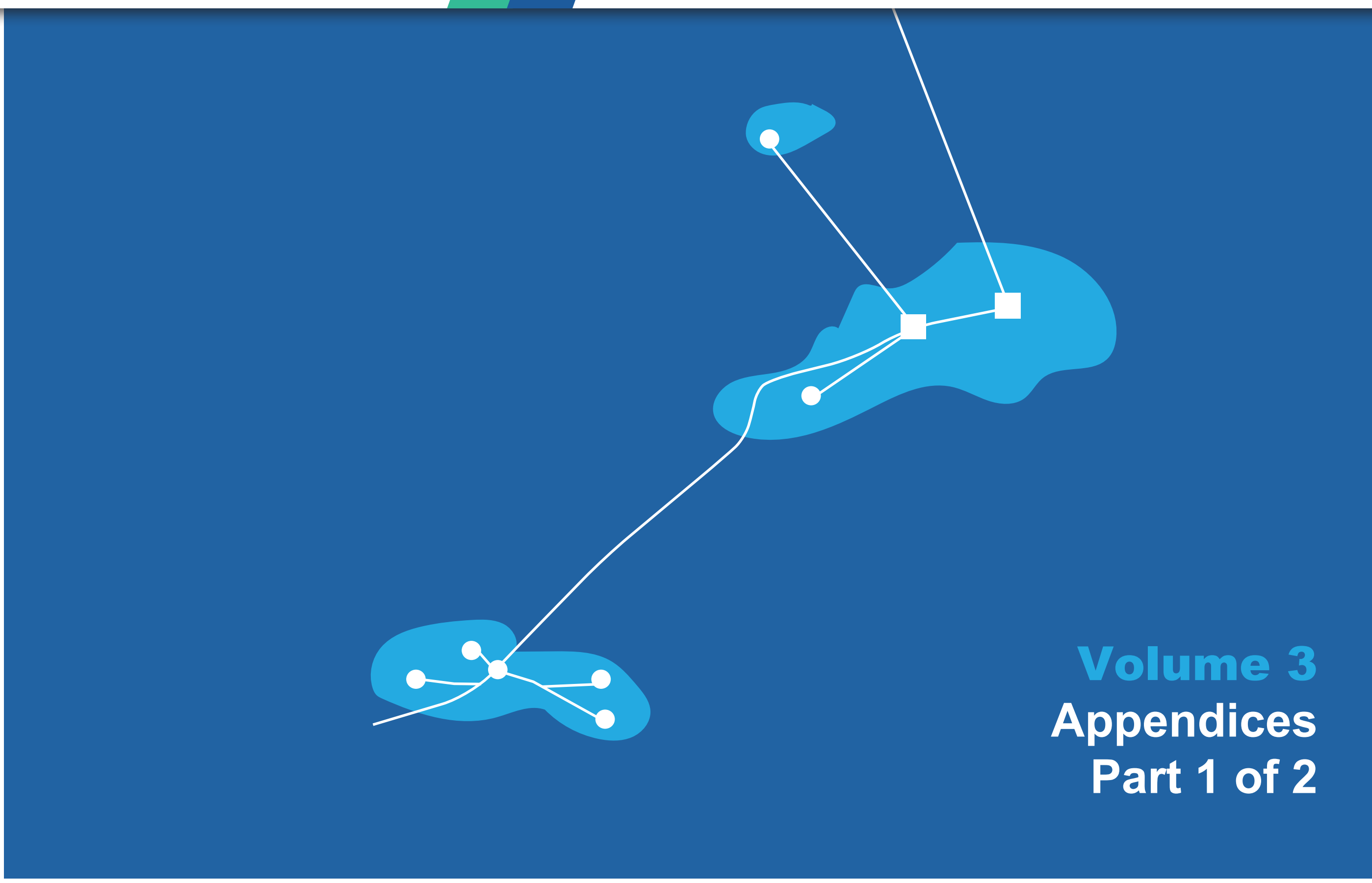
Kinsale Energy

Kinsale Area Decommissioning Project

Environmental Impact Assessment Report



Volume 3
Appendices
Part 1 of 2

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Hartley Anderson — For Environmental Management & Science

ARUP

Table of Contents

Appendices

Kinsale Area Decommissioning Project

Appendix A

International and European Legislation

A1.1 Relevant International Conventions and European Legislation

Table A1 below summarises the key international conventions and European legislation relevant to the KADP. **Section A1.2** and **Section A1.3** provide further detail.

Table A1: Key International legislation relevant to the KADP

Relevant Legislation	Consents / requirements for Decommissioning
OSPAR Convention (1992)	The KADP shall take all possible steps to prevent and eliminate pollution and apply the necessary measures to protect the maritime area against the adverse effects of human activities during works. Under paragraph 2 of the Decisions 98/3, the dumping, and leaving wholly or partly in place, of disused offshore installations is prohibited within the OSPAR maritime area – Kinsale Area platforms and subsea structures to be removed as part of the KADP.
MARPOL Convention, International Maritime Organisation (1978)	Ireland ratified the Convention, the requirements of which are transposed in Sea Pollution Act, 1991 (No. 27 of 1991). The Convention will apply to all shipping operations associated with the KADP ensure the prevention of pollution of the marine environment.
UN Convention on the Law of the Sea (1982)	The Convention will apply to the granting by the competent authority of an authorisation for the KADP.
Basel Convention	Any waste generated by the KADP, which has to be exported from Ireland, will be subject to the Convention.
Espoo Convention	Assessment required of the potential for the proposed activity to result in significant transboundary effects.
OECD Decision on the Control of Transboundary Movements of Waste	Any waste generated by the KADP, which will be exported from Ireland, will be subject to the OECD Decision.
Ballast Water Convention	All vessels associated with the KADP are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships vessels also have to carry a ballast water record book and an international ballast water management certificate
Water Framework Directive (2000/60/EC)	The Water Framework Directive, EC (2000), sets the objectives for water protection for the future and applies to inland surface waters, groundwater, transitional waters and coastal waters. Most of the KADP activities will be located outside 'coastal waters', as defined in the Directive. The Directive requirements will apply only to near shore and onshore decommissioning activities.
Marine Strategy Framework Directive (2008/56/EC)	The Directive aims to achieve good environmental status for the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. Most of the KADP activities will be located within the marine area, to which the Directive applies. The Directive requirements will apply to KADP activities.
Waste Framework Directive (2008/98/EC)	Waste activities arising from the KADP must comply with the Directive.

Relevant Legislation	Consents / requirements for Decommissioning
Commission Decision 2000/532/EC on the list of wastes, as amended by Commission Decision 2014/955/EU	Waste, arising from the KADP, must be classified in accordance with the Decision.
Regulation (EC) No 1013/2006 on Shipments of Waste	The management of waste, arising from the KADP, must comply with the requirements of the Regulation.
Aarhus Convention (Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters) (1998)	The relevant requirements of the Aarhus Convention, in relation to public participation in decision making on environmental matters, have been incorporated into the EIA Directive 2011/92/EU.

A1.2 Relevant International Conventions

MARPOL Convention

MARPOL Convention, International Maritime Organisation (1978), is the main international convention covering prevention of pollution of the marine environment. It was developed in an effort to minimise pollution of the oceans and seas and to preserve the marine environment. Its aim is to eliminate planned discharge of pollutants to the marine environment and to minimise accidental spillage of deleterious substances.

The MARPOL Protocol was developed and adopted in 1978 in response to a number of tanker accidents in 1976 and 1977. As the 1973 Convention had not yet entered into force, the 1978 Protocol absorbed the parent Convention. It entered into force in 1983 and was updated by amendments over the years. In 1997, a new Protocol was adopted to amend the Convention and a new Annex VI added.

The Convention includes regulations aimed at preventing and minimising pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes.

Ireland ratified the Convention, the requirements of which are transposed in Sea Pollution Act, 1991 (No. 27 of 1991).

The Convention will apply to all shipping operations associated with the KADP.

UN Convention on the Law of the Sea (1982)

The UN Convention on the Law of the Sea (UNCLOS), UN (1982), defines the exclusive economic zone (not greater than 200 nautical miles from the low water mark) where the rights and jurisdiction of the coastal State are governed by the Convention. Within the exclusive economic zone, the convention gives a State the sovereign right to the exploitation of resources and exclusive jurisdiction over authorisation and regulation of any installations or structures (refer to Article 56, paragraph 1(a) and 1(b) and Article 60, paragraph 1 and 2).

Article 193 of UNCLOS further references the granting of exclusive rights to Coastal States to explore and exploit the natural (non-living) resources and states the following with regard to environmental protection:

"States have the sovereign right to exploit their natural resources pursuant to their environmental policies and in accordance with their duty to protect and preserve the marine environment".

With regard to disused installations or structures, Article 60, paragraph 3, states the following:

"Any installations or structures which are abandoned or disused shall be removed to ensure safety of navigation, taking into account any generally accepted international standards established in this regard by the competent international organization [such as the International Maritime Organisation (IMO)]*. Such removal shall also have due regard to fishing, the protection of the marine environment and the rights and duties of other States. Appropriate publicity shall be given to the depth, position and dimensions of any installations or structures not entirely removed".*

The ambiguity between the requirement to remove abandoned or disused installations and reference to publicity for structures not entirely removed has led to debate and different interpretations of the decommissioning requirements of UNCLOS.

UNCLOS also makes provision for the protection and preservation of the marine environment (Part XII, Articles 192 to 237 inclusive).

Coastal states are obliged to adopt national laws and take measures to prevent, reduce and control pollution of the marine environment, arising from, or in connection with, the exploration or exploitation of the natural resources of the seabed and subsoil, and from dumping within their jurisdiction.

A number of other articles are relevant to the proposed KADP, including the following:

- Article 194 – Measures to Prevent, Reduce and Control Pollution of the Marine Environment.
- Article 206 – Assessment of Potential Effects of Activities.
- Article 208 – Pollution from seabed activities subject to national jurisdiction
- Article 210 – Pollution by Dumping.
- Article 214 – Enforcement with respect to pollution from seabed activities.

Ireland and the European Union have ratified the Convention.

The Convention will apply to the granting by the competent authority of an authorisation for the KADP.

Basel Convention (1989)

The Basel Convention, UN (1989), is a comprehensive global environmental agreement on the management of hazardous and other wastes. The Convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movement and disposal of hazardous and other wastes. The Basel Convention was adopted in 1989 and entered into force in 1992. Ireland has ratified the Convention.

