Ensign Pipelines
Decommissioning Programme

SPIRIT ENERGY

DOCUMENT CONTROL

Document ID:		SPT-DCM-SNS0104-REP-0005	
Document Classification:		PUBLIC	
Document Ownership:		Decommissioning	
Date of Document:	30/08/18	Signature	Date
Prepared by:	S. Axon	Simon Axon Digitally signed by: Simon Axon DN: CN = Simon Axon email = laptech@btconnect.com C = AD O = Spirit Energy Date: 2019.10.02 09:53:33 Z	02 Oct 2019
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Approved by:	M. Fotheringham	M. Fotheringham	02 Oct 2019

REVISION RECORD

Revision No.	Date of Revision	Reason for Issue
A1	15/03/19	Combined DP issued for Review and Comment
A2	24/04/19	Issued to OPRED for Review and Comment
A3	08/10/19	Issued for Statutory Consultation

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TABLE OF CONTENTS			INST	P/L
1.	**Executive Summary**	**7**		√
1.1	Decommissioning Programme	7		√
1.2	Requirement for Decommissioning Programme	7		√
1.3	Introduction	7		√
1.4	Overview of Pipelines Being Decommissioned	8		√
1.5	Summary of Proposed Decommissioning Programme	8		√
1.6	Field Location in UKCS	9		√
1.7	Industrial Implications	17		√
2.	**Description of Items to be decommissioned**	**18**		√
2.1	Pipelines including stabilisation features	18		√
2.2	Inventory Estimates	22		√
3.	**Removal and Disposal Methods**	**22**		√
3.1	Pipelines	23		√
3.2	Pipeline Stabilisation Features	25		√
3.3	Waste Streams	25		√
4.	**Environmental Impact Assessment**	**27**		√
4.1	Potential Environmental Impacts and their Management	27		√
5.	**Interested Party Consultations**	**29**		√
5.1	Informal Consultations	29		√
6.	**Programme Management**	**30**		√
6.1	Project Management and Verification	30		√
6.2	Post-Decommissioning Debris Clearance and Verification	30		√
6.3	Schedule	30		√
6.4	Costs	30		√
6.5	Close Out	31		√
6.6	Post-Decommissioning Liability, Monitoring and Evaluation	31		√
7.	**Supporting Documents**	**32**		√
Appendix A	**Burial Profiles**	**33**		√
Appendix A.1	PL2838 & PL2839 Burial Profile	33		√
Appendix A.2	PLU2840 & PL2841 Burial Profile	34		√
Appendix B	**PUBLIC NOTICE & CONSULTEE CORRESPONDENCE**	**35**		√
Appendix B.1	Public Notices	35		√

FIGURES AND TABLES

TERMS AND ABBREVIATIONS

ABBREVIATION	EXPLANATION
3-LPP	Layer Polypropylene
BT	British Telecommunications plc
CPUK	Conoco Phillips UK Limited
CSV	Construction Support Vessel
DOC	The blue line on the burial profiles shows the profile of cover. The area between the blue line (DOB) and maroon line (DOL) shows the backfill
DOL	Pipeline trench profile; depth of lowering (to top of pipe)
DSV	Diving Support Vessel
Ensign	Installation comprising small topsides and jacket held in location using 4x piles
ESDV	Emergency Shutdown Valve
GMG	Global Marine Group
HD	High Density concrete mattress (6m x 3m x 0.3m, average density 1.9kg/m^3)
HT	Half-thickness concrete mattress (6m x 3m x 0.15m). Although this type of concrete mattress might be standard in some parts of the North Sea, the term is used to differentiate the different types of concrete mattresses used for Ensign
Installation	Installation as defined by the Section 29 Notice, comprising topsides and jacket
“	Inch; 25.4 millimetres
JNCC	Joint Nature Conservation Committee
km	Kilometre
KP	Kilometre Post (Distance along pipeline from point of origin, base of riser at Ensign)
LOGGS	Lincolnshire Offshore Gas Gathering System
m	Metre(s)
MAT, SAT	Master Application Template, Supplementary Application Template
MD	Mixed Density concrete mattress (6m x 3m x 0.3m average density1.6kg/m^3)
MEG	Mono-ethylene Glycol
MSV	Multipurpose Support Vessel
N,S,E,W, ESE	North, South, East, West, East-South-East
n/a	Not Applicable
NFFO	National Federation of Fishermen's Organisations
NIFPO	Northern Ireland Fish Producers Organisation
NORM	Naturally Occurring Radioactive Material
NPAI	Not Permanently Attended Installation
NUI	Normally Unattended Installation
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
Piggybacked	Smaller pipeline is adjacent and clamped to a larger pipeline throughout its length
Pipeline	Pipeline or umbilical
PL	Pipeline Identification numbers

ABBREVIATION	EXPLANATION
PLA	Pipeline Operations as defined in MAT Operation Types
Platform	Installation, typically comprising topsides and jacket
PWA	Pipeline Works Authorisation
ROVSV	Remotely Operated Vehicle Support Vessel
SD	Standard Density concrete mattress (6m x 3m x 0.3m, average density 1.5kg/m^3)
SFF	Scottish Fishermen's Federation
Spirit Energy	Spirit Energy North Sea Limited
TUTU	Topsides Umbilical Termination Unit
UHB	Upheaval Buckling
UK	United Kingdom
UKCS	United Kingdom Continental Shelf

1. EXECUTIVE SUMMARY

1.1 Decommissioning Programme

This document contains one Decommissioning Programme for the set of notices under Section 29 of the Petroleum Act 1998. The Decommissioning Programme is concerned with:

- The four pipelines associated with Ensign: **PL2838**, **PL2839**, **PLU2840** and **PL2841**.

Although decommissioning of the pipelines is being treated in this document as a standalone project, Spirit Energy will also continue to explore cost saving synergies with other projects.

A separate Decommissioning Programme will be prepared for the Ensign installation.

1.2 Requirement for Decommissioning Programme

Pipelines: In accordance with the Petroleum Act 1998, Spirit Energy North Sea Limited as operator of the Ensign pipelines, and on behalf of the Section 29 notice holders (Table 1.4.2), is applying to OPRED to obtain approval for decommissioning the pipelines detailed in Section 2 of this document.

In conjunction with public, stakeholder and regulatory consultation, this Decommissioning Programme is submitted in compliance with national and international regulations and OPRED guidance notes. The schedule outlined in this document is for a four-year period due to begin mid-2019 with well decommissioning. This allows flexibility for exploring synergistic decommissioning opportunities in the area.

1.3 Introduction

The Ensign field lies within the main Southern North Sea (SNS) Gas Province in UK Block 48/14a. The field lies ~109km west of Easington on the coast of Norfolk in water depths of ~25m.

The Ensign gas field was developed using a single platform. The field achieved first production in 2011. The Ensign installation and pipelines are wholly owned by Spirit Energy North Sea Limited. The installation itself is a Not Permanently Attended Installation (NPAI) supported by four-legged conventional piled steel jacket. Until May 2017, gas from Ensign used to be exported to Audrey A using 10” pipeline (**PL2838**, ~22.3km long) and on to LOGGS using the 20” gas export line **PL496**. LOGGS used to supply methanol to Audrey A using 3” methanol pipeline **PL497** and on to Ensign using 2” pipeline **PL2839** (~22.2km long), the difference in length between the piggybacked pipelines being accounted for by the layout of the pipelines as they approach Audrey A. **PL2839** is piggybacked onto **PL2838**. Decommissioning of PL496 and piggybacked PL497 pipelines are dealt with in the Audrey and Annabel Decommissioning Programmes; these were approved early 2018. LOGGS is no longer operational.

A 10” pipeline (**PL2841**) ~2.1km long and an umbilical pipeline (**PLU2840**) ~2.2km long, were also installed for Ensign but never used; these are covered by a Disused Pipeline Notification. The Cessation of Production justification for Ensign is in the process of being approved by the Oil and Gas Authority.

Following public, stakeholder and regulatory consultation, the Decommissioning Programme will be submitted without derogation and in full compliance with the OPRED guidance notes. The Decommissioning Programme explains the principles of the removal activities and is supported by an environmental impact assessment documented in the environmental appraisal. The Decommissioning Programme for the pipelines is also supported by a comparative assessment.

1.4 Overview of Pipelines Being Decommissioned

1.4.1 Pipelines

Table 1.4.1: Pipelines Being Decommissioned		
Number of Pipelines	4	See Table 2.1.1

Table 1.4.2: Pipelines Section 29 Notice Holders Details		
Section 29 Notice Holder	**Registration Number**	**Equity Interest**
Spirit North Sea Gas Limited	SC182822	0%
Spirit Energy North Sea Limited	04594558	100%
Centrica Resources UK Limited	06791610	0%
GB Gas Holdings Limited	03186121	0%
NSGP (Ensign) Limited	92236	0%

1.5 Summary of Proposed Decommissioning Programme

Table 1.5.1: Summary of Decommissioning Programme	
Proposed Decommissioning Solution	**Reason for Selection**
1. Pipelines	
Most of PL2838, PL2839, PLU2840 and PL2841 will be flushed and left buried *in situ*. On approach to the Ensign Platform, the Audrey A platform and the suspended subsea well, the pipeline ends will be cut as they exit the deposited rock to ensure that the ends remain buried. As a contingency measure, small deposits of rock may need to be added to existing rock to ensure that the pipeline ends remain buried. Surveys indicate that all pipelines will remain buried. Degradation will occur over a long period within the deposited rock and seabed sediment; it is not expected to represent a hazard to other users of the sea. Any permit applications required for work associated with pipeline pigging, flushing, cutting and removal (PLA MAT) will be submitted.	Outside the 500m safety zones the pipelines are already exposed to fishing activity. The pipelines are sufficiently buried and stable - with latest survey data indicating that no spans are present, posing no hazard to marine users. Minimal seabed disturbance, lower energy usage, reduced risk to personnel engaged in the activity.
2. Interdependencies	
For PL2838 and piggybacked PL2839 there is one third party pipeline crossing and one third party cable crossing. These are both outside 500m safety zone and will not be disturbed because of these decommissioning proposals. Pipeline stabilisation features such as concrete mattresses and any grout bags found that are exposed will be removed as part of the pipeline decommissioning activities, but deposited rock and any buried stabilisation features will remain *in situ*.	

