline ends with rock.
Safety	Project risk to personnel offshore	Significant manual handling of equipment and recovered items. Handling of umbilical's does not pose as much risk as handling piggyback lines.	Significant manual handling of equipment and recovered items. Handling of umbilical's does not pose as much risk as handling piggyback lines.	Limited manual handling of equipment and recovered items. Relatively short lengths of line being recovered.	Significant manual handling of equipment and recovered items. Handling of umbilical's does not pose as much risk as handling piggyback lines.	Standard rockdumping operations.
	Project risk to other users of the sea	Significant duration of vessels in the field, which will disrupt area for fishing activities.	Potentially significant duration of vessels in the field.	Short duration of vessels in the field.	Short duration of vessels in the field.	Minimal offshore duration.
	Project risk to personnel onshore	Significant quantities of materials returned to shore. Risks increased due to volume of materials; however, it should be standard operations.	Potentially significant quantities of materials returned to shore.	Relatively low quantities of materials returned onshore.	Significant quantities of materials returned to shore. Risks increased due to volume of materials; however, it should be standard operations.	Minimal onshore works (demob activities only).
	Project risk to communities / public onshore	Highest quantity of materials returned for processing, which will involve multiple trucks.	Potentially significant quantities of materials returned to shore. Licenced disposal site will be used.	Relatively low quantities of materials returned onshore. Licenced disposal site will be used.	Highest quantity of materials returned for processing, which will involve multiple trucks. Licenced disposal site will be used.	No materials returned onshore.


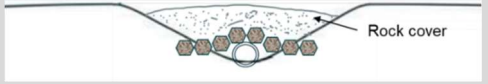
Criteria		Option 1	Option 2a	Option 2b	Option 3b	
Main	Sub-					
		Licensed disposal site will be used.				
	Residual risk to other users of the sea	Umbilicals are recovered and so there should be no remaining risks.	Umbilicals remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard. Additional snagging hazard from multiple cut pipeline ends, albeit remediated.	Umbilicals remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard. Additional snagging hazard from a few cut pipeline ends, albeit remediated.	Umbilicals are recovered and so there should be no remaining risks.	Umbilicals remain <i>in-situ</i> and may become exposed through life, potentially becoming a snagging hazard.
Environmental	Energy use and atmospheric emissions	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials.	Varying energy usage / emissions depending on option.	Some additional offshore time but limited.	Some additional offshore time but limited.	Minimal operational durations.
	Seabed disturbance	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. Not an environmentally sensitive area.	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. May be multiple areas of remedial rock over Umbilicals cut ends. Not an environmentally sensitive area.	Some seabed disturbance due to cutting and recovery operations, plus permanent seabed disturbance due to rock, over cut Umbilical ends.	Moderate seabed disturbance over large area during MFE and recovery operations but expected to remediate naturally over time. Not an environmentally sensitive area.	Permanent seabed disturbance due to rock, however short areas affected and not within sensitive areas.
	Noise	Significant duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Varying duration of vessels on location and on DP. Multiple transits to offload recovered materials. Minimal noise from subsea shears.	Some additional durations for offshore operations, but limited.	Some additional durations for offshore operations, but limited.	Short duration for operations.

Criteria		Option 1	Option 2a	Option 2b	Option 3b	
Main	Sub-					
	Discharges / spills to sea or onshore.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Long duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures.	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. Varying duration of activities increasing chances of equipment failure. May be some SIMOPS but will be managed under standard operating procedures	Possible loss of hydraulic fluid for subsea cutting equipment and ROVs, though this would be minimal. May be some SIMOPS but will be managed under standard operating procedures	Short duration for operations and minimal equipment required.	Short duration for operations and minimal equipment required.
	Waste	Highest quantity of materials returning to shore for processing.	Varying quantities of waste for processing	Limited quantities of material returning onshore.	Highest quantity of materials returning to shore for processing.	No materials returning onshore.
	Legacy impacts	No materials left <i>in-situ</i>	Varying quantities of pipeline material left on the seabed. Potential for release of residual hydrocarbons etc.as Umbilicals degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal	Majority of Umbilicals materials left on the seabed.	No materials left <i>in-situ</i>	100% of Umbilicals material left on the seabed. Potential for release of residual hydrocarbons etc.as pipelines degrade over time - release will occur slowly and therefore the impact on the environment is expected to be minimal.
Technical	Technical feasibility / challenge	Standard operation Challenges over reliability and efficiency of cutting equipment.	Standard operation Challenges over reliability and efficiency of cutting equipment.	Limited length of Umbilicals being recovered.	Standard operations but complexities may arise when attempting to reel the umbilical onto the AHV due to DOC and snagging	Standard operations.