The Convention regulates the transboundary movements of hazardous and other wastes by applying the “Prior Informed Consent” procedure (shipments made without consent are illegal). The Convention obliges its Parties to ensure that hazardous and other wastes are managed and disposed of in an environmentally sound manner. To this end, Parties are expected to minimise the quantities that are moved across borders, to treat and dispose of wastes as close as possible to their place of generation, and to prevent or minimise the generation of wastes at source. Strong controls have to be applied from the moment of generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal.

In 1995, an amendment to the Basel Convention (“the Ban Amendment”) was adopted. The amendment provided for the prohibition of:

- All transboundary movements to States, which are not included in Annex VII, of hazardous wastes covered by the Convention that are intended for final disposal, and
- All transboundary movements to States, which are not included in Annex VII, of hazardous wastes covered by paragraph 1 (a) of Article 1 of the Convention that are destined for reuse, recycling or recovery operations.

In 1998, Annexes VIII and IX were added to provide further elaboration as to the wastes regulated by the Convention as listed in Annexes I and III. Since then, various changes to these Annexes VIII and IX have also been adopted.

The Basel Convention has been implemented in European Union and Irish legislation.

Any waste generated by the KADP, which has to be exported from Ireland, will be subject to the Convention.

Espoo Convention (Convention on Environmental impact Assessment in a Transboundary Context) (1991)

Ireland is a Contracting Party to the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo 1991) and thus an assessment is needed of the potential for the proposed activity to result in significant transboundary effects. The relevant requirements of the Espoo Convention, in relation to the environmental assessment of transboundary effects, have been incorporated into the EIA Directive 2011/92/EU.

OECD Decision on the Control of Transboundary Movements of Waste

Since March 1992, transboundary movements of wastes destined for recovery operations between member countries of the Organisation for Economic Co-operation and Development (OECD) have been supervised and controlled according to Decision C (92)39 on the Control of Transfrontier Movements of Wastes, OECD (1992). The 1992 decision was revised in 2001 and amended in 2002, 2004, 2005 and 2008, OECD (2001). The OECD Decision provided a framework for the OECD member countries to control transboundary movements of recoverable wastes within the OECD area in an environmentally sound and economically efficient manner. Compared to the Basel Convention, it gave a simplified and more explicit means of controlling such movements of wastes.

It also facilitated transboundary movements of recoverable wastes between OECD member countries in the case where an OECD member country is not a Party to the Basel Convention.

The OECD Decision includes lists of wastes, which have been harmonised to a large extent with the lists of wastes of the Basel Convention.

Ireland is a member of the OECD. OECD Council Decisions are legally binding for member countries.

Any waste generated by the KADP, which will be exported from Ireland, will be subject to the OECD Decision.

OSPAR Convention (1992)

The OSPAR Convention, OSPAR (1992), is the current legislative instrument regulating international cooperation on environmental protection in the North-East Atlantic. It replaces the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution. Ireland has ratified the Convention.

The Convention applies to the internal waters and the territorial seas of the Contracting Parties, the sea beyond and adjacent to the territorial sea under the jurisdiction of the coastal State to the extent recognised by international law, and to the high seas, including the bed of all those waters and its subsoil, situated within specified limits of the Atlantic and Arctic Oceans.

The convention requires all parties to take all possible steps to prevent and eliminate pollution and apply the necessary measures to protect the maritime area against the adverse effects of human activities so as to safeguard human health and to conserve maritime ecosystems and, when practicable, restore marine areas which have been adversely affected. Parties are required to, individually and jointly, adopt programmes and measures and to harmonise policies and strategies.

In addition, in order to meet their obligations, Article 2, paragraph 2(a) and 2(b) states that Parties to the Convention must apply the following two principles:

- *“the precautionary principle, by virtue of which preventive measures are to be taken when there are reasonable grounds for concern that substances or energy introduced, directly or indirectly, into the marine environment may bring about hazards to human health, harm living resources and marine ecosystems, damage amenities or interfere with other legitimate uses of the sea, even when there is no conclusive evidence of a causal relationship between the inputs and the effects;*
- *the polluter pays principle, by virtue of which the costs of pollution prevention, control and reduction measures are to be borne by the polluter.”*

Annex II of the convention, which specifically addresses the prevention and elimination of pollution by dumping or incineration, states that *“No disused offshore installation or disused offshore pipeline shall be dumped and no disused offshore installation shall be left wholly or partly in place in the maritime area without a permit issued by the competent authority”* (Article 5, paragraph 1). The Annex further states that such permits shall not be issued if substances, which are likely to represent a hazard, are present (paragraph 2).

Article 8 of Annex II reinforces this, stating that “*No placement of a disused offshore installation or a disused offshore pipeline in the maritime area for a purpose other than that for which it was originally designed or constructed shall take place without authorisation or regulation by the competent authority of the relevant Contracting Party*”.

For the purposes of the convention ‘dumping’ and ‘wastes or other matter’ are defined as follows:

Article 1 – Definitions

“(f) "Dumping" means

(i) any deliberate disposal in the maritime area of wastes or other matter

(1) from vessels or aircraft;

(2) from offshore installations;

(ii) any deliberate disposal in the maritime area of

(1) vessels or aircraft;

(2) offshore installations and offshore pipelines.”

“(g) "Dumping" does not include:

(i) the disposal in accordance with the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, or other applicable international law, of wastes or other matter incidental to, or derived from, the normal operations of vessels or aircraft or offshore installations other than wastes or other matter transported by or to vessels or aircraft or offshore installations for the purpose of disposal of such wastes or other matter or derived from the treatment of such wastes or other matter on such vessels or aircraft or offshore installations;

(ii) placement of matter for a purpose other than the mere disposal thereof, provided that, if the placement is for a purpose other than that for which the matter was originally designed or constructed, it is in accordance with the relevant provisions of the Convention; and

(iii) for the purposes of Annex III, the leaving wholly or partly in place of a disused offshore installation or disused offshore pipeline, provided that any such operation takes place in accordance with any relevant provision of the Convention and with other relevant international law.”

“(o) "Wastes or other matter" does not include:

(i) human remains;

(ii) offshore installations;

(iii) offshore pipelines;

(iv) unprocessed fish and fish offal discarded from fishing vessels.”

OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations

Decisions 98/3, OSPAR (1998), amended the Convention in 1998. Under paragraph 2 of the Decisions 98/3, the dumping, and leaving wholly or partly in place, of disused offshore installations is prohibited within the OSPAR maritime area. However, paragraph 3 of the Decision provides a derogation to the paragraph 2 prohibition, providing that following an assessment, the competent authority of the relevant Contracting Party may give permission to leave disused installations or parts of disused installations in place.

The categories where derogations may be considered are outlined in Annex 1 to the Decision, which states the following:

“The following categories of disused offshore installations, excluding their topsides, are identified for the purpose of paragraph 3:

a) *steel installations weighing more than ten thousand tonnes in air* [and placed in the maritime area before 9th February 1999]*;*

b) *gravity based concrete installations;*

c) *floating concrete installations;*

d) *any concrete anchor-base which results, or is likely to result, in interference with other legitimate uses of the sea.”*

A disused offshore installation is defined as an offshore installation, which is neither *"(a) serving the purpose of offshore activities for which it was originally placed within the maritime area, nor (b) serving another legitimate purpose in the maritime area authorised or regulated by the competent authority of the relevant Contracting Party*".

The definition of disused offshore installation does not include "*(c) any part of an offshore installation which is located below the surface of the sea-bed, or (d) any concrete anchor-base associated with a floating installation which does not, and is not likely to, result in interference with other legitimate uses of the sea*." OSPAR Decision 98/3 also does not refer to subsea pipelines, umbilicals and their protective materials and therefore are not covered by Decision 98/3.

Decision 98/3 is reviewed every 5 years. The most recent review, in 2013, made no change to the information outlined above.

The Kinsale Area platform jackets, Alpha and Bravo, each weigh less than 10,000 tonnes. Consequently, the derogation will not be applicable.

International Convention for the Control and Management of Ships' Ballast Water and Sediments

The Ballast Water Management Convention, adopted in 2004 and entered into force in September 2017, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Under the Convention, all ships in international traffic are required to manage their ballast water and sediments to a certain standard, according to a ship-specific ballast water management plan. All ships will also have to carry a ballast water record book and an international ballast water management certificate.

A1.3 Relevant European Legislation

Water Framework Directive (2000/60/EC)

The Water Framework Directive, EC (2000), sets the objectives for water protection for the future and applies to inland surface waters, groundwater, transitional waters and coastal waters. Coastal waters are defined in the Directive as *'surface water on the landward side of a line, every point of which is at a distance of one nautical mile on the seaward side from the nearest point of the baseline from which the breadth of territorial waters is measured, extending where appropriate up to the outer limit of transitional waters'*.

The aim of the directive is to prevent and reduce pollution, promote sustainable water use, protect the aquatic environment, improve the status of aquatic ecosystems and mitigate the effects of floods and droughts. The directive addresses the management of water quality and water resources and affects conservation, fisheries, flood defence, development planning and environmental monitoring. It requires Member States to control all impacts, including physical, polluting or otherwise, on our water resource.

The Directive has been transposed in Irish legislation through a number of measures, including the European Communities (Water Policy) Regulations, 2003 (S.I. No. 722 of 2003).

Most of the KADP activities will be located outside 'coastal waters', as defined in the Directive. The Directive requirements will apply only to near shore and onshore decommissioning activities.

Marine Strategy Framework Directive (2008/56/EC)

The 'Marine Strategy Framework Directive' was adopted in 2008, EC (2008a).

The Directive aims to achieve good environmental status for the EU's marine waters by 2020 and to protect the resource base upon which marine-related economic and social activities depend. It is the first EU legislative instrument related to the protection of marine biodiversity, as it contains the explicit regulatory objective that "biodiversity is maintained by 2020", as the cornerstone for achieving good environmental status.

In order to achieve its goal, the Directive establishes European marine regions and sub-regions on the basis of geographical and environmental criteria.

In order to achieve good environmental status by 2020, each Member State is required to develop a strategy for its marine waters, which will be updated every six years.

The Directive applies to water on the seaward side of the baseline to the outmost reach of the area where a Member State has rights, under UNCLOS i.e. 200 nautical miles. The geographical scope of the Marine Spatial Framework Directive overlaps with the Water Framework Directive by one nautical mile.

The Marine Strategy Framework Directive has been transposed into Irish legislation by a number of measures, including the European Communities (Marine Strategy Framework) Regulations (S.I. No. 249 of 2011).

Most of the KADP activities will be located within the marine area, to which the Directive applies. The Directive requirements will apply to KADP activities.