1.6 Field Location in UKCS

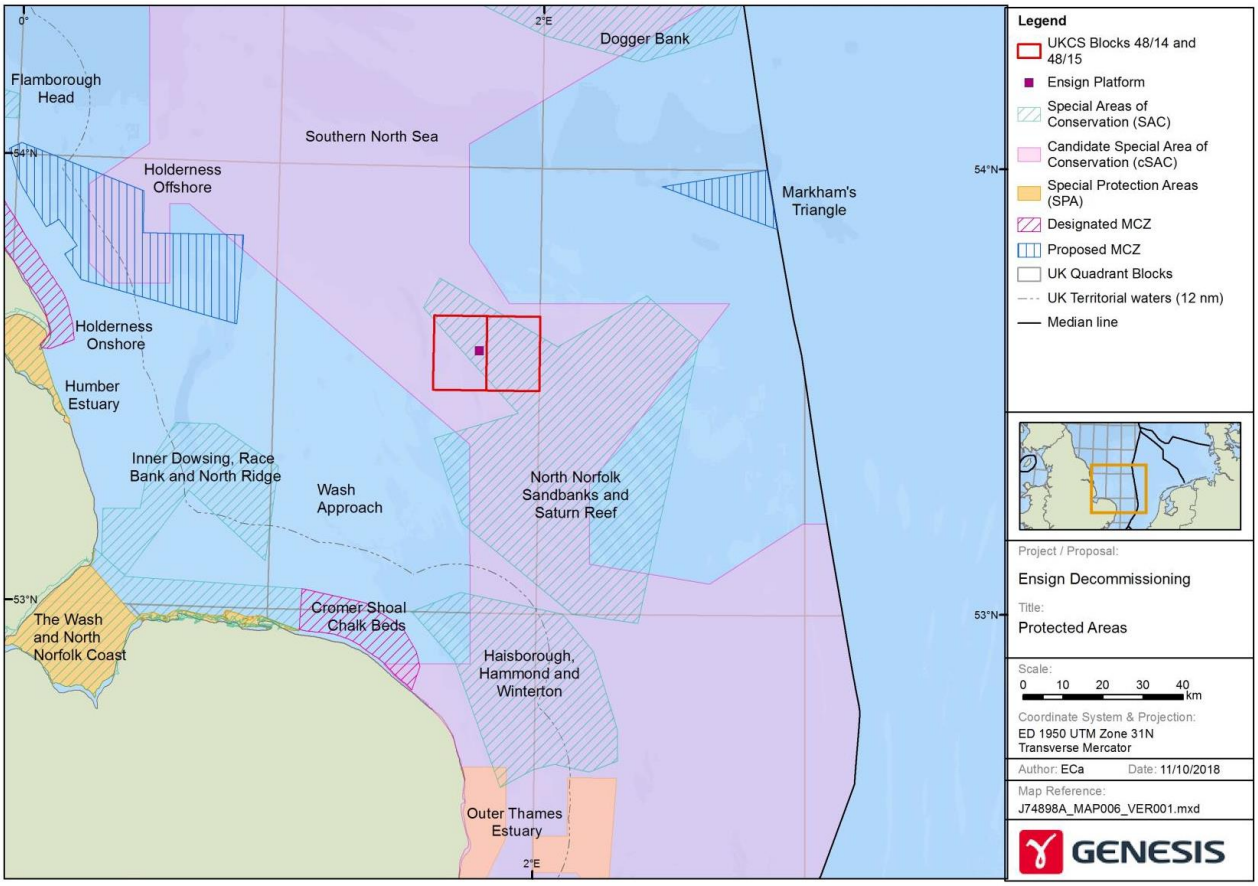


Figure 1.6.1: Field Location in UKCS

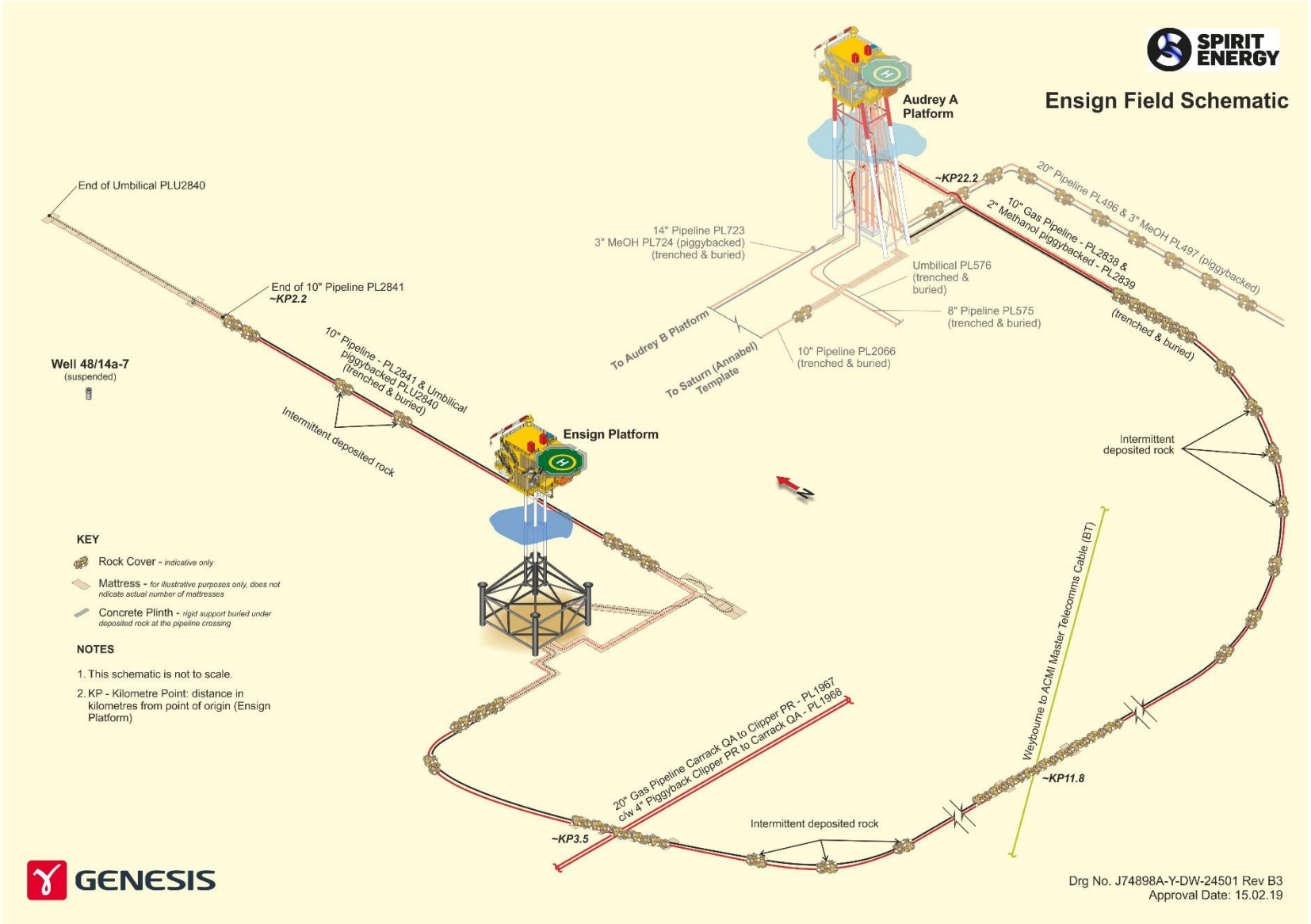


Figure 1.6.2: Ensign Prior to Decommissioning

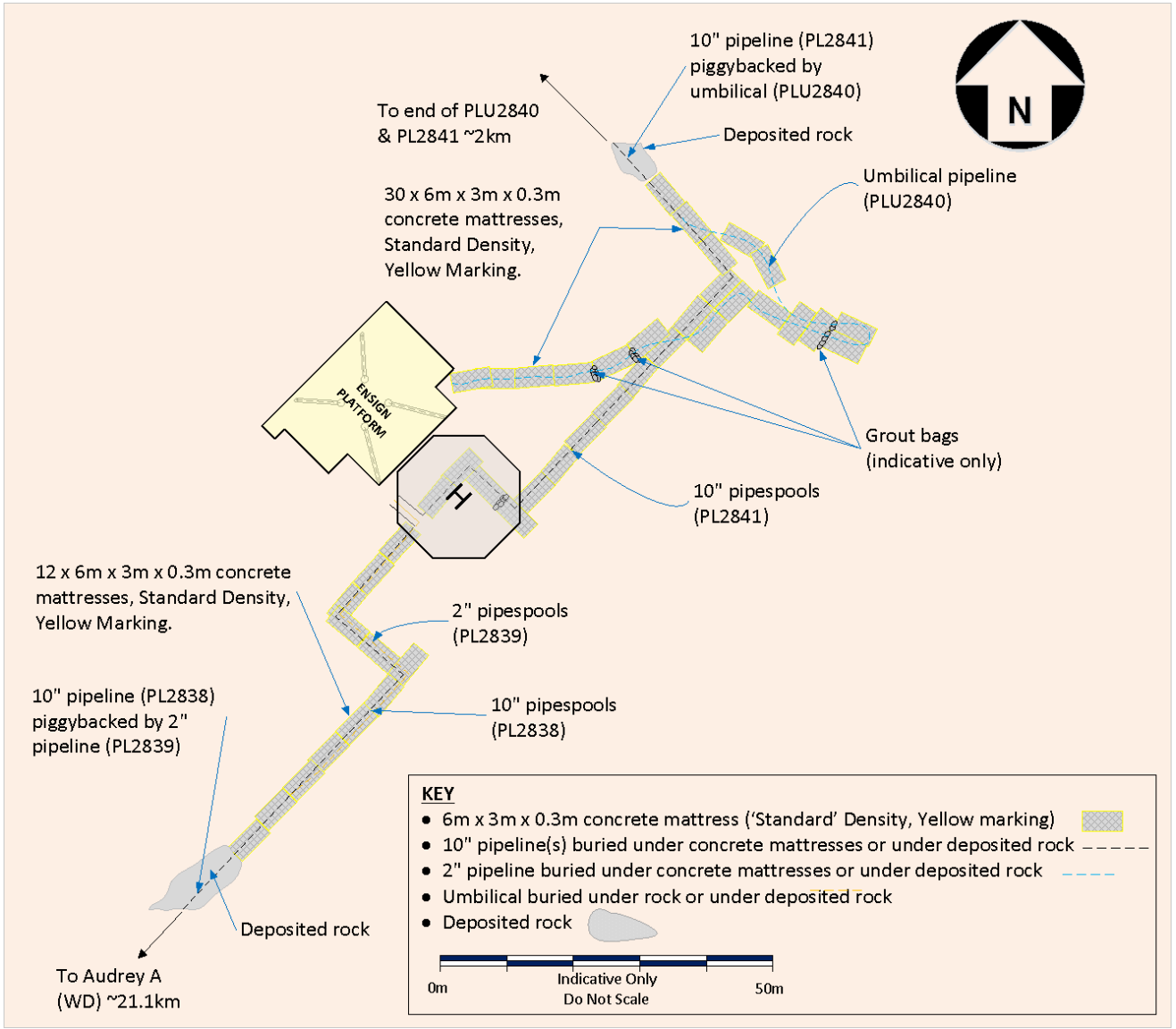