Criteria		Option 1	Option 2a	Option 2b	Option 3b	
Main	Sub-					
	Track record	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation, however the vast number of cuts required will mean that equipment with low downtime and easily repairable will be essential.	No new equipment/technology required for this operation. Limited number of cuts.	Standard operations but complexities may arise when attempting to reel the umbilical onto the AHV due to DOC and snagging	Standard operations.
	Risk of major project failure	High risk of schedule extensions, leading to additional campaigns and cost overruns.	High risk of schedule extensions, leading to additional campaigns and cost overruns.	Limited risk of failure or overruns.	Potential risk of failure or overruns due to the ease of recovery being unknown	Very low risk of any issues.
Societal	Impacts on offshore users	This option will have a positive impact on the fishing industries as it will clear the existing fishing areas.	Umbilicals will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	Umbilicals will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.	This option will have a positive impact on the fishing industries as it will clear the existing fishing areas.	Umbilicals will remain <i>in-situ</i> - however the areas are already fished and any remediation will be designed for fishing interaction. Ongoing monitoring and potential future remediation will be required.
	Amenities & Communities	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the transport of material to disposal/recycling facilities. Positive/negative balance.	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the transport of material to disposal/recycling facilities. Positive/negative balance.	Minimal impacts.	Large quantities of infrastructure returned onshore. Positive impact on associated businesses and employment, however increased road traffic expected with the transport of material to disposal/recycling facilities. Positive/negative balance.	No impacts anticipated.
Economic	Decom cost	Highest cost	Varying costs which could be significant.	Some additional cost, but not significant.	Some additional cost, but not significant.	Lowest cost

Criteria		Option 1	Option 2a		Option 2b	Option 3b
Main	Sub-					
	Legacy costs	No ongoing monitoring required.	Ongoing monitoring and potential for future remediation requirements.	Ongoing monitoring and potential for future remediation requirements.	Limited ongoing monitoring for areas remaining under rock.	Ongoing monitoring and potential for future remediation requirements.

Appendix E.4 Mattresses and Grout Bags

Criteria		Option 1	Option 2	Option 3 - Contingency
Main	Sub-			
Option Description & Data		Complete removal of all mattresses.	Complete removal of mattress completely or partially exposed i.e. visible 	Complete removal of mattress completely or partially exposed i.e. visible Remediate using rock cover if it is not possible to remove the mattress. 
		MFE as required to expose sufficiently for recovery. Recover individually to deck using handling frame or move to a separate location for recovery later using baskets or grab.	MFE as required to expose sufficiently for recovery. Recover individually to deck using handling frame or move to separate location for recovery later using baskets or grab.	As per Options 1 & 2, then rock cover remainder, or those items not feasible to recover. Height of required rock is TBC.
Safety	Project risk to personnel offshore	No planned diving operations. Standard procedures, part of larger campaign.	No planned diving operations. Standard procedures, part of larger campaign.	No planned diving operations. Standard procedures, part of larger campaign.
	Project risk to other users of the sea	May add approx. 4 days to existing offshore schedule, excluding other vessels from the work sites.	May add approx. 3 days to existing offshore schedule, excluding other vessels from the work sites.	May add approx. 4 days to existing offshore schedule, excluding other vessels from the work sites.
	Project risk to personnel onshore	Highest quantity of materials returned to shore, but not a significant amount.	Medium quantity of materials returned to shore.	Lowest quantity of materials returned to shore.
	Residual risk to other users of the sea	No residual risk remains from mattresses or grout bags.	Non-preferred by OPRED or SFF to leave any mattresses on the seabed, even within trenches. Risk that currently buried mattresses may become exposed, or the current natural backfill is insufficient to deflect trawl gear. Seabed clearance verification will be performed and ongoing monitoring and remediation plan agreed. Considered to be low risk due to trench depth and likelihood of continued natural backfill.	Non-preferred by OPRED or SFF to leave any mattresses on the seabed, however remedial rock will be designed to be fishing friendly.