Waste Framework Directive (2008/98/EC)

Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (known as the Waste Framework Directive) has been effective since 12 December 2010, EC (2008b). The new Directive repealed the codified Directive 2006/12/EC on Waste, the Hazardous Waste Directive (91/689/EEC) and the Waste Oils Directive (75/439/EEC).

The Directive seeks to implement the provisions of the Basel Convention, sets the basic concepts and definitions related to waste management and lays down the following waste management principles:

- The "polluter pays principle" which requires costs of waste management to be borne by the original waste producer or by current or previous waste holders; and
- The "waste hierarchy" which is a five-step hierarchy of waste management options which must be applied by Member States when developing their national waste policies, as follows:
  - Waste prevention (preferred option);
  - Re-use;
  - Recycling;
  - Recovery (including energy recovery); and
  - Safe disposal, as a last resort.

The Directive defines 'waste' as *"any substance or object which the holder discards or intends or is required to discard"* (Article 3 (1)).

The Directive also addresses when waste ceases to be waste and becomes a secondary raw material and how to distinguish between waste and 'by-products' and includes recycling and recovery targets.

Article 6 of the Directive provides that certain specified waste can cease to be waste when it has undergone a recovery operation and complies with certain criteria. Regulation No 333/2001 establishes criteria determining when iron, steel and aluminium scrap, including aluminium alloy scrap, ceases to be waste.

Article 13 requires Member States to take the necessary measures to ensure that waste management is carried out without endangering human health, without harming the environment.

Article 23 specifies that Member States shall require any establishment or undertaking intending to carry out waste treatment to obtain a permit from the competent authority. Treatment is defined in Article 3 (14) as *"recovery or disposal operations, including preparation prior to recovery or disposal".*

The provisions of the Waste Framework Directive have been transposed into Irish Law through the Waste Management Act, 1996 (No. 10 of 1996) as amended and associated regulations.

Waste activities arising from the KADP must comply with the Directive.

Commission Decision 2000/532/EC on the list of wastes, as amended by Commission Decision 2014/955/EU

Commission Decision 2000/532/EC established a list of wastes, in support of the implementation of the Waste Framework Directive. Decision 2000/532/EC has been amended several times. The most recent amendment was by Commission Decision 2014/955/EU, EU (2014b). This Decision establishes the classification system for wastes, including a distinction between hazardous and non-hazardous wastes.

Waste, arising from the KADP, must be classified in accordance with the Decision.

Regulation (EC) No 1013/2006 on Shipments of Waste

Regulation (EC) No 1013/2006 of the European Parliament and of the Council of 14 June 2006 on shipments of waste (as amended) specifies conditions under which waste can be shipped between/through Member States and other countries. Its aim is to strengthen and simplify procedures for controlling waste shipments in order to improve environmental protection and reduce the risk of uncontrolled shipments. The Regulation addresses all types of wastes, with the exception of radioactive waste or waste types subject to separate control regimes. It controls procedures for two classes of waste, as follows:

- The 'Green listed' procedure applies to non-hazardous waste intended for recovery; and
- The 'Amber list' notification procedure applies to shipments of all waste intended for disposal and hazardous waste intended for recovery.

This Regulation is transposed into Irish legislation by the Waste Management (Shipments of Waste) Regulations, 2007 (S.I. No. 419 of 2007).

The management of waste, arising from the KADP, must comply with the requirements of the Regulation.

Aarhus Convention (Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters) (1998)

The Public Participation Directive (Directive 2003/35/EC) Directive implements the 1998 Aarhus Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters. The Convention and Directive are intended to improve public access to environmental information and greater participation in the environmental decision-making process. The relevant requirements of the Aarhus Convention, in relation to public participation in decision making on environmental matters, have been incorporated into the EIA Directive 2011/92/EU.

Kinsale Area Decommissioning Project

Appendix B1

Seabed Features & Habitats

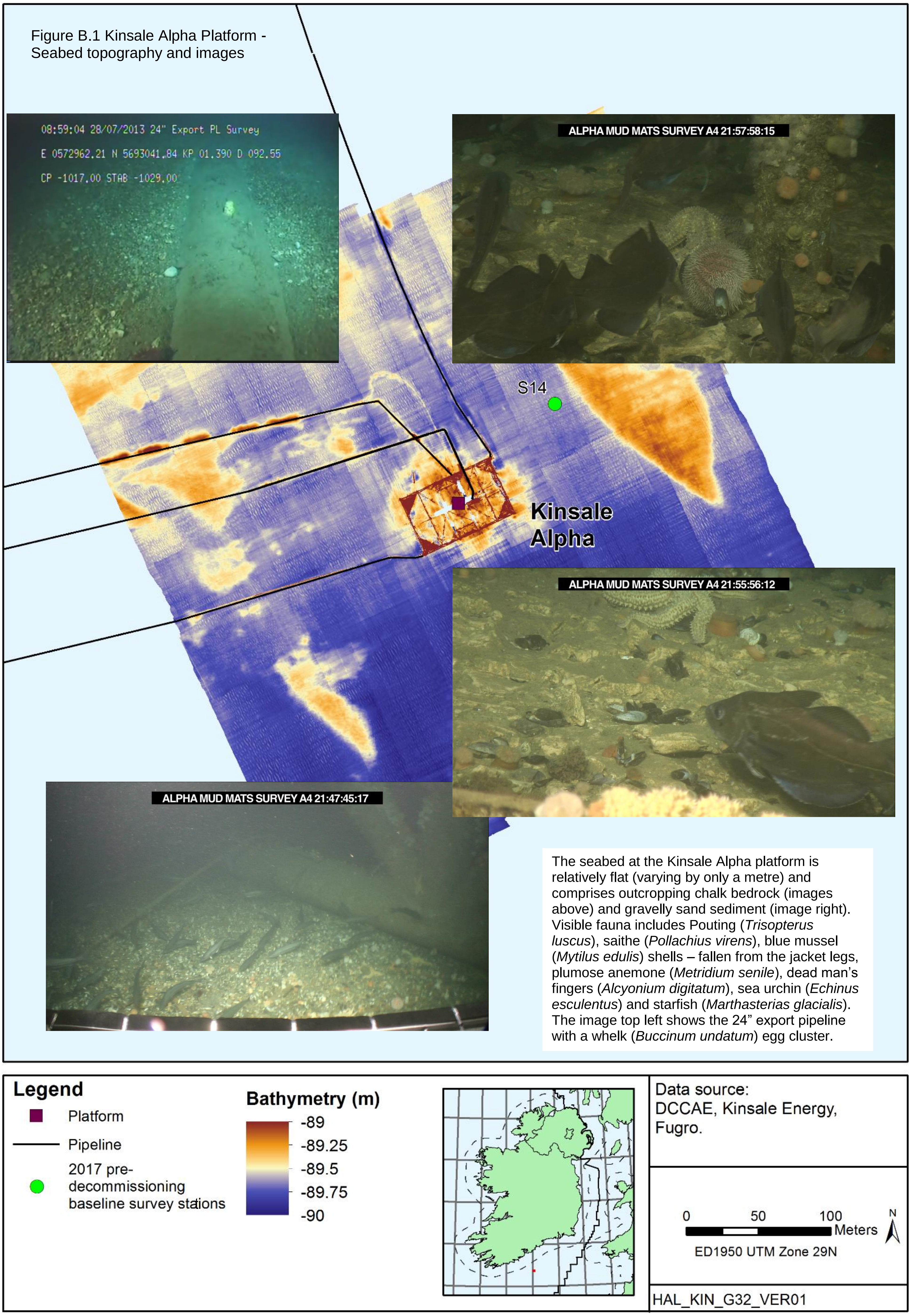
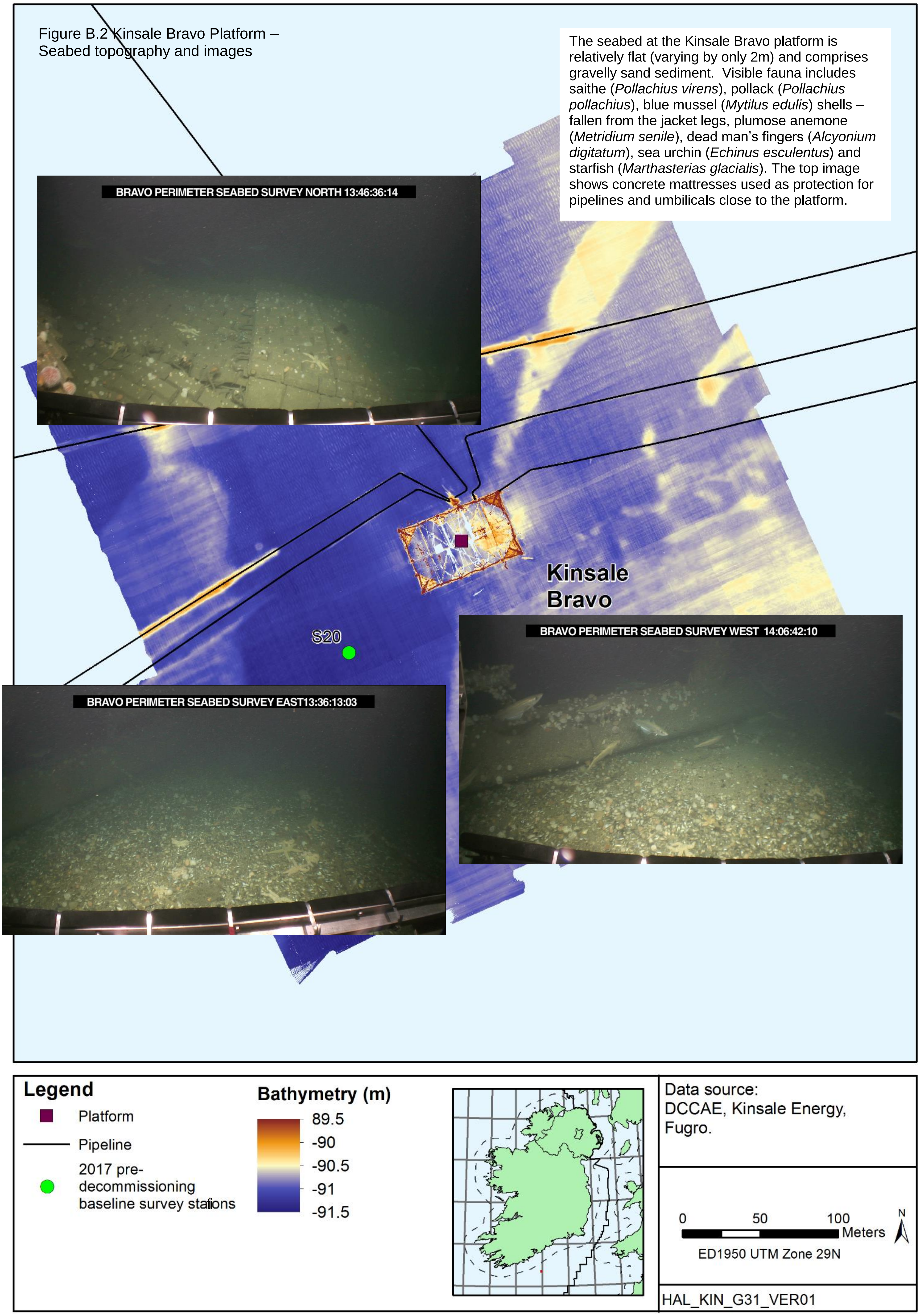