Figure 1.6.3: Overview of Ensign Approaches

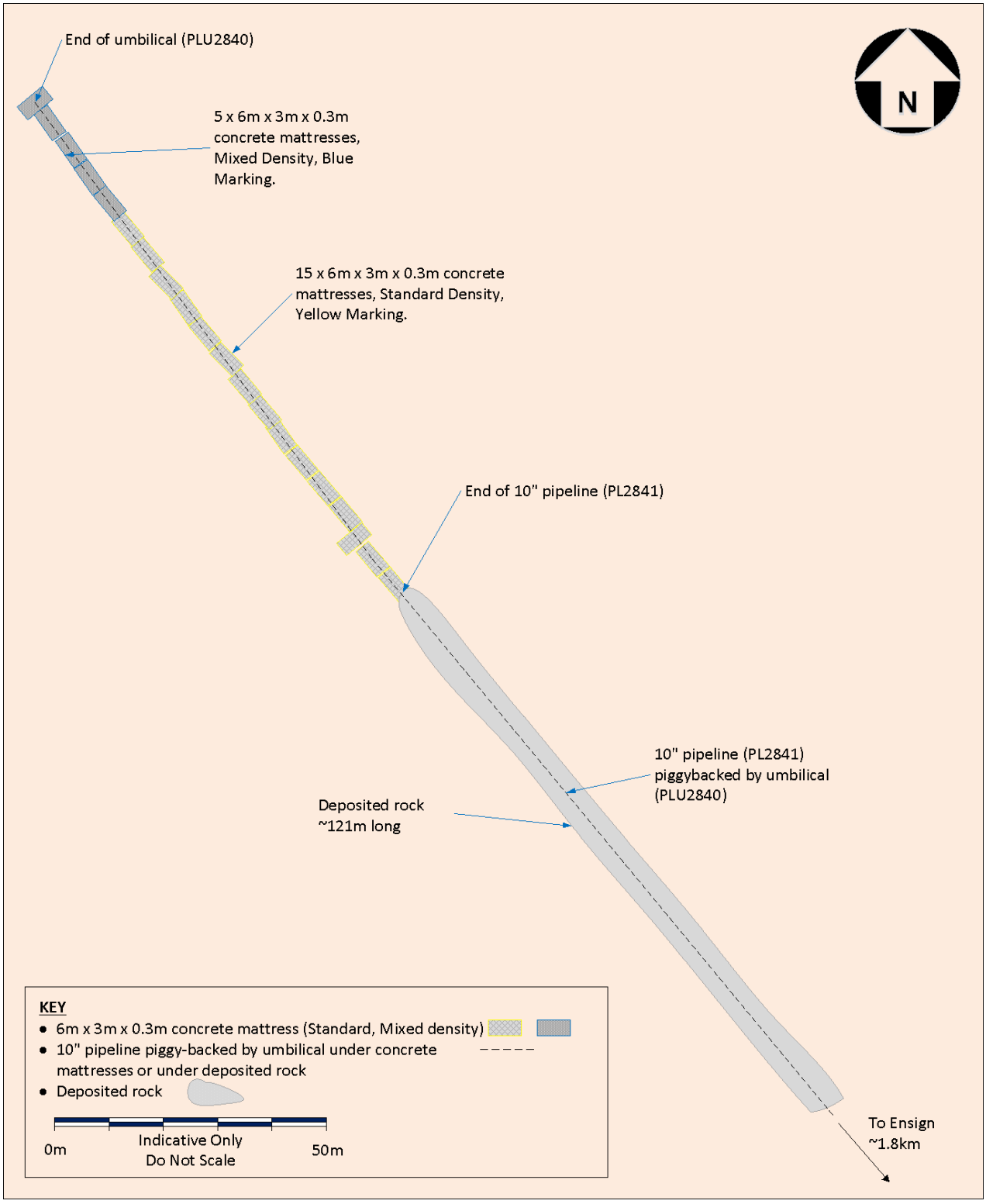


Figure 1.6.4: Ensign Suspended Well Approaches (~KP1.9)

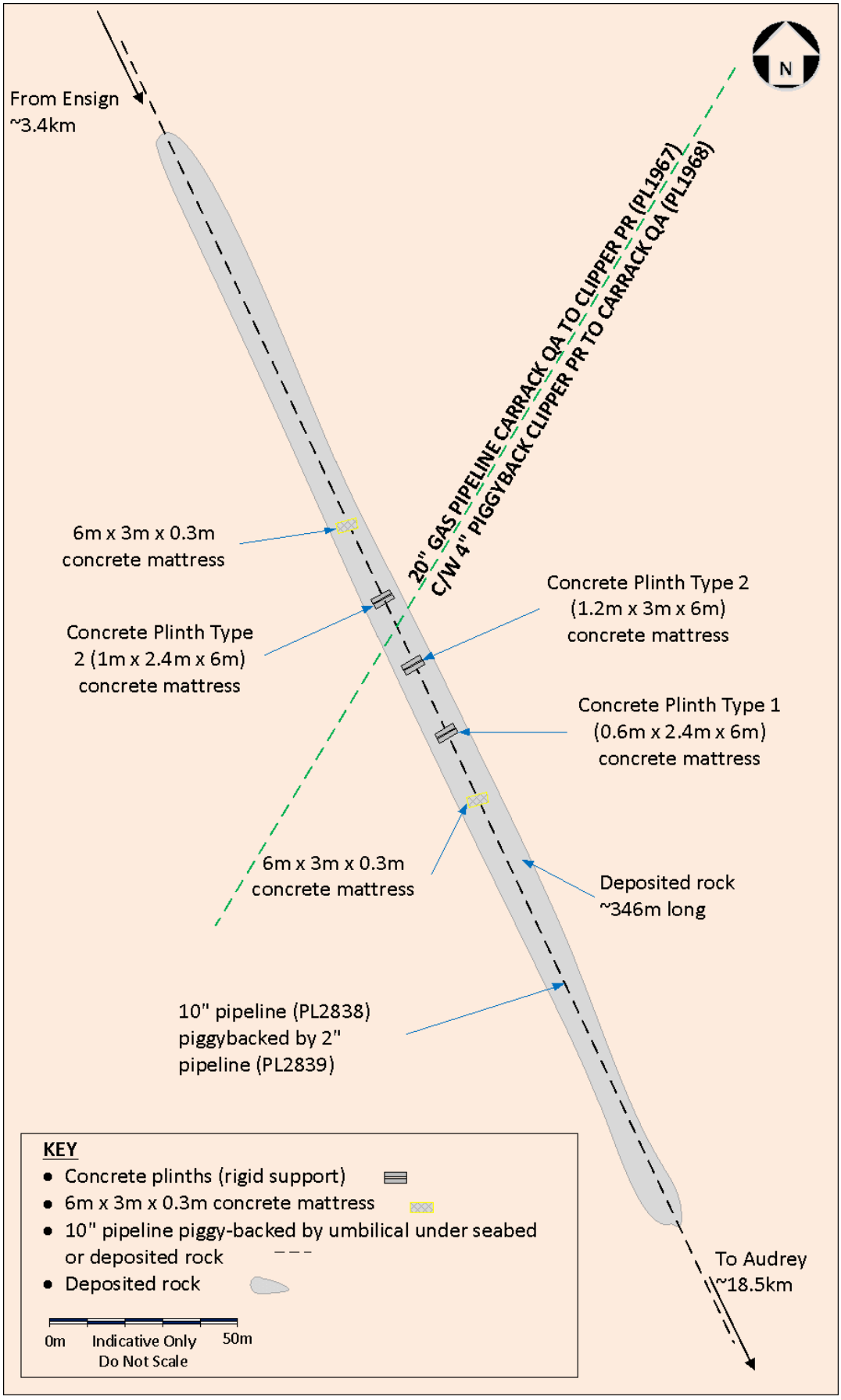


Figure 1.6.5: Carrack QA to Clipper PR Pipeline Crossing (~KP3.5)