Main	Criteria	Option 1	Option 2	Option 3 - Contingency
	Sub-			
Environmental	Energy use and atmospheric emissions.	Approx 4 Days additional energy use and emissions (vessel on DP).	Approx 4 Days additional energy use and emissions (vessel on DP).	Approx 4 Days additional energy use and emissions (vessel on DP).
	Seabed disturbance	Some seabed disturbance during MFE and recovery but expected to remediate naturally within a few years. Seabed disturbance will be higher than for Option 2 since extra dredging will be required to locate and recover buried mattresses.	Some seabed disturbance during MFE and recovery but expected to remediate naturally within a few years.	Some seabed disturbance during MFE and recovery but expected to remediate naturally within a few years. Some nominal rock cover will be required but this is not possible to estimate till the offshore execution.
	Noise	Approx 4 Days additional engine noise from vessel on DP.	Approx 3 Days additional engine noise from vessel on DP.	Approx 4 Days additional engine noise from vessel on DP.
	Discharges / spills to sea or onshore.	Vessels in field for additional approx. 4 days.	Vessels in field for additional approx. 3 days.	Vessels in field for additional approx. 4 days.
	Waste	Highest quantity of materials for processing.	As per option 3, with lowest quantity of materials returned to shore for processing.	As per option 2, with lowest quantity of materials returned to shore for processing.
	Legacy impacts	Will be part of ongoing monitoring for any pipelines left on seabed. No specific legacy for mattresses and grout bags that are fully recovered.	Ongoing survey regime to be agreed with OPRED/SFF.	Ongoing monitoring for any mattresses and grout bags left on seabed in conjunction with any pipelines left on seabed, and any rock cover. Ongoing survey regime to be agreed with OPRED/SFF.
Technical	Technical feasibility / challenge	Low technical challenge but locating and dredging of fully buried mattresses may take longer than anticipated. No new equipment/technology required for this activity. Restricted weather window may be required.	Low technical challenge, but dredging may take longer than anticipated. No new equipment/technology required for this activity. Normal operating weather windows required.	Low technical challenge, but dredging may take longer than anticipated. No new equipment/technology required for this activity. Normal operating weather windows required.
	Track record	Recovery operations are frequently performed, however locating and dredging of buried mattresses and grout bags is not a typical activity.	Frequently performed	Frequently performed

Main	Criteria	Option 1	Option 2	Option 3 - Contingency
	Sub-			
	Risk of major project failure	Not applicable, contingency option of rock cover (subject to approval by OPRED) applies.	Not applicable, contingency option of rock cover (subject to approval by OPRED) applies.	Not applicable, contingency option of rock cover (subject to approval by OPRED) applies.
Societal	Impacts on offshore users	Seabed clearance verification and a monitoring & remediation plan will be agreed so there should be no impacts.	Seabed clearance verification and a monitoring & remediation plan will be agreed so there should be no impacts.	Areas with rock remediation will be marked on charts and seabed clearance verification will be performed. Rock will be designed to be fishing friendly and so the area can be fished.
	Amenities & Communities	No impact anticipated.	No impact anticipated.	No impact anticipated.
Economic	Decom cost	~£600k	<£500k	<£500k
	Legacy costs	The mattresses and grout bags are associated with underlying pipelines and so there is no additional cost impact for legacy surveys, since the pipelines will be subject to an agreed legacy survey programme		