Figure B.1 Kinsale Alpha Platform -
Seabed topography and images
08:59:04 28/07/2013 24" Export PL Survey
E 0572962.21 N 5693041.84 KP 01.390 D 092.55
CP -1017.00 STAB -1029.00
ALPHA MUD MATS SURVEY A4 21:57:58:15
S14
Kinsale
Alpha
ALPHA MUD MATS SURVEY A4 21:55:56:12
ALPHA MUD MATS SURVEY A4 21:47:45:17
The seabed at the Kinsale Alpha platform is relatively flat (varying by only a metre) and comprises outcropping chalk bedrock (images above) and gravelly sand sediment (image right). Visible fauna includes Pouting (*Trisopterus luscus*), saithe (*Pollachius virens*), blue mussel (*Mytilus edulis*) shells – fallen from the jacket legs, plumose anemone (*Metridium senile*), dead man's fingers (*Alcyonium digitatum*), sea urchin (*Echinus esculentus*) and starfish (*Marthasterias glacialis*). The image top left shows the 24" export pipeline with a whelk (*Buccinum undatum*) egg cluster.
Legend
Platform
Pipeline
2017 pre-decommissioning baseline survey stations
Bathymetry (m)
-89
-89.25
-89.5
-89.75
-90
Data source:
DCCAE, Kinsale Energy, Fugro.
0
50
100
Meters
N
ED1950 UTM Zone 29N
HAL_KIN_G32_VER01

Figure B.2 Kinsale Bravo Platform – Seabed topography and images



The seabed at the Kinsale Bravo platform is relatively flat (varying by only 2m) and comprises gravelly sand sediment. Visible fauna includes saithe (*Pollachius virens*), pollack (*Pollachius pollachius*), blue mussel (*Mytilus edulis*) shells – fallen from the jacket legs, plumose anemone (*Metridium senile*), dead man's fingers (*Alcyonium digitatum*), sea urchin (*Echinus esculentus*) and starfish (*Marthasterias glacialis*). The top image shows concrete mattresses used as protection for pipelines and umbilicals close to the platform.

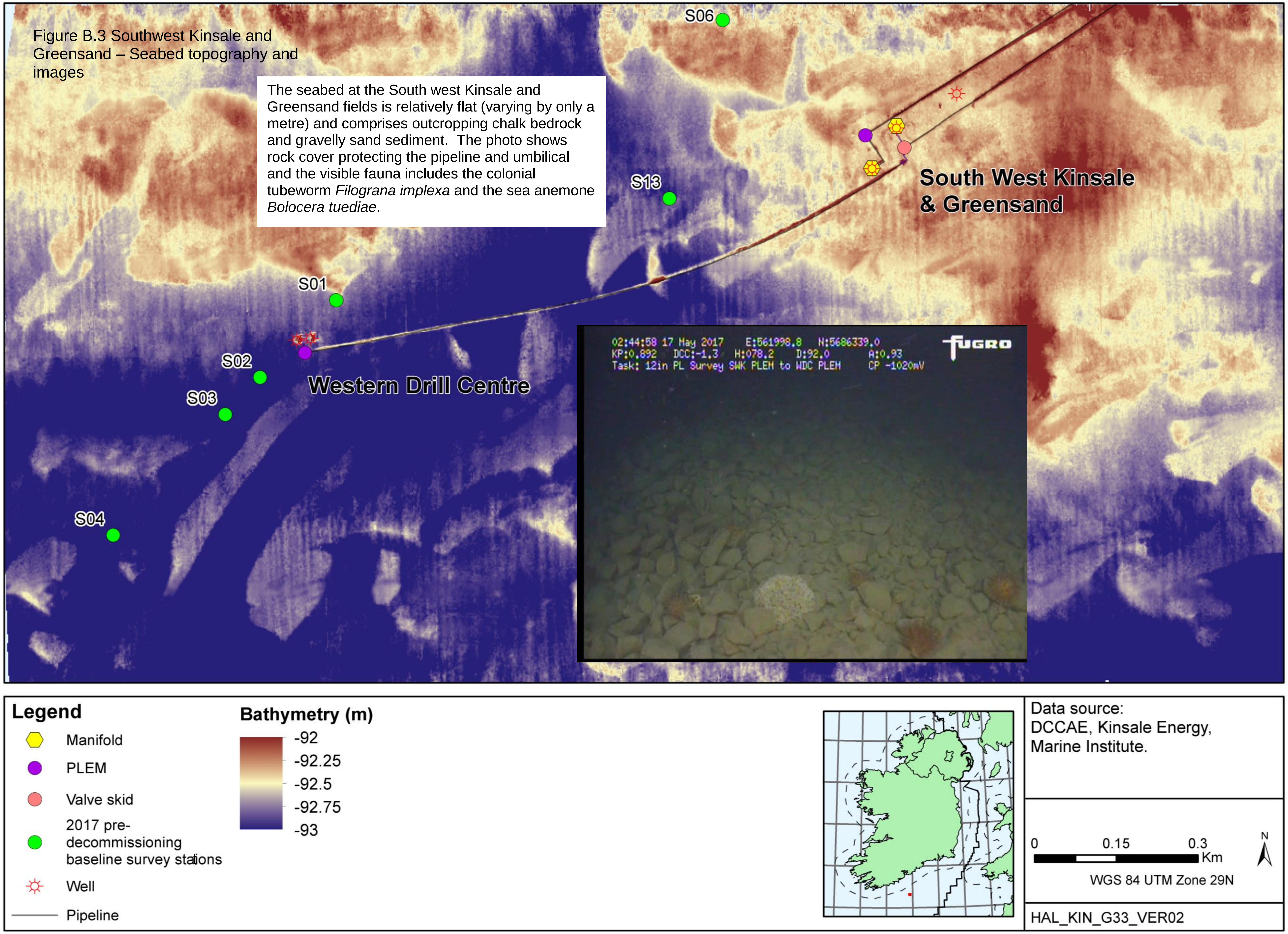


Figure B.3 Southwest Kinsale and Greensand – Seabed topography and images

The seabed at the South west Kinsale and Greensand fields is relatively flat (varying by only a metre) and comprises outcropping chalk bedrock and gravelly sand sediment. The photo shows rock cover protecting the pipeline and umbilical and the visible fauna includes the colonial tubeworm *Filograna implexa* and the sea anemone *Bolocera tuediae*.