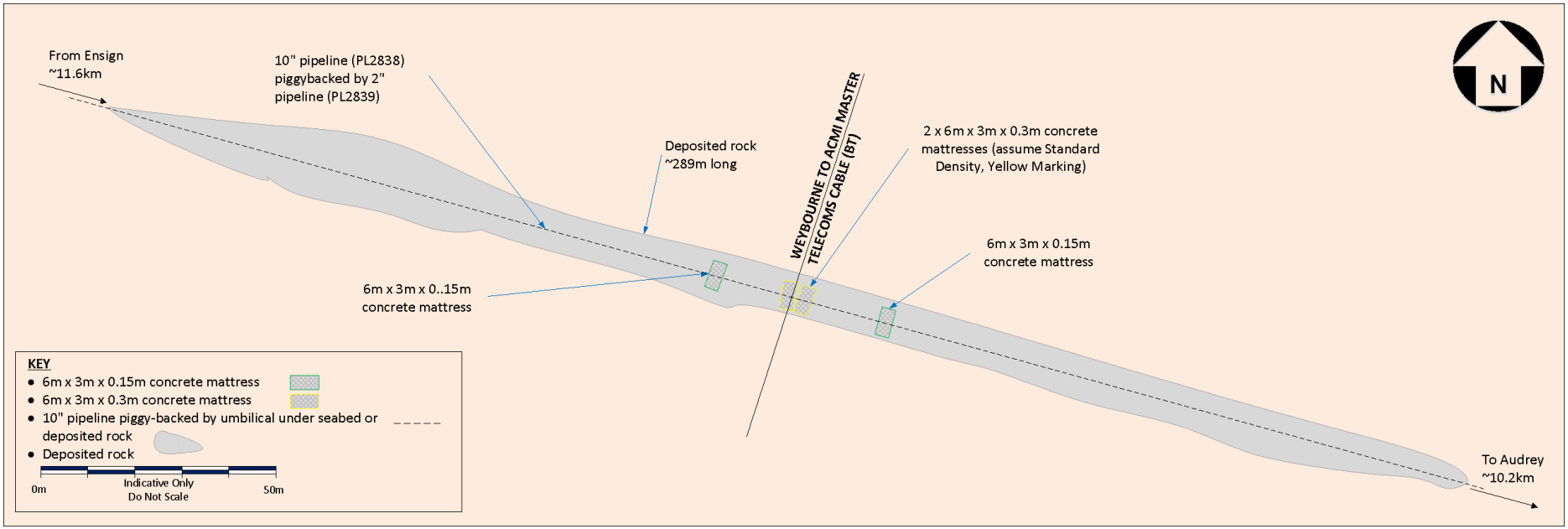


Figure 1.6.6: Overview of Weybourne to ACMI Cable Crossing (~KP11.8)

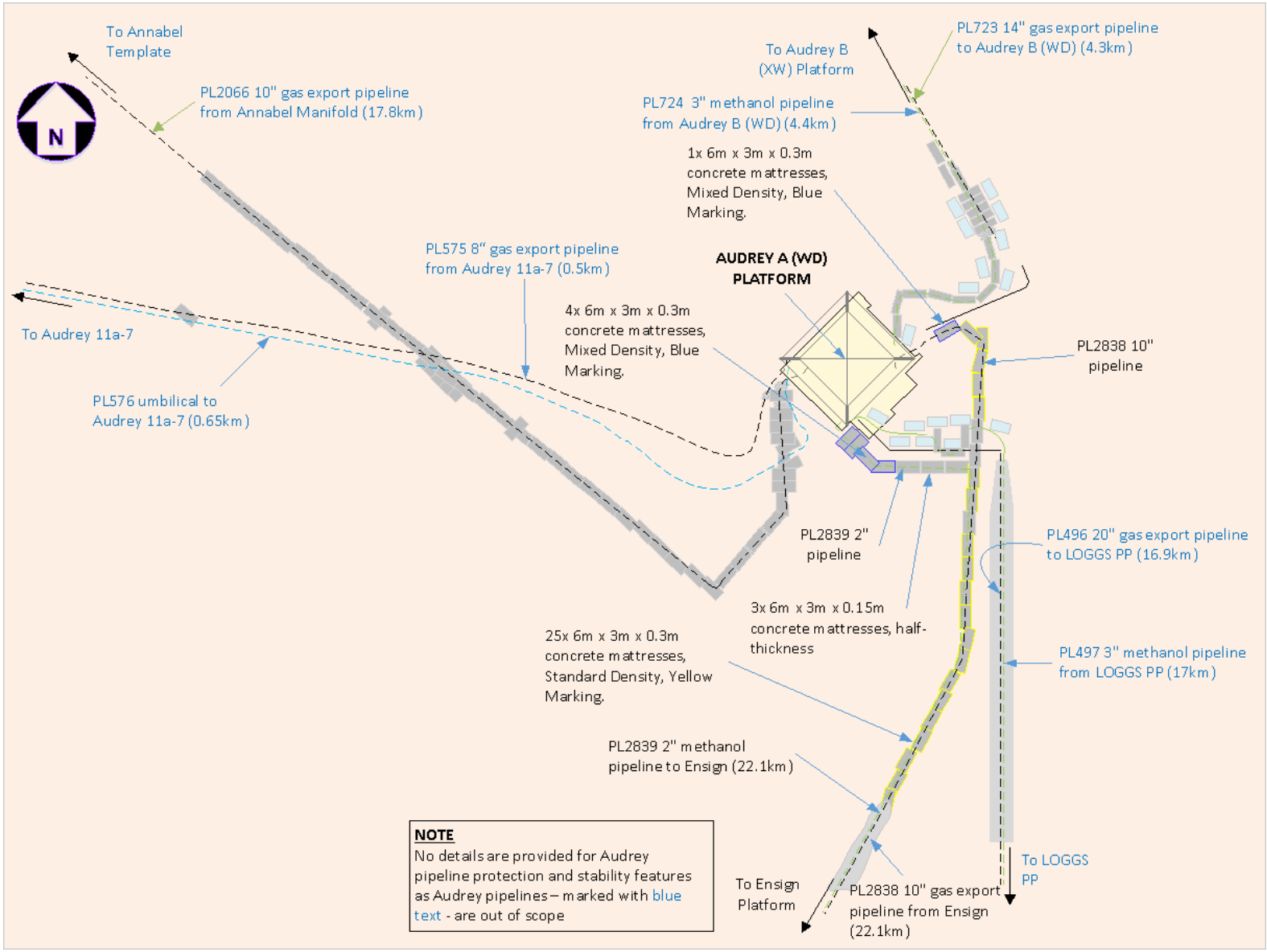


Figure 1.6.7: Overview of Approaches to Audrey A (WD)

Table 1.6.1: Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/Direction**	**Information[1]**	**Status**
Spirit Energy	Audrey A (WD)	Fixed Steel Platform. NUI	16.9km ESE of Ensign	Ensign used to export gas via Audrey A onto LOGGS	Cold Suspension
Spirit Energy	Audrey B (XW)	Fixed Steel Platform. NUI	13.2km ESE of Ensign		Cold Suspension
CPUK	LOGGS Riser Platform	Fixed Steel Platform. NUI	26.8km SE of Ensign		Operational
CPUK	LOGGS Compression Platform	Fixed Steel Platform. NUI	26.9km SE of Ensign		Operational
CPUK	North Valiant Platform	Fixed Steel Platform. NUI	27km SE of Ensign		Operational
CPUK	LOGGS Production Platform	Fixed Steel Platform. NUI	27km SE of Ensign		Operational
CPUK	LOGGS Accommodation Platform	Fixed Steel Platform.	27km SE of Ensign		Operational
Shell UK Limited	Clipper PH	Fixed Steel Platform	14.3km S of Ensign	Accommodation Platform	Operational
Shell UK Limited	Clipper PR	Fixed Steel Platform. NUI	14.3km S of Ensign	Riser Platform	Operational
Shell UK Limited	Clipper PW	Fixed Steel Platform. NUI	14.8km S of Ensign	Wellhead Platform	Operational
Shell UK Limited	Clipper PC	Fixed Steel Platform. NUI	14.9km S of Ensign	Compression Platform	Operational
Shell UK Limited	Clipper PM	Fixed Steel Platform. NUI	14.9km S of Ensign	Metering & Manifold Platform	Operational
Shell UK Limited	Clipper PT	Fixed Steel Platform	14.9km S of Ensign	Production & Platform	Operational
Shell UK Limited	Carrack QA to Clipper PR 20" Pipeline	Pipeline PL1967	Pipeline crossing under PL2838 (& PL2839) at KP3.5 from Ensign (Figure 1.6.5)	20" Gas export pipeline piggybacked by 4" MEG pipeline	Operational
Shell UK Limited	Clipper PR to Carrack QA 4" Pipeline	Pipeline PL1968			
BT	Weybourne to ACMI Cable	Cable	Cable crossing under PL2838 (&PL2839) at KP11.8 from Ensign (Figure 1.6.6)	PL2838 & PL2839 cross over this cable	Unknown

[1] Where pipelines share a crossing, the KP refers to the gas pipeline PL2838 and not the methanol pipeline

Table 1.6.1: Adjacent Facilities Impacts of Decommissioning Proposals
There are no direct impacts on adjacent facilities from the associated decommissioning works outside the Ensign installation. Where crossings and concrete mattresses are overlain with rock, it is proposed to decommission the rock and the infrastructure beneath by leaving *in situ*. As part of the environmental appraisal we have considered potential in combination or cumulative effect of activities in the area, including decommissioning and new developments. This has been done using data that are publicly available. However, operational windows tend to include a degree of flexibility, so it is not possible to be precise. However, as part of the operational phase any potential impacts will be mitigated in two ways. The first is via direct communication with the parties involved, and the other is via submission of the MATs and SATs.

1.7 Industrial Implications

The activities to decommission the pipelines will be completed using a Dive Support Vessel (DSV), Remotely Operated Vehicle Support Vessel (ROVSV), Construction Support Vessel (CSV), or Multi Support Vessel (MSV). The need for diving related activities will be minimised.

It is Spirit Energy's intention to develop a contract strategy that will result in an efficient and cost-effective execution of the decommissioning works. Where appropriate existing framework agreements may be used for decommissioning of the pipelines and pipeline stabilisation features. Spirit Energy will try to combine Ensign decommissioning activities with other development or decommissioning activities to reduce mobilisation costs should the opportunity arise; as a minimum the current intention is for decommissioning activities at the Audrey A (WD) location to be carried out at the same time as activities for Ensign pipelines PL2838 and PL2839. The decommissioning schedule allows flexibility for when decommissioning operations are carried out and completed.

2. DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Pipelines including stabilisation features

Table 2.1.1: Pipeline/Flowline/Umbilical Information									
Description	**Pipeline Number (as per PWA)**	**Diameter (NB) (inches)**	**Length (km)[1]**	**Description of Component Parts**	**Product Conveyed**	**From – To End Points**	**Burial Status**	**Pipeline Status**	**Current Content**
Gas pipeline	PL2838	10"	22.315	3-LPP coated steel pipeline	Natural gas, condensate, water	ESDV flange at Ensign Platform to ESDV flange at Audrey A (WD)	Fully trenched and buried with extensive deposited rock	Out of use	Inhibited seawater
Methanol pipeline	PL2839	2"	22.240	3-LPP coated steel pipeline	Methanol and corrosion inhibitor	Audrey-LOGGS Methanol Pipeline tie-in at Audrey A (WD) to Ensign NPAI 3" Methanol Riser ESDV Flange	As PL2838	Out of use	Inhibited seawater
Control and Chemical Injection Umbilical	PLU2840	4.8"	2.190	Wire armoured Electro-Hydraulic Control and Chemical Injection Umbilical	N/A	Ensign umbilical TUTU to end of Concrete Mattresses on approach top Ensign Well	Fully trenched and buried with extensive rock	Out of use	6 x Hydraulic (Aqualink 300v2/300E) 4 x Chemical Injection (Aquaglycol 24/24F)
Gas pipeline	PL2841	10"	2.050	3-LPP coated steel pipeline	N/A	End of deposited rock on approach to Ensign Well to ESDV Flange at Ensign NPAI	As PLU2840	Out of use	Filtered Treated Seawater

NOTE 1: PL2838 & PL2839 and PLU2840 & PL2841 are piggybacked. PL2840 & PL2841 were not brought into operation.

Table 2.1.2: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Total Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
Concrete mattresses & plinths	20	168.5	5 x MD in vicinity of undeveloped Ensign subsea well; 15 x SD in vicinity of undeveloped Ensign subsea well; Refer Figure 1.6.4.	Survey data suggests that most of the concrete mattresses in vicinity of Ensign subsea well approach are visible.
	42	348.6	12 x SD in vicinity of Ensign Platform (PL2838/PL2839); 30 x SD in vicinity of Ensign Platform (PLU2840/PL2841); Refer Figure 1.6.3.	Survey data suggests that most of the concrete mattresses in vicinity of Ensign are visible.
	4	27.2	2 x HT at Weybourne to ACMI Cable Crossing; 2 x SD at Weybourne to ACMI Cable Crossing; Refer Figure 1.6.6.	These mattresses are buried under rock at the crossing.
	7	56	2 x HT at Carrack QA to Clipper PR Pipeline Crossing; 2 x SD at Carrack QA to Clipper PR Pipeline Crossing; 1 x Concrete Plinth Type 1 (1.m x 2.4m x 6m); 1 x Concrete Plinth Type 2 (1m x 2.4m x 6m); 1 x Concrete Plinth Type 3 (0.6m x 2.4m x 6m); Refer Figure 1.6.5.	These mattresses and plinths are buried under deposited rock at the crossing.
	33	261.9	5 x MD in vicinity of Audrey A (WD) Platform; 25 x SD in vicinity of Audrey A (WD) Platform; 3 x HT in vicinity of Audrey A (WD) Platform; Refer Figure 1.6.7.	Survey data suggests that most of the concrete mattresses in vicinity of Audrey A (WD) are visible.
Grout bags	358	9.0	Notional number of grout bags. As-built data not explicit.	Survey data suggests that most of the grout bags in vicinity of Ensign are visible.
Deposited rock	n/a	1,084	Approaches to Ensign undeveloped subsea well, 121m long; Figure 1.6.4.	Largely exposed.
	n/a	2,306	Approaches to Ensign NPAI, 244m long; Figure 1.6.3.	Largely exposed

Table 2.1.2: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Total Weight (Te)**	**Location(s)**	**Exposed/Buried/Condition**
	n/a	782	Approaches to Audrey A (WD), 124m long; Figure 1.6.7	Largely exposed
	n/a	6,925	PL2838 & PL2839 UHB Mitigation, intermittent between KP0.02 and KP21.1; Total 1,7km long	Largely exposed
	n/a	76	PLU2840 and PL2841 UHB Mitigation, between KP0.18 and KP.19 and between KP0.28 and KP0.29; Total 18m long	Largely exposed
	n/a	7,179	Carrack QA to Clipper PR Pipeline Crossing; 346m long; Figure 1.6.5	Largely exposed
	n/a	3,598	Weybourne to ACMI Master Cable Crossing; 249m long; Figure 1.6.6	Largely exposed

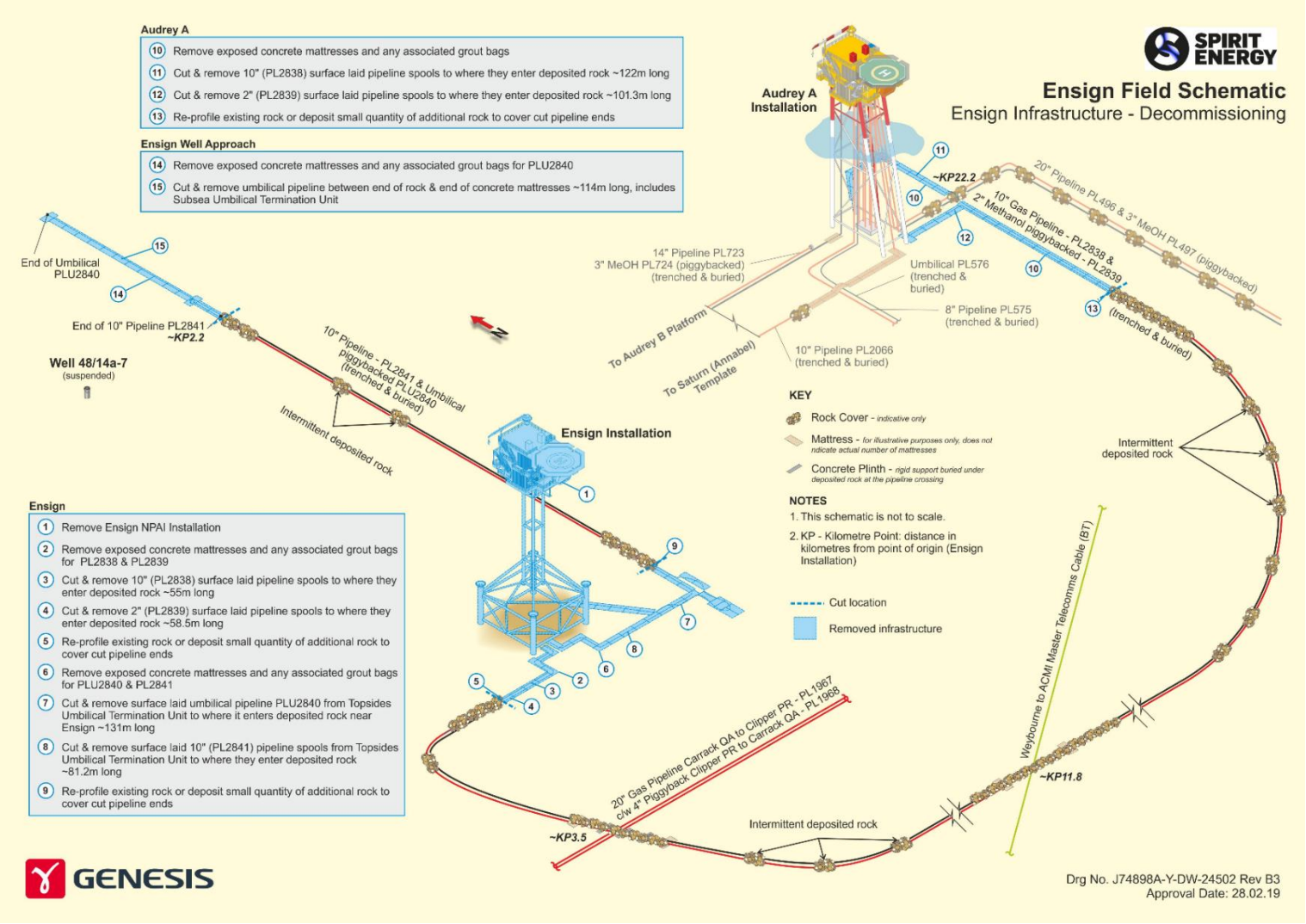


Figure 2.1.1: Overview of Ensign decommissioning proposals[2]

[2] Although the Ensign installation is not addressed in this Decommissioning Programme, for completeness the decommissioning proposals are included on this schematic.