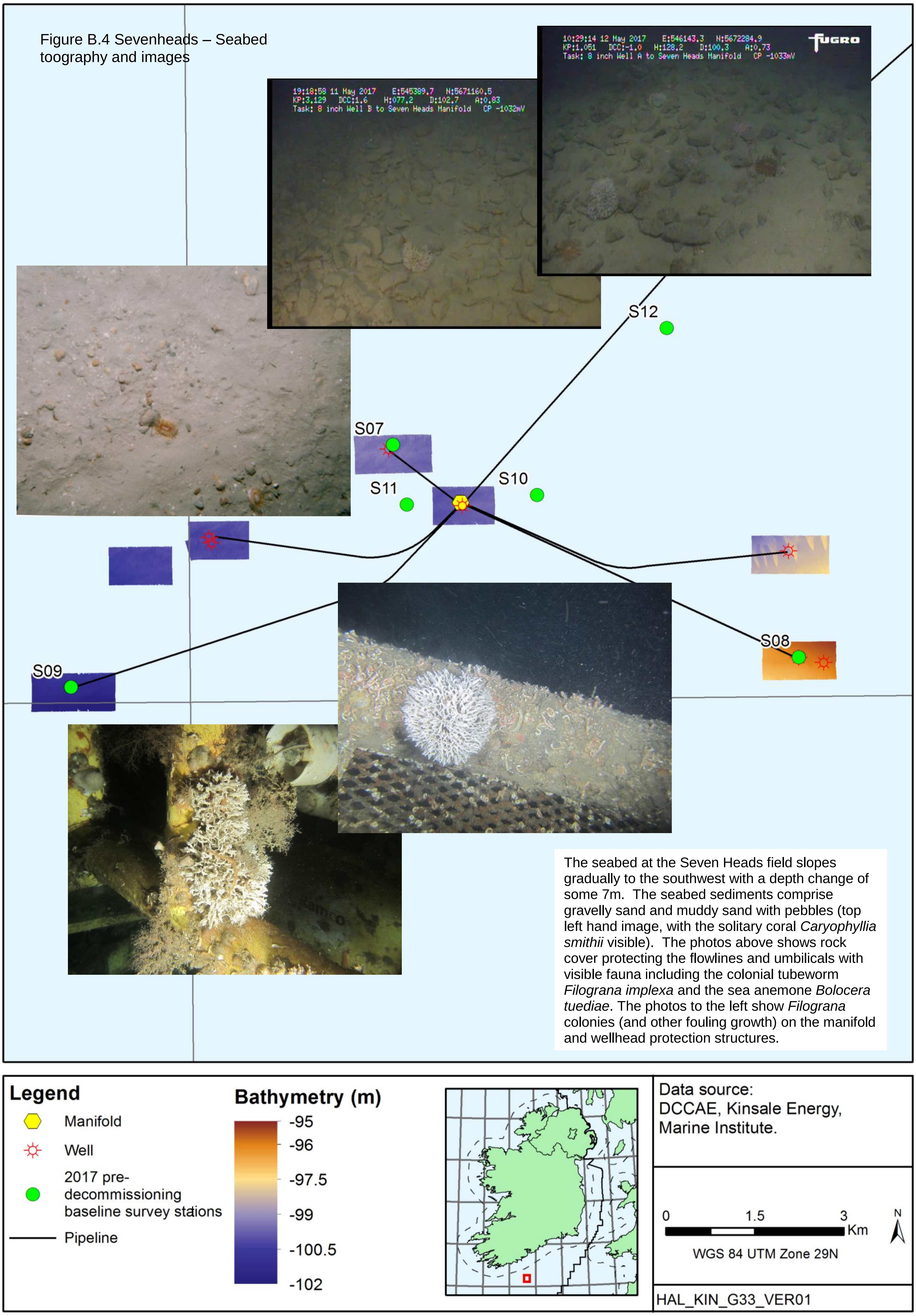


Figure B.4 Sevenheads – Seabed
toography and images
19:18:58 11 May 2017 E:545389.7 N:5671160.5
KP:3.129 DCC:1.6 H:077.2 D:102.7 A:0.83
Task: 8 inch Well B to Seven Heads Manifold CP -1032mV
10:29:14 12 May 2017 E:546143.3 N:5672284.9
KP:1.051 DCC:-1.0 H:128.2 D:100.3 A:0.73
Task: 8 inch Well A to Seven Heads Manifold CP -1033mV
FUGRO
S12
S07
S11
S10
S08
S09
The seabed at the Seven Heads field slopes gradually to the southwest with a depth change of some 7m. The seabed sediments comprise gravelly sand and muddy sand with pebbles (top left hand image, with the solitary coral *Caryophyllia smithii* visible). The photos above shows rock cover protecting the flowlines and umbilicals with visible fauna including the colonial tubeworm *Filograna implexa* and the sea anemone *Bolocera tuediae*. The photos to the left show *Filograna* colonies (and other fouling growth) on the manifold and wellhead protection structures.
Legend
Manifold
Well
2017 pre-decommissioning baseline survey stations
Pipeline
Bathymetry (m)
-95
-96
-97.5
-99
-100.5
-102
Data source:
DCCAE, Kinsale Energy,
Marine Institute.
0
1.5
3
Km
N
WGS 84 UTM Zone 29N
HAL_KIN_G33_VER01

Kinsale Area Decommissioning Project

Appendix B2

Archaeological Assessments

Archaeological Assessment Records		
Year	Report	Relevant Section
1989	Ballycotton Development – Environmental Report	Section 4.5 Archaeological Sites
1995	Southwest Kinsale – Environmental Impact Assessment	Section 4.3.3 Coastal Activities
2003	SWK Greensand – Environmental Impact Statement	Section 4.7.7 Wrecks & Archaeological Features
2003	Seven Heads – Environmental Impact Statement	Section 4.7.10 Wrecks & Archaeological
2010	Gas Storage Project – Archaeological Impact Assessment – Moore Marine Report M10C05 - Inch Terminal Extension Study	Full Report
2011	Gas Storage Project – Archaeological Impact Assessment – Moore Marine Nearshore Pipeline Route Survey	Full Report
2011	Gas Storage Project - Archaeological Impact Assessment – Moore Marine Offshore Pipeline Route Survey	Full Report

External Pipeline Surveys Conducted					
Survey Year	Type of Survey	Contractor	Time of Year	Line Surveyed	Additional Equipment Used/Notes
1974	ROV	Hunting Surveys Ltd.	Aug	A-B / A-Inch	Pre Lay -
1977	ROV	Hunting Surveys Ltd.	July	A-B / A-Inch	Post Lay -
1990	Side Scan Sonar	Seaway Technology Ltd.	March	Ballycotton Route Survey	Sub Bottom Profiler
1991	ROV	Marconi-UDI	May	24" A-B / A-Inch	
1993	Near-shore survey	Caledonian Geotech	Sept	24" Near / Inshore/ Beach & Land	Electromagnetic
1994	ROV	Fugro Ltd	April	A-B / A-Inch / BC & BCU	
1996	ROTV (SSS)	Svitzer-Britsurvey	May	A-B / A-Inch / BC & BCU	
1997	ROTV (SSS)	Svitzer-Britsurvey	May	A-B / A-Inch / BC & BCU	
1998	ROTV (SSS)	Britsurvey Ltd.	June	A-B / A-Inch / BC & BCU	
1999	ROTV (SSS)	Britsurvey Ltd.	June	A-B / A-Inch / BC & BCU	
2001	ROV	RovTech Ltd.	March	A-B/A-Inch/BC+BCU/SWK	
2002	Side Scan Sonar	Svitzer Ltd.	Sept	WDC Wells & 12" Inter-P Route	Sub Bottom Profiler
2002	Side Scan Sonar	Svitzer Ltd.	Sept	Greensand Well Location & Route	Sub Bottom Profiler
2003	ROTV	Svitzer Ltd.	July	A-B/A-Inch/BC+BCU/SWK	
2004	Side Scan Sonar	Caledonian Geotech	June	All Lines in KHGF & SHGF	
2005	Side Scan Sonar	Marine Institute	May	All Lines in KHGF & SHGF	

External Pipeline Surveys Conducted					
Survey Year	Type of Survey	Contractor	Time of Year	Line Surveyed	Additional Equipment Used/Notes
2006	Side Scan Sonar	Marine Institute	April	All Lines in KHGF & SHGF	
2007	ROV	Fugro Ltd	May	Line in KHGF & SHGF	Exception BC & BCU
2008	ROTV (SSS)	Marine Institute	July	All Lines in KHGF & SHGF	
2009	ROV	Fugro-RovTech	Aug	All Lines in KHGF & SHGF	
2012	Side Scan Sonar	Marine Institute	March	All Lines in KHGF & SHGF	
2013	ROV	Marine Institute	Sept	All Lines in KHGF & SHGF	
2014	Near-shore survey	Irish Hydrodata Ltd	Nov	24" Export Pipeline Inshore	Side Scan Sonar
2017	ROV	Fugro Ltd.	May	All Lines in KHGF & SHGF	

Abbreviations:

A-B	*Alpha to Bravo*
A-Inch	*Alpha to Inch Beach*
KHGF	*Kinsale Head Gas Field*
SHGF	*Seven Heads Gas Field*
BC	*Ballycotton*
BCU	*Ballycotton Umbilical*
Inter-P	*Inter-Platform A to B*

Kinsale Area Decommissioning Project

Appendix C1

Characteristics of the Terrestrial Environment - Biodiversity

Table C1.1: Recorded terrestrial bird species and conservation status

Species		Birds Directive Annex			BOCCI	
		I	II	III	Red List	Amber List
Columba palumbus	Woodpigeon		X	X		
Erithacus rubecula	Robin					X
Carduelis cannabina	Linnet					X
Turdus merula	Blackbird					
Corvus frugilegus	Rook					
Corvus monedula	Jackdaw					
Carduelis carduelis	Goldfinch					
Anthus pratensis	Meadow pipit				X	
Pica pica	Magpie					
Prunella modularis	Dunnock					
Parus caeruleus	Blue Tit					
Troglodytes troglodytes	Wren					
Phasianus colchicus	Pheasant					
Parus major	Great tit					
Corvus cornix	Hooded Crow					
Turdus philomelos	Song Thrush					
Fringilla coelebs	Chaffinch					
Pyrrhula pyrrhula	Bullfinch					
Carduelis chloris	Greenfinch				X	
Larus argentatus	Herring Gull					X
Hirundo rustica	Barn Swallow				X	
Sylvia communis	Whitethroat					

Symbol	Description
I	Annex 1: species and sub-species are particularly threatened. Member States must designate Special Protection Areas (SPAs) for their survival and all migratory bird species.
II	Annex 2: bird species can be hunted. However, the hunting periods are limited and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.
III	Annex 3: overall, activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. With certain restrictions, Member States can allow some of these activities for species listed here.

Kinsale Area Decommissioning Project

Appendix C2

Characteristics of the Terrestrial Environment - Archaeology

C.2.1 Cartographic and Placename Evidence

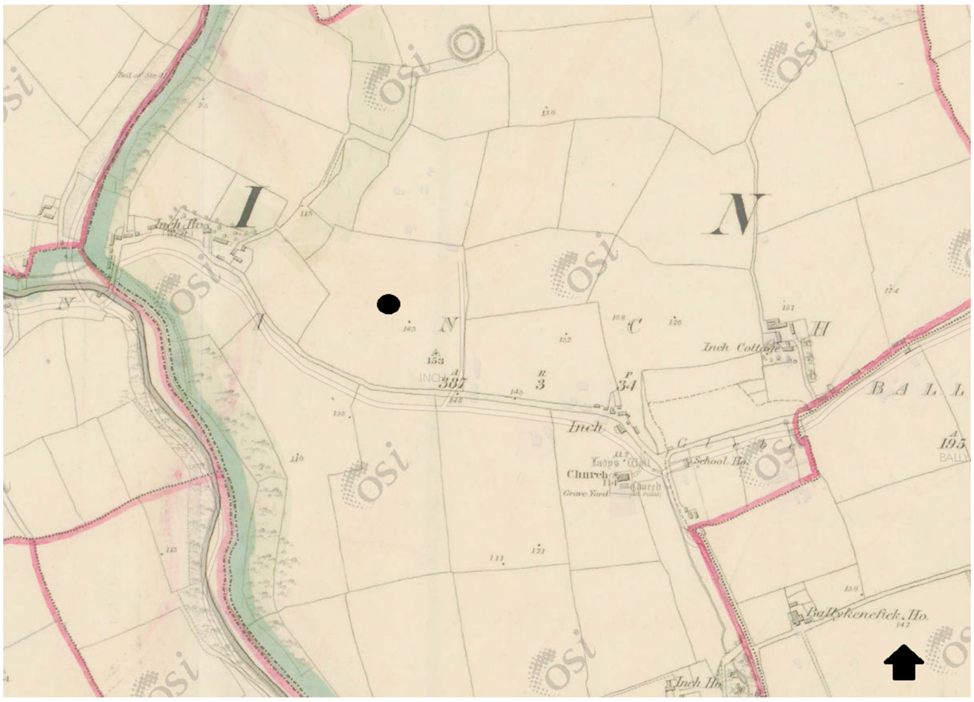
C.2.1.1 Cartographic Evidence

First Edition Ordinance Survey

This extract from the First Edition Ordnance Survey (Sheet CO:100 surveyed in 1842) depicts the terminal site in much the same manner as it is found today. The field units are broadly similar; the site is still surrounded by agricultural land. Inch House West, still appears in much the same manner as it was depicted in 1842.

A number of topographical variations have been identified since this map was drawn. This map depicts the field boundary immediately to the south of Inch Ringfort as having the southern section of the Ringfort incorporated into the field boundary. This is no longer the case. This map does not record the presence of any previously unrecorded features of cultural heritage significance. Refer to **Figure 5.15** in the main Environmental Report for the First Edition Ordnance Survey mapping.

Figure C.2.1: Extract from the First Edition Ordnance Survey (Sheet CO:100 surveyed in 1842)

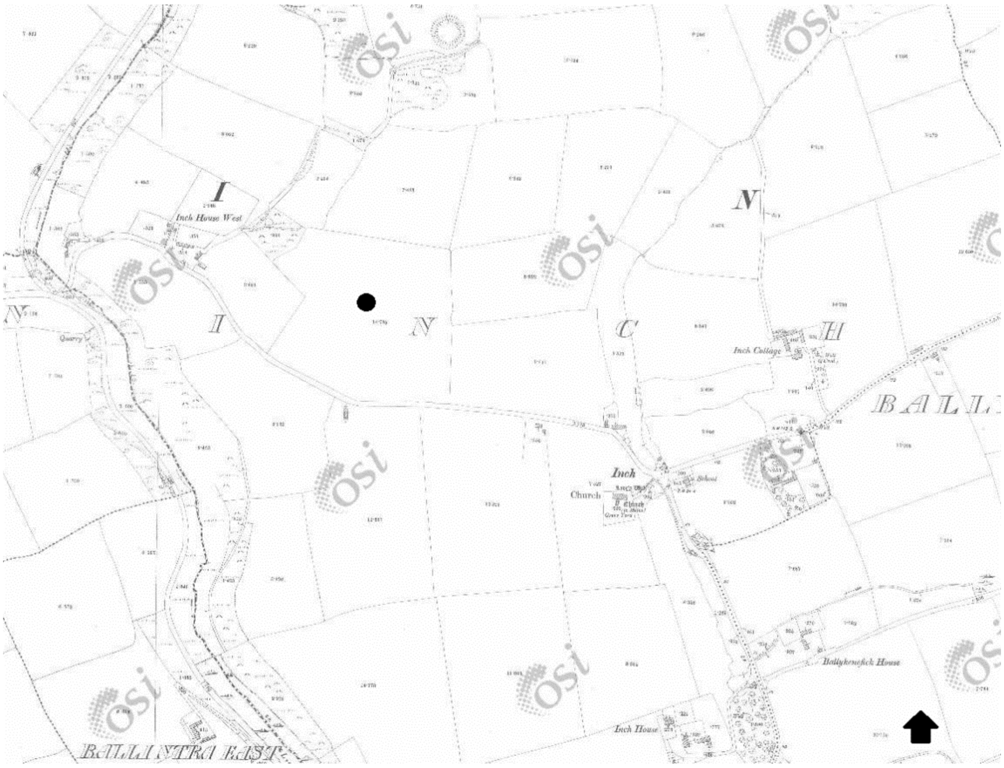


Second Edition Ordinance Survey

This extract from the Second Edition Ordnance Survey (Sheet CO:100 surveyed in 1882) depicts the terminal site in much the same manner as it is found today. The field units are broadly similar, the site is still surrounded by agricultural land and the northern boundary of the assessment area still defines the northern boundary of Inch townland. Inch House West, still appears in much the same manner as it was depicted in 1882.

A number of topographical variations have been identified since the previous edition of this map. This map now depicts the field boundary immediately to the south of Inch Ringfort as being in the same place as it is today. It no longer incorporates the southern section of Inch Ringfort. Also, the northern and southern section of the area along the eastern townland boundary are depicted as marginal wetland areas. This depiction would appear to co-relate with current conditions. This map does not however record the presence of any previously unrecorded features of cultural heritage significance. Refer to **Figure 5.16** in the main Environmental Report for the Second Edition Ordnance Survey mapping.

Figure C.2.2: Extract from Second Edition Ordnance Survey (surveyed 1882)



C.2.1.2 Placename Evidence

The name Inch derives from the Irish ‘Inse’ meaning river-meadow or moist smooth pasture along a stream. This is an obvious reference to the nearby Inch stream. The name Lahard derives from the Irish ‘Leath- Ard’ meaning half height. It was often used to denote a diminution of the usual condition, where by half height would mean a gentle slope. This nomenclature makes reference to the local topography which slopes towards the sea.

The name Ballintra (East & West) derives from the Irish ‘Baile an tra’ meaning town beside the beach. This name refers to the location of the clóchan adjacent to the nearby beach. The names Ballykefenick, Ballyshane, Ballybranagan, Ballytibbott all derive from old English family manes which were incorporated into townland names. The name Tullaheen derives from the Irish ‘Tullach ean’ meaning hillock of the bird.

C.2.2 Archaeological and historical background

Mesolithic

The Mesolithic (middle stone age) people were the first inhabitants of Ireland, arriving about 9000 years ago. Unlike many other areas of the country, where there is little evidence of Mesolithic and Neolithic cultures, there is a considerable amount of evidence for both in the area from Roche's Point to Power Head and further east. Much of this evidence was gathered by a research project carried out by University College Cork under the directorship of Prof. Peter Woodman in the 1980s (Power, 1994). The programme carried out a number of field surveys, examining recently ploughed fields for evidence of Mesolithic and early Neolithic activity.

Typically this evidence took the form of discarded stone tools and debris from their manufacture, and provided evidence for Mesolithic occupation of the area. Collectively termed as 'flint or lithic scatters', one of these sites was identified in the field immediately to the north of Inch beach. The townlands where these flint scatters were recorded include Ballintra West, Ballybranagan, Ballycroneen East, Ballycroneen West, Ballykenefick, Inch, Lahard and Trabolgan.

Evidence of Mesolithic seafaring or its technology is inferred in the fact that Ireland has a Mesolithic culture. As with today, prehistoric Ireland was separated from both mainland Eurpor and Britain by a stretch of sea. The only way that the Mesolithic culture could have arrived to Ireland was via some form of seafaring technology, namely a boat or raft (Blackwell, 1992, Breen and Forsythe 2004).

The coastal emphasis of much of the recorded Mesolithic settlement in southern Ireland (Guileen & Doonpower Head Co. Cork and Ferriters Cove Co. Kerry) and the discovery of seafood remains at many of these sites would appear to indicate that there was a reliance on the sea for food. The remains of a Mesolithic poplar dug-out log discovered at Carrigdirty Rock, in the Shannon Estuary proves that there was seafaring capabilities at this time (O Sullivan, 2001).

Although it could be argued that the discovery of such a number of Mesolithic sites in this area was as a result of deliberate targeting, and that similar numbers of sites could be identified in other areas if targeted field survey was carried out. It still remains that the recording of such a preponderance of flint scatters in such a confined geographic area would appear to indicate this is one of the few areas of the country where there is a confirmed and obviously sustainable Mesolithic population with a very obvious focus on exploitation of marine resources.

Neolithic

Similar to the Mesolithic discoveries, the University College Cork field surveys recorded the presence of a number of Neolithic sites in this area. A number of these sites can be identified as transition sites, from

Mesolithic to Neolithic. Megalithic tombs are a characteristic feature of Neolithic cultures both in Ireland and in Western Europe. They typically comprise of one of four tomb types, where collective burial was carried out in stone tombs. There are only two megalithic structures, (Rostellan RMP CO:88:10 and Castlemary RMP CO:88:15) in the broader vicinity of the proposed development. Both are situated close to the coast, adjacent to the town of Cloyne almost 8km from the subject site.

Again, although there is no recorded evidence of any Neolithic activity at the site of the nearshore survey, the presence of contemporary features on the adjacent coastal fringe infers that these cultures must have visited this area.

Bronze Age

While some communal megalithic monuments, particularly wedge tombs continued to be used, the Bronze Age is characterised by a movement towards single burial and the production of prestige items and weapons, suggesting that society was increasingly stratified and warlike.

Bronze Age occupation of the area surrounding the subject site is represented by the presence of a possible standing stone (RMP CO:100:055), located in the townland of Ballycroneen West. This 3.3m (11 ft) tall monolith is associated with a similar structures from the region. The practice of Bronze Age cultures erecting megalithic structures such as this on their lands is largely restricted to two distinct regions in Ireland, south Munster and mid Ulster. It is in this south Munster series that this monolith is classed (O Nualainn, 1991). The erection of this stone pillar in the area is believed to have been of considerable significance to the local community. The fact that it belongs to a wider regional cultural tradition indicates that there was communication between contemporary Bronze Age communities.

The exact means and methods of communication appear to have been lost but it must be considered that waterbourne communication was practiced in the region. All the boat finds for this period in Ireland consist exclusively of logboats (Breen and Forsythe, 2004). None were recovered from the region surrounding the subject site as the area is too dynamic to provide favourable preservation conditions.

A boat recovered from a bog in Lurgan Co. Galway, is considered by some to be an unfinished seagoing vessel which measures over 15m in length, and was fitted for outriggers. Its discovery would appear to indicate that coastal travel was being carried out at this time.

Iron Age

In late Bronze Age Ireland the use of the metal reached a high point with the production of high quality decorated weapons, ornament and instruments, often discovered from hoards or ritual deposits. The Iron Age however is known as a ‘dark age’ in Irish prehistory. Iron objects are found rarely, but there is no evidence for the warrior culture of the rest of Europe, although the distinctive La Tène style of art with animal motifs and spirals was adopted. Life in Iron Age in Ireland seems to have been much as it was in the early historic period – mixed farmers living in or around small defended settlements known as ringforts or stone cashels.

Monuments indicative of human habitation during the Iron Age include promontory forts, cashels and fulacht fiadh. Unsurprisingly considering the continued occupation of this area since the Mesolithic period, there is considerable evidence for Iron Age activity in the vicinity of the proposed development. This evidence takes the form of two coastal Promontory Forts at Lahard (RMP CO100:01702) and Ballyrobin South (RMP CO100A1:002). Two Fulacht Fiadh are recorded on the subject site (RMP CO:100:1101 & 02), with a number of additional sites in the general vicinity.

With regard to maritime communication, archaeological evidence indicates that there was extensive local, national and international trade being carried out. The discovery of the skull of an African Barbary Ape in Navan Fort, Co. Armagh and the mentioning of Ireland (Hibernia) in a number of Phonecian, Roman and

Egyptian text and maps indicates that international travel was being carried out at this time.

Again, although there is no recorded evidence of any Bronze Age activity at the site of the nearshore survey, the presence of contemporary features on the adjacent coastal fringe infers that these cultures must have visited and exploited this area.

Early Christian Period

The Early Medieval Period represented a time of considerable change. Christianity appears to have arrived in this area sometime around 560, when St. Colman founded his monastery in nearby Cloyne. Colman, son of Lenin, lived from 522 to 604 A.D. He had been a poet and bard at the court of Caomh, King of Munster at Cashel. It was St. Brendan of Clonfert that induced Colman to become Christian. He embraced his new faith eagerly and studied at the monastery of St. Jarleth in Tuam. He later preached in East Cork and established his own monastic settlement at Cloyne about 560 A.D. His feast day is celebrated on November 24th. Cloyne was later to become the centre of an extensive diocese in Munster and for eight centuries, it was the residence of the Bishops of Cloyne and the site of his Cathedral.