2.2 Inventory Estimates

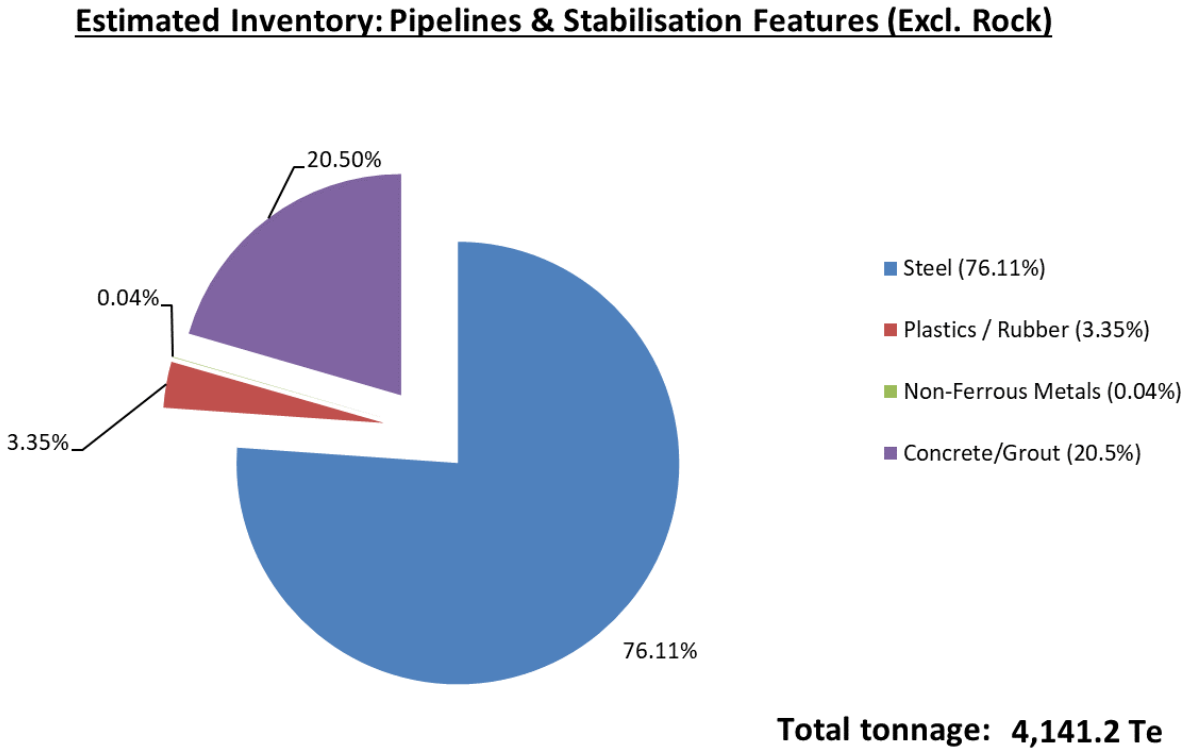


Figure 2.2.1: Pie chart of estimated pipeline inventory

Refer to Section 4.7 of the Environmental Appraisal [2] for further details.

3. REMOVAL AND DISPOSAL METHODS

Waste will be dealt with in accordance with the Waste Framework Directive. The reuse of an installation or pipelines (or parts thereof) is first in the order of preferred decommissioning options. Options for the reuse of the pipelines (or parts thereof) are currently under investigation. Waste generated during decommissioning will be segregated by type and periodically transported to shore in an auditable manner through licensed waste contractors. Steel and other recyclable metal are estimated to account for the greatest proportion of the materials inventory. Refer to Section 4.7 of the Environmental Appraisal [2] for further details concerning disposal of waste.

3.1 Pipelines

3.1.1 Decommissioning Options

All exposed pipelines or pipespools on approach to the undeveloped subsea well, the Ensign installation and Audrey A (WD) installation will be completely removed. That is, all pipelines buried under concrete mattresses that would otherwise be exposed will be removed.

The following options considered and identified in terms of applicability to the pipelines listed in Table 3.1.1 are:

1) Complete removal;

2) Leave *in situ*, making pipeline ends safe.

Table 3.1.1: Pipeline or Pipeline Groups Decommissioning Options

Pipeline or Group	Condition of line/group (Surface laid/Trenched/ Buried/ Spanning)	Whole or part of pipeline/group	Decommissioning options considered
PL2838 & PL2839	Trenched and buried throughout with deposited rock at locations (total length of rock 2,544m) to prevent upheaval buckling, at pipeline crossings, and on approach to the Ensign and Audrey A (WD) installations.	Whole 10" gas pipeline and piggybacked 2" methanol pipeline, except short lengths of pipespools buried under concrete mattresses.	1 & 2
PLU2840 & PL2841	Trenched and buried throughout with deposited rock at locations (total length 259m) to prevent upheaval buckling, and on approach to the undeveloped Ensign Well and Ensign installation.	Whole unused 10" gas pipeline and piggybacked umbilical pipeline except short lengths buried under concrete mattresses.	1 & 2

3.1.2 Comparative Assessment Method

A comparative assessment of the decommissioning options was performed in accordance with the Spirit Energy Guidance for Comparative Assessments for Decommissioning. Each decommissioning option was qualitatively assessed against Safety, Environment, Technical and Societal and Cost. Refer [3] for details.

3.1.3 Outcome of Comparative Assessment

Table 3.1.2: Outcomes of Comparative Assessment

Pipeline or Group	Recommended Option	Justification
PL2838 & PL2839	Leave most of the pipelines *in situ*. At Ensign sever the pipelines where they emerge from the deposited rock and disconnect them from the riser flanges. Completely remove otherwise exposed 10" pipespools (~55m long) and exposed 2" methanol pipespools (~58.5m) once the associated stabilisation features have been removed. At Audrey A (WD) sever the pipeline or pipespools where they emerge from the	Both pipelines are buried and stable for most of their length except for the ends at Ensign and Audrey A (WD). Therefore, we propose to leave most of the pipelines *in situ* except for the short-exposed ends. This will result in minimal seabed disturbance, lower energy usage, and reduced risk to personnel and lower cost; all contribute to the proposed

Table 3.1.2: Outcomes of Comparative Assessment		
Pipeline or Group	**Recommended Option**	**Justification**
	deposited rock and disconnect them from the riser flanges. Completely remove otherwise exposed 10" pipespools (~122m) and exposed 2" methanol pipespools (~101.3m) once the associated stabilisation features have been removed. At the ends the deposited rock will be redistributed slightly to ensure that the pipeline ends remain buried; as a contingency measure it may be necessary to deposit up to 2Te of loose rock over each of the pipeline ends.	recommendation. Refer Appendix A.1 for pipeline burial profile. Monitoring to confirm the pipelines remain buried will be completed to a schedule agreed with OPRED.
PLU2840 & PL2841	Leave most of the pipelines *in situ*. On approach to the undeveloped Ensign subsea well only the umbilical pipeline is protected by the concrete mattresses; completely remove the section of umbilical pipeline as it exits the deposited rock to the end of the concrete mattresses (~114m long). At this point the 10" pipeline does not extend past the deposited rock. At Ensign sever the 10" pipeline where it emerges from the deposited rock and disconnect it from the riser flange. Disconnect the umbilical pipeline from the TUTU and cut umbilical where it enters the deposited rock. Completely remove otherwise exposed 10" pipespools (~81.2m) and exposed umbilical pipeline (~131m; this dimension excludes length between TUTU and bottom of J-tube ~50m long) once the associated stabilisation features have been removed. The short length of umbilical pipeline inside the J-tube and up to the TUTU will also be recovered as part of removal operations. At the ends the deposited rock will be redistributed slightly to ensure that the pipeline ends remain buried; as a contingency measure it may be necessary to deposit up to 2Te of loose rock over each of the pipeline ends.	Both pipelines are buried and stable for most of their length. Therefore, we propose to leave most of the pipelines *in situ* except for the short otherwise-exposed ends. This will result in minimal seabed disturbance, lower energy usage, and reduced risk to personnel and lower cost; all contribute to the proposed recommendation. Refer Appendix A.2 for pipeline burial profile. Monitoring to confirm the pipelines remain buried will be completed to a schedule agreed with OPRED.

3.2 Pipeline Stabilisation Features

All concrete mattresses will be recovered to shore unless noted otherwise.