At this time, Ireland had already developed laws with which the country would be governed fairly, many of these dealt exclusively with marine subjects. In the 3rd century, Cormac Mac Art was reputed to have compiled a book of rights. In it, he mentions that an annual tribute of ten ships with beds were to be paid to the Ard Ri. Later legal tracts called the Muir Brethra or Sea Laws, elaborated this and defined the rights and duties of foreign trading vessels. The later Brehon Laws, were even more detailed, describing the fee payable to a boat owner in the event that their boat was damaged. They went even went so far as to classify boat types according to their length. The laws also indicated the place in society which a boat builder occupied and his honour price.

The fact that these laws were in place bears testament to the fact that a considerable amount of maritime activity must have been taking place. Sadly the full extent of the trade links were not fully recorded.

The coming of Christianity heralded a change in Irish society, not only were small proto towns and markets being established around monasteries but we also read first hand accounts of ocean going travel in manuscripts such as the Brendan Voyage and annals detailing the establishment of monasteries on outpost island sites such as Skellig Micheal, Co. Kerry, Tory island Co. Donegal and High Island, Co. Galway. They also tell of sea journeys taken by the monks to outposts such as Iona and Lindisfarne.

The Inch Terminal site is located in the southern boundary of Imokilly Barony. Evidence for Early Christian activity abounds in this area. The presence of 5 Ringforts within 2 km of the beach landfall indicates that there was extensive contemporary rural settlement in this area.

Again, although there is no recorded evidence of any Early Christian activity at the site of the nearshore survey, the presence of contemporary features on the adjacent coastal fringe infers that these cultures must have visited and exploited this area.

Viking Period

The early years of Viking contact comprised mainly of seasonal raids, whereby high status sites would be plundered by the visiting Viking. These raiders would travel from their native homeland of Norway and Denmark to Ireland performing hit and run raids on monasteries and other high status sites. Annalistic sources indicate that the first recorded attack on the monastery at Corcach Mór na Mumhan (Cork City) occurred in 820 AD (Valante 2008).

It is widely recorded that these visiting raiders were very proficient in seamanship and that most of their plunder sites were reached via boat. Consequently, although there is no direct historical or archaeological evidence to confirm, it must be assumed that the visiting Vikings must have passed by Power Head and Inch Beach on their approach to Cork.

It is however very unlikely that they would have camped, visited or established any form of settlement in this area as it is located on an exposed section of coastline. Conditions such as these would have been very unfavourable to Viking settlement. Additionally, considering the detail and extent of contemporary records, any Viking settlement in this area would almost definitely have been mentioned in some of the written sources.

The arrival of the Vikings to Ireland did ultimately lead to greater trade links with foreign towns. The monks in the Saint Finnbarr’s monastery (Cork) recorded that one could get a boat from Cork to mainland Europe.

Wine was imported for church use while salt was imported for the preservation of meat. The exact source of these commodities is unknown; remaining documentary evidence suggests that the trading network reached across to Britain and France. In terms of exports, it is likely that the principle exports were sheep’s wool, hides and meat from cattle and fish. It is also probable that an internal trading system had been established between the Cork Viking port and other nearby Viking ports such as Youghal, Kinsale and Waterford.

Although there was a marked increase in local, national and international maritime trade during the Viking Period, none of this appears to have been centred around Power Head and Inch. It is most likely that this area was simply a transit hinterland and promontory.

Historic Period

At around the period the Anglo-Normans arrived in Ireland one of the dominant families in the area was the Uí Meic Tire. Infighting between the Uí Meic Tíre family facilitated the Anglo-Norman conquest of Imokilly. It is recorded that in 1177, King Henry II granted the Kingdom of Cork to Robert Fitz-Stephen and Milo de Cogan, two Anglo-Norman adventurers who had played prominent roles in the conquest of Ireland.

In the subsequent division of lands, Imokilly came into the possession of Robert FitzStephen, and FitzStephen's land was parcelled out among his friends and kinsmen in accordance with the Anglo-Norman land system and they then held it by feudal tenure. Two of the main foeffees of Robert FitzStephen, were the Fitzgeralds and the Carews. They ranked amongst the earliest Anglo Norman settlers in East Cork and their arrival effectively put an end to the era of Gaelic chieftains in Ireland.

During the period between the plantation of Munster and the Confederate wars, Cork had become one of the primary trading ports in the Country. The already well established trade links between the traditional English trading families of Cork City and the nearby Continent were being expanded on and smaller ports such as Youghal and Kinsale were expanding rapidly, so much so that in the 1630s Kinsale was the foremost tobacco importer in the Country (Dickson, 2005).

The suppression of the confederates, brought a change to this dynamic. Older, more established, merchant families had their assets and lands stripped and they were expelled from the walled town. New opportunities then arose for the new settlers.

The newly arrived protestant settlers did not waste any time in establishing trade links with mainland Britain, Europe and also the burgeoning colonies in the west (Caribbean and America). The recent arrival meant that their allegiance to their homeland, England was still strong, however their religious diversity meant that they had deeper and wider religious origins which could be exploited for trade purposes.

Britain at this time was almost as powerful as the Dutch and the colonies were exporting huge amounts of tobacco. Figures indicate that between 1665 and 1685 Irish imports of tobacco doubled, and the majority of this was imported through Cork. The diversity of this new trade could be seen in 1686 import figures for Cork City, where only 25% of direct trade was with England, 18% was with Holland, 22% with France, 14% with Southern Europe and 20% from transatlantic sales (Dickson, 2005). This was a trend that was to remain for the next almost 75 years.

The location of the safe deepwater port of Cork as one of the last stops on the transatlantic route meant it was ideally suited to take advantage of the this new trade. Additionally, its sheltered and easily defended location afforded it the unrivalled ability to provide shelter to the large naval fleets assembled during the American War of Independence and later during the Napoleonic Wars.

Another major factor in the expansion of Cork was the adoption of the Port by the Royal Navy as a victualing station. High quality salted beef, butter and other supplies were goods that could be easily acquired from the hinterland around Cork.

It is precisely this reason that the provision of high quality goods generated such wealth for the town’s merchants. The close links of Cork’s economic prosperity to the war economy and the export of salted goods were weaknesses that were exposed in the period of peace following the Napoleonic Wars.

The textile industries in Cork also flourished during this period. The demand for linen for sailcloth helped the growth of the Douglas sailcloth factory which was the biggest such factory in Europe by 1726.

The late 1700s saw the tanning, brewing, and distilling industries flourish. The Beamish and Crawford brewery established in 1792 became the biggest of its kind in Ireland.

19th Century

Cor The early decades of nineteenth century saw a marked decline in the economic fortunes of Cork City. The ending of the Napoleonic Wars was a major factor in the economic slump. Cork Harbour no longer regularly hosted fleets of the Royal Navy and this caused a major decline in the provisions trade. Since the Act of Union in 1800, Ireland had been protected from the full force of British competition but a change of law in 1824 saw Irish industry exposed to competition from the far more developed British economy. The combined impact of these developments was catastrophic for the traditional textile industry and the provisions trade.

Not all of the city's industries were equally affected by the economic decline of the first half of the 1800s. Shipbuilding, brewing, distilling, tanning and the butter trade still flourished. Cork Harbour did however remain a major port for trans-Atlantic trade.

Samuel Lewis in his Topographical Dictionary of Ireland, 1837 describes the area surrounding Inch as “a parish, in the barony of Imokilly, county of Cork, and province of Munster 5 miles (S. by W.) from Cloyne, on the road to Poer Head; containing 1854 inhabitants. It comprises 3761 statute acres, about two-thirds of which are under tillage, and the remainder in pasture: the soil, which rests on clay-slate, is light and indifferently cultivated. The seats are Castle Mary, the residence of the Rev. R. Longfield, standing in an extensive and well-wooded demesne; Woodview, of the Rev. J. P. Lawless; and the very pretty residence of Mr Fitzgerald, proprietor of the extensive limestone quarries at Carrigacrump. These quarries supplied stone for the works on Hawlbowling and Spike Islands and the Martello towers near Cove; also for the court-house, quays, and custom-house of Cork. The coast around Poer Head, which is a coast-guard station, is very bold, and is composed of schistose rocks with thin layers of argillaceous grit intermingled.

The living is a rectory and vicarage, in the diocese of Cloyne, and in the gift of the Crown: prior to 1835 it formed part of the union of Aghada, which was held in commendam by the bishops of Cloyne. The tithes amount to £524. 8. There is no glebe-house; the glebe comprises 10 acres. The church was erected by aid of a gift of £600 from the late Board of First Fruits, in 1831. In the R. C. divisions the parish forms part of the union or district of Aghada. The male and female parochial schools were erected by Bishop Brinkley, in 1828; and there is a school in connection with the National Board. In Castle Mary demesne are the remains of a cromlech; and near Poer Head, on the top of the cliff, are the extensive ruins of a fortress, erected by order of Queen Elizabeth in 1595, but destroyed by the Earl of Desmond soon after, when the garrison was either put to the sword or thrown over the cliff”.

Between the years 1845-1850 Ireland experienced a great famine. During this period Cork City was one of the main convergence points for people wishing to flee the horrors of this catastrophe. Consequently, the city and surrounding villages witnessed scenes of horror and destitution.

Cork in World War One

During the first quarter of the twentieth century, the main route for shipping from the USA to southern English ports passed the southern coast of Cork. At this time Britain was reliant on the importation of a large amount of its foodstuffs from Ireland and North America. The Declaration of War, by the British on Germany on 4th August 1914, meant that these imports were now at risk.

After the Declaration of War, Britain confirmed that Cork would be one of the main Naval bases for the Atlantic campaign. Cork Harbour was a natural choice for a base of warships charged with the protection of these waters. In the period 1914 to 1918 Queenstown was a base for tugs, sloops, armed trawlers, armed yachts, Q-ships, motorboats and from April 1917, a fleet of U.S. destroyers. The harbour itself was protected by anti-submarine devices and the entrance was regularly swept for mines which were laid overnight by German submarines, more commonly known as Uboats.

In February 1917, an order was issued by the Admiral Hennin Van Holtzendorff, Germany's Chief of Naval Staff, for the navy to begin unrestricted naval warfare against all vessels, including those of neutral nations. The U-boats were highly efficient in this task, at the peak of their success in 1917 they sunk 603,000 tons of merchant shipping in March alone.

The U.S. declared war on Germany in April 1917. It was around this time that Irish fishing vessels off the Cork coast began to be targeted by the U-boats, reputedly for supplying the British with food.