Table 3.2.1: Pipeline Stabilisation Features

Stabilisation features	Number	Description	Disposal Route (if applicable)
Concrete mattresses (underneath pipeline crossings, underneath or on top of pipespools)	103	20x (6m x 3m x 0.3m) near undeveloped subsea well; 42x (6m x 3m x 0.3m) near Ensign; 4x (6m x 3m x 0.3m) at Weybourne to ACMI Cable Crossing; 2x (6m x 3m x 0.3m) at Carrack QA to Clipper PR Pipeline Crossing; 2x (6m x 3m x 0.15m) at Carrack QA to Clipper PR Pipeline Crossing; 33x (30x 6m x 3m x 0.3m & 3x 6m x 3m x 0.15m) near Audrey A (WD).	Recover all exposed concrete mattresses to shore for re-use, recycling or disposal. Leave the concrete mattresses buried under deposited rock at the pipeline and cable crossings *in situ*.
Concrete plinths	3	At Carrack QA to Clipper PR Pipeline Crossing; 1x Concrete Plinth Type 1 (1.m x 2.4m x 6m); 1x Concrete Plinth Type 2 (1m x 2.4m x 6m); 1x Concrete Plinth Type 3 (0.6m x 2.4m x 6m).	Leave the concrete plinths buried under deposited rock at the pipeline crossing *in situ*.
Grout bags, commonly placed adjacent to or over concrete mattresses.	358	25kg grout bags.	If found and exposed, recover to shore for re-use, recycling or disposal.
Deposited Rock	21,951Te	Interspersed along the pipeline routes.	Leave *in situ*

3.3 Waste Streams

Table 3.3.1: Waste Stream Management Method

Waste Stream	Removal and Disposal Method
Bulk liquids	The various pipelines have been flushed and left filled with seawater. The corrosion inhibitor and methanol has already been removed from the methanol line, and the umbilical pipeline has never been used. Any residual fluids from within these pipelines will be released to marine environment under permit prior to removal to shore. Further cleaning and decontamination will take place onshore prior to re-use or recycling.
Marine growth	Where necessary and practicable, to allow access some marine growth will be removed offshore. The remainder will be brought to shore and disposed of according to guidelines and company policies.
NORM	Tests for NORM will be undertaken offshore by the Radiation Protection Supervisor and any NORM encountered will be dealt with and disposed of in accordance with guidelines and company policies and under appropriate permit.
Asbestos	No asbestos is expected, but if small quantities are found they will be dealt with and disposed of in accordance with guidelines and company policies.
Other hazardous wastes	Other hazardous waste will be recovered to shore and disposed of according to guidelines and company policies and under appropriate permit.

Table 3.3.1: Waste Stream Management Method	
Waste Stream	**Removal and Disposal Method**
Onshore Dismantling sites	Appropriate licensed sites will be selected. The dismantling site must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver re-use and recycling options.

Table 3.3.2: Inventory Disposition			
Inventory	**Total Inventory Tonnage**	**Planned tonnage to shore**	**Planned tonnage decommissioned *in situ***
Pipelines	4,141	860	3,281

All recovered material will be transported onshore for re-use, recycling or disposal. It is not possible to predict the market for reusable materials with any confidence, so the figures presented here are aspirational.

Table 3.3.3: Re-use, Recycle & Disposal Aspirations for Recovered Material			
Inventory	**Re-use**	**Recycle**	**Disposal**
Pipelines	<5%	>95%	<5%

Refer to [2] for further details.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Potential Environmental Impacts and their Management

Environmental Appraisal Summary:

There will be some planned and unplanned environmental impacts arising from decommissioning of the Ensign infrastructure (48/14a). Long-term environmental impacts from the decommissioning operations are expected to be low. Incremental cumulative impacts and trans-boundary effects associated with the planned decommissioning operations are also expected to be low.

4.1.1 Overview

Table 4.1.1: Environmental Impact Management [2]

Activity	Main Impacts	Management
Decommissioning pipelines (offshore)	Decommissioning of the pipelines *in situ* will require activities such as local water-jetting of sediments, cutting and temporary placement of equipment or components. Any exposed pipeline ends will be cut back at the buried location. Removed components will be lifted from the seabed by ROVSV or CSV. Principal impacts will include • disturbance of the seabed from cutting and removal activities; • noise from removal and cutting activities and operational support vessels; • operational discharges from vessels; • production of waste material. These effects are expected to be short-term and localised. The seabed and associated ecosystem is expected to recover rapidly once activities cease.	Activities will be planned to be executed as efficiently as possible, minimising disturbance of the seabed to reduce the potential for impact on the area around the pipelines. Consideration will be given where equipment and/or components should be temporarily placed on the seabed prior to removal, seeking to minimise the requirement wherever possible. Vessels will be managed to minimise the durations required and associated discharges. In addition, on board operational practices will address fuel efficiency, noise management and minimise waste.
Decommissioning stabilisation features	The Decommissioning Programme includes the removal of existing concrete mattresses and any	Activities will be planned to be executed as efficiently as possible, minimising disturbance of the seabed to reduce the potential for

Table 4.1.1: Environmental Impact Management [2]		
Activity	**Main Impacts**	**Management**
	exposed grout bags if found. Mattresses and grout bags will be lifted from the seabed by ROVSV or CSV. Impacts will include disturbance of the seabed and noise from vessels. These effects are expected to be short-term and localised. The seabed and associated ecosystem is expected to recover rapidly once activities cease.	impact. Consideration will be given to how the work is to be conducted seeking to minimise the requirement wherever possible. Vessels will be managed to minimise the durations required and associated discharges. In addition, on board operational practices will address fuel efficiency, noise management and minimise waste, in accordance with the marine assurance standard.

5. INTERESTED PARTY CONSULTATIONS

5.1 Informal Consultations

Table 5.1.1: Summary of Stakeholder Comments		
Who	**Comment**	**Response**
INFORMAL CONSULTATIONS		
JNCC		
NFFO	The decommissioning proposals herein were presented to NFFO on 22 Oct 2018.	The NFFO had no adverse comment to make concerning the decommissioning proposals.
SFF	The decommissioning proposals herein were presented to SFF on 28 Jan 2018.	The SFF had no adverse comment to make concerning the decommissioning proposals.
STATUTORY CONSULTATIONS		
NFFO		
SFF		
NIFPO		
GMG		
Public		

6. PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Spirit Energy project management team will manage the operations of competent contractors selected for all decommissioning activities. The team will ensure the decommissioning is executed safely, in accordance with legislation and Spirit Energy Health and Safety principles. Changes to the Decommissioning Programme will be discussed with OPRED with any necessary approvals sought.

6.2 Post-Decommissioning Debris Clearance and Verification

6.2.1 Offshore

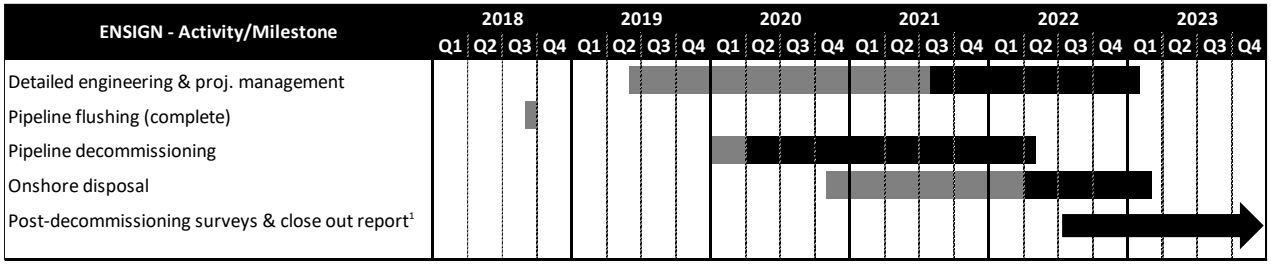
The Ensign installation sites including the 500m safety zones and along a 100m wide corridor along the all pipelines will be subject to clean seabed verification surveys when decommissioning activities have concluded. Due to the sensitive nature of the North Norfolk Sandbanks and surrounding area, we would propose to work with OPRED and NFFO to use a non-invasive and evidence-based approach to establish an acceptable clear seabed for the pipelines outside of the existing 500m safety zone.

Any seabed oil and gas debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the jacket and pipeline area and this will be supported by a Certificate of Clearance. This will be included in the Close Out Report and sent to the Seabed Data Centre (Offshore Installations) at the Hydrographic Office.

6.3 Schedule

A proposed schedule is provided in Figure 6.3.1. The activities are subject to the acceptance of the Decommissioning Programme presented in this document and any unavoidable constraints (e.g. vessel availability) that may be encountered while executing the decommissioning activities. Therefore, activity schedule windows have been included to account for this uncertainty.

The commencement of offshore decommissioning activities will depend on commercial agreements and commitments.



Notes / Key

Earliest potential activity

Activity window to allow commercial flexibility associated with decommissioning activities

1. Post decommissioning surveys and close out reports will be prepared on completion of decommissioning activities

Figure 6.3.1: Gantt Chart of Project Plan

6.4 Costs

Decommissioning costs will be provided separately to OPRED and OGA.

6.5 Close Out

A close out report will be submitted within 12 months of completion of the offshore work, including debris clearance and post-decommissioning surveys, as required in OPRED guidance notes. The report will explain any variance from the Decommissioning Programme.

6.6 Post-Decommissioning Liability, Monitoring and Evaluation

After decommissioning activities have been concluded, pipeline status surveys and environmental surveys will be completed with the findings being sent to OPRED in the Close Out report. The frequency and scope of future surveys will be agreed with OPRED and supported by a risk assessment. Residual liability will remain with the Section 29 holders identified in Table 1.4.2. Unless agreed otherwise in advance with OPRED, Spirit Energy will remain the focal point for such matters, such as any change in ownership, for example.

The requirement for legacy and liability management will be described in more detail in the Close Out report.

7. SUPPORTING DOCUMENTS

[1] Fugro (2019) Pre-Decommissioning Environmental & Debris Survey, Ensign, 182070V1.1;

[2] Spirit Energy (2019) Ensign Decommissioning Environmental Appraisal, SPT-DCM-SNS0104-REP-0002;

[3] Spirit Energy (2019) Ensign Decommissioning Comparative Assessment for Pipelines, SPT-DCM-SNS-104-REP-0003;

[4] Spirit Energy (2019) Ensign Installation Decommissioning Programme, SPT-DCM-SNS0104-REP-0005.

APPENDIX A BURIAL PROFILES

Appendix A.1 PL2838 & PL2839 Burial Profile

PL2838 is the 10" gas export pipeline ~22.3km long overall, and it is piggybacked with **PL2839** (~22.2km long). That is, **PL2839** is connected to **PL2838** using clamps. **PL2838** is routed from the Ensign platform to Audrey A (WD) and from there gas used to be comingled with Gas from Audrey A (WD) and transported via **PL496** to LOGGS Production Platform. At ~KP3.5 the pipelines cross over the 20" Carrack QA to Clipper PR gas export pipeline and 4" piggybacked Clipper PR to Carrack QA MEG pipeline. At ~KP11.8 the pipelines cross over the Weybourne to ACMI Master cable. Both pipelines exhibit a good depth of burial and cover along their original trenched and buried lengths.

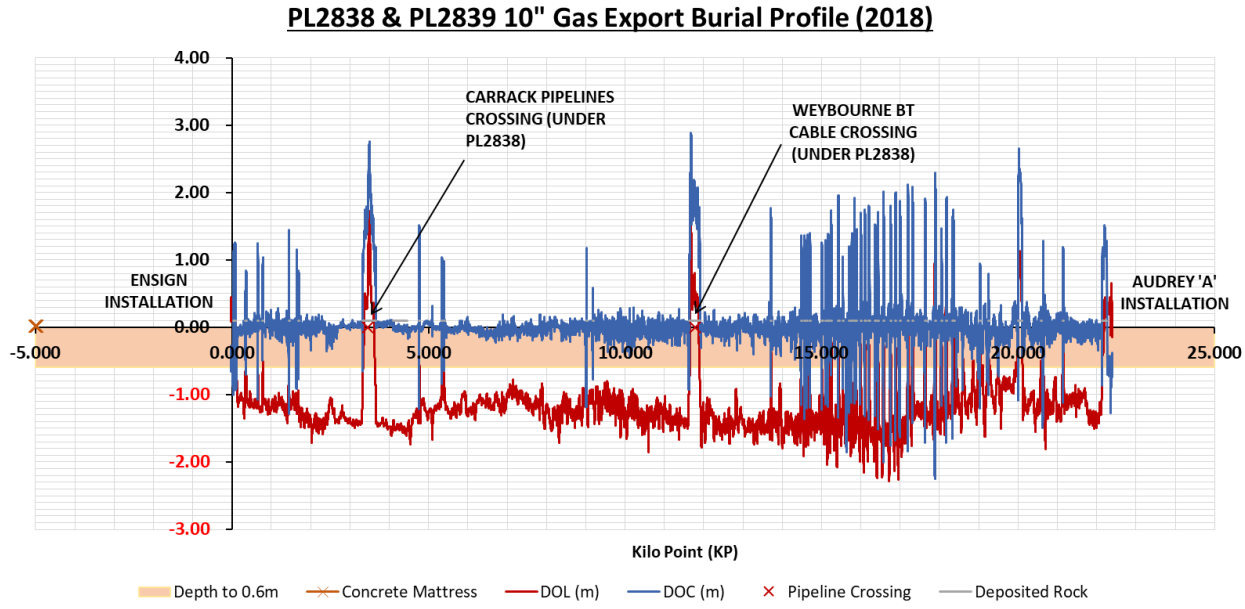


Figure A.1.1: PL2838 (& PL2839) Burial Profile

Appendix A.2 PLU2840 & PL2841 Burial Profile

PL2841 is the 10" gas export pipeline ~2.1km long overall, and it is piggybacked by **PLU2840**, an umbilical pipeline (~2.2km long). That is, **PLU2840** is connected to **PL2841** using clamps. **PLU2840** is routed to the end of the concrete mattresses on approach to the suspended subsea well, whereas **PL2840** terminates at the end of the deposited rock. Both pipelines exhibit a good depth of burial and cover along their original trenched and buried lengths.

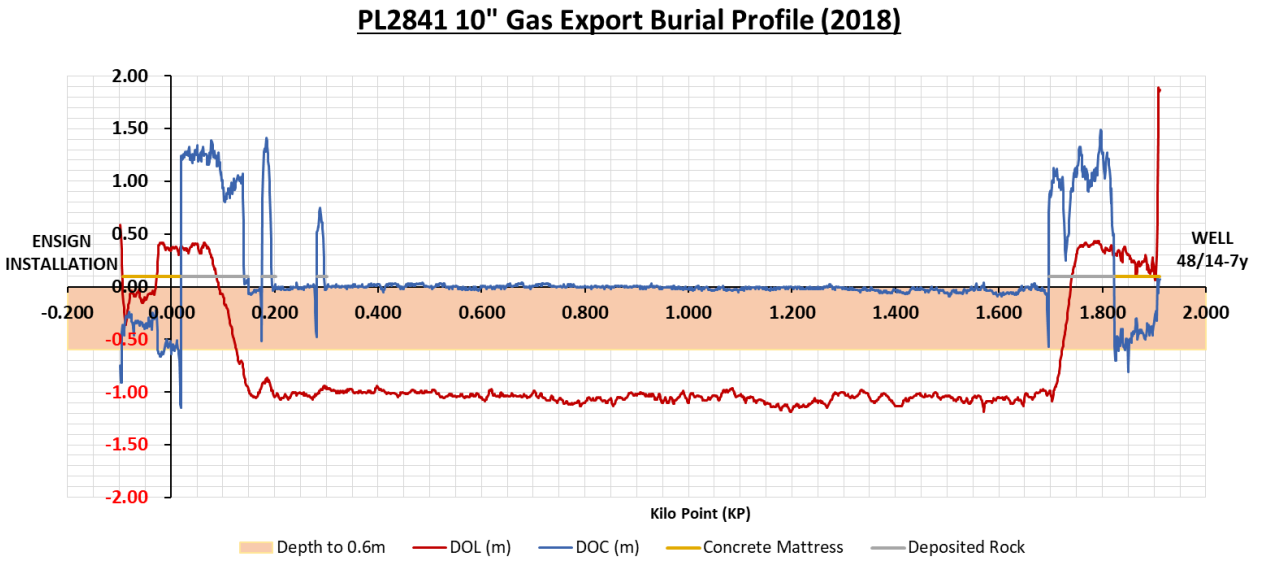


Figure A.2.1: PL2841 Burial Profile

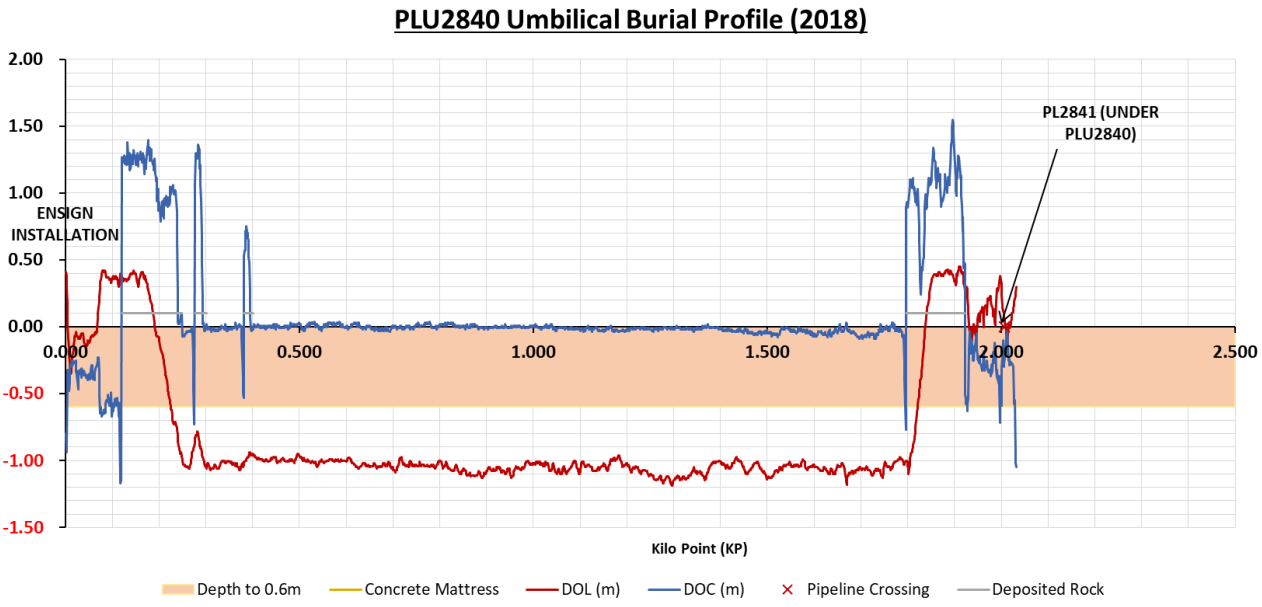


Figure A.2.2: PLU2840 Burial Profile

APPENDIX B PUBLIC NOTICE & CONSULTEE CORRESPONDENCE

Appendix B.1 Public Notices