A fleet of American destroyers set sail for Queenstown upon the U.S. declaration of war. They would be based in Queenstown for the remainder of the war and provided long range protection for Allied shipping. From 1917 onward inbound vessels were met and escorted by warships from a point about 60 miles west of The Fastnet. An escorted convoy system for trans-Atlantic crossings of merchant ships, war ships and troop ships came into effect later in 1917 and the u-boats strangle hold on western Europe began to lift.

Cork in the Second World War

Ireland had put a bitter civil war behind her and was a recently emerged nation when the Second World War (WWII) broke out in 1939. Still nominally a dominion of the British Empire and a member of the Commonwealth, Ireland had gained de facto independence from the United Kingdom after the Anglo-Irish War, and the Anglo-Irish Treaty of 1921 declared Ireland to be a 'sovereign, independent, democratic state'. A new constitution had been adopted by the Irish Parliament in 1937. The Statute of Westminster meant that unlike in World War I, Britain's entry into the war no longer automatically included its dominions. Dáil Éireann voted for neutrality at the outbreak of hostilities in Europe and this neutrality was maintained throughout until the end of the war in 1946. In comparison to the previous war there was less hostile activity off the Cork coast for the duration of the Second World War. Intense battles between escorted convoys and packs of Uboats took place in the mid-Atlantic and off the south coast of Greenland in 1942. The submarines still took their toll; in a period from January 1942 to May 1943 submarines accounted for 6,808,000 tons of Allied shipping sunk in the North Atlantic alone (Smith, 2008).

Military weapons technology experienced rapid advances during World War II. Naval warfare had changed dramatically, the aircraft carrier was now the premier vessel of the fleet.

Submarines had advanced and were now held used by both the Allied and Axis forces (Smith, 2008). The German U-boats were once again put into action against merchant shipping crossing the Atlantic. This time the U-boats were used in groups, so called 'wolf packs', to counter the effect of the convoy system which had proved successful in the First World War. To counter the threat of the German submarines the Allied forces now carried shipboard and aircraft radar and some of the first acoustic listening devices, or sonar.

C.2.3 Record of Monuments and Places

Table C.2.1: Recorded monuments within 2km of study area

Record Number:	Classification:	Description:
CO088-040	Redundant record	Listed as a 'potential site – aerial photo' in the SMR (1988) and the RMP (1998) based on a feature visible on an aerial photo (GSI W255). The current evidence is not sufficient to warrant accepting this as the location of an archaeological monument.
CO088-052	Fulacht fia	In pasture, on S side of stream. Spread of burnt material (L c. 18m; Wth c.18m). Noted as dark soil mark on aerial photograph (GSAP, W255). The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994). In certain instances the entries have been revised and updated in the light of recent research.
CO088-116	Standing stone	In pasture, atop hill, overlooking stream to N. Subrectangular stone aligned NW-SE (H 2m; 0.65m x 0.28m). (pers. comm. Joan Rockley) The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994). In certain instances the entries have been revised and updated in the light of recent research.
CO100-024	Moated site	In pasture, on N-facing slope. Square enclosure (38m N-S; 37.6m E-W) defined by earthen bank (max. int. H 1.2m); stone-faced to N; exterior fosse and parallel field fence (H 1m) to W. Gaps to NE (Wth 5m) and SW (Wth 2.6m). Partially overgrown. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994). In certain instances the entries have been revised and updated in the light of recent research.
CO100-025	Enclosure	In tillage, on level ground. Depicted as subrectangular enclosure on 1842 OS 6-inch map; roadway running NNW-SSE, crosses SW quadrant. Levelled; slight rise to E may mark line of bank. According to Power (1940, 105) ' one small lios (almost obliterated) on Cashman's farm'. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994). In certain instances the entries have been revised and updated in the light of recent research.
CO100-026	Ringfort - rath	In tillage, land slopes gently to E. Shown on 1842 OS 6-inch map as hachured semi-circle S->N (c. 35m N-S), truncated by N-S field fence; Levelled; earthen stone-faced bank retained in N field fence (max. H c. 1m). According to Power (1940, 103) 'There were formerly four lioses, only one of which...survives. One of the destroyed specimens...was double ramparted - though of no great size'. The above description is derived from the published 'Archaeological Inventory of County Cork. Volume 2: East and South Cork' (Dublin: Stationery Office, 1994). In certain instances the entries have been revised and updated in the light of recent research.
CO100-023001	Souterrain	In a levelled rath (CO100-023----). This earth-cut souterrain was discovered in June 2003 when the ground collapsed during ploughing. The collapsed opening (0.75m x 0.7m) revealed two passages, one leading to the SSW and the second to the E. The former (min. L 1.1m) had a rounded roof, 0.6m below ground level and was inaccessible due to collapsed earth. The second passage (min. L 1.6m) slopes steeply down to the E into a possible chamber that was also inaccessible.
CO100-023	Ringfort - rath	Cropmark (GSI, W255) shows circular univallate enclosure (diam. c. 35m); possibly one of the two 'lioses' referred to by Power (1940, 103) as having 'been demolished long since'. In June 2003 a souterrain (CO100-023001-) was discovered here after the ground collapsed under the weight of a tractor. While the landowner was not aware of any rath or souterrain here, the placename 'Lios na gCruach' is associated with this area. The class for this record has therefore been changed to rath
CO100-012	Ringfort - rath	In pasture, on W-facing slope. Circular area (35.5m N-S; 34.3m E-W) enclosed by earthen bank (H 1m) with external fosse (max. D 2m), shallow to W; counterscarp

Record Number:	Classification:	Description:
		bank to NW. Gap (Wth 6m) in bank to W. Just inside and parallel to bank is low ridge NE->SSE
CO088-038001	Ringfort - rath	In tillage, on E-facing slope. Shown on 1842 and 1902 OS 6-inch maps as circular enclosure (diam. c. 30m), cut to N and W by trackways. S bank conjoined to another possible ringfort (CO088-03802-). According to Power (1940, 17) '...on the townland is a conjoint lios, of two parts - both double-ramparted'. No visible surface trace.
CO088-038002	Ringfort - rath	In tillage, on E-facing slope. Shown on 1842 OS 6-inch map as irregular enclosure (diam. c. 35m N-S) cut to W by trackway; N bank conjoined to possible ringfort (CO088-03801-). According to Power (1940, 17), '...on the townland is a conjoint lios, of two parts - both double-ramparted'. No visible surface trace.
CO088-118	Church	In Ballincrostig. Cruciform church (long axis E-W); pointed window opes; sash windows with switch line tracery. Date stone on N transpet ...'Built in 1830. The other part July 1804'. Bellcote on W gable.
CO088-039	Ringfort - rath	In pasture, on E-facing slope. Roughly circular area (c. 33m E-W; c. 32m N-S) enclosed by earthen bank (int. H 1.3m) to S, W and N; scarp to E; shallow external fosse to S and W.
CO100-011001	Fulacht fia	In pasture, on W-facing slope. Low oval mound (19.2m NW-SE; 12.9m NE-SW; H 1m) of burnt material. Stream to W. Second fulacht fiadh (CO100-01102-) c. 40m to SE.
CO100-011002	Fulacht fia	In pasture, on W-facing slope. Grass-covered spread of burnt material c. 40m SE of another fulacht fiadh (CO100-11101-). Stream to S.
CO100-037	House - vernacular house	Roadside. Front (E) of 3 bays; central doorway. Gable-ended, thatched roof; chimneys on gables. Occupied.
CO100-009003	House - vernacular house	Roadside. Front (NW) of 2-bays; off-centre doorway to left. Hipped-roof of thatch, partially collapsed. Off-centre chimney to right. Abandoned. A short distance to SW is second similar structure, now roofless.
CO100-009002	Souterrain	In ringfort (CO100-00901-). According to local information, collapse occurred in interior of fort after ploughing. No visible surface trace.
CO100-008	Ringfort - rath	In tillage, on SE-facing slope, overlooking Gyleen Bay to SSE. Excavated by O'Flaherty (1982, 129-31) prior to levelling. Circular area (max. diam. 35m) defined by bank (max. H 2m); bank heavily denuded on N side. Excavation revealed bank constructed of re-deposited boulder clay; also presence of external fosse. Partially stone-lined drain in interior; no evidence for occupation. Interpreted as cattle corral. According to Power (1940, 100) 'There were, at least, five lioses....; of these, three have been prostrated' (CO100-00901-; CO100-01001-; CO100-050---; CO100-051---).
CO100-010001	Ringfort - rath	In tillage. Shown on 1842 OS 6-inch map as circular enclosure (diam. c. 30m). According to Power (1940, 100) 'There were, at least, five lioses....of these, three have been destroyed' (CO100-008---; CO100-00901-; CO100-050---; CO100-051---). No visible surface trace. Souterrain (CO100-01002-) in interior.
CO100-007	Religious house - unclassified	Shown only on first edition map as rectangular area defined by dotted line and named 'Site of Old Building'. Lewis (1837, vol. 1, 429) refers to 'extensive ruins, supposed to have belonged to a religious establishment' in this field. It is not included in Gwynn and Hadcock's list of religious houses in Ireland (1988). No visible surface trace.
CO100-034	Settlement cluster	Coastal village overlooking Powerhead Bay, which retains several houses shown on 1842 OS 6-inch map. All are 1-storey and many are or were thatched, mainly with hipped roofs. Fronts range from 3-5 bays with central doorway. According to local information there were three shops and two public houses in the past; one public house survives.

Record Number:	Classification:	Description:
CO100-042	Prehistoric site - lithic scatter	On E side of Gyleen village, on cliff overlooking sea to S. Identified during field study (1983-5). 'Flint artefacts were scattered throughout much of the field with two main concentrations... one of these produced...uni-plane cores... larger flakes and blades resembleing later Mesolithic material... the second concentration produced uniformly smaller flakes, blades and cores... not diagnostic of any particular lithic industry' (Johnson 1987, 14); excavation in 1986 produced 'no features or any evidence for an undisturbed 'occupation' level' (ibid.).
CO100-035	House - vernacular house	Front (E) of 5 bays; off-central doorway to left. Hipped-roof of thatch; two off-centre chimneys. Demolished in 1988.
CO100-036	House - indeterminate date	Overlooking Powerhead Bay. Rectangular (long axis E-W) 2-storey double gable-ended structure. Front (S) of 5 bays; central doorway; sash windows with glazing bars; chimneys on gables. E gable is weather-slated. Second building to N is a long, gable-ended, 2-storey structure divided into three separate residential units.
CO100-043	Prehistoric site - lithic scatter	In pasture overlooking sea. Found during field walking. "Small scatter of flint including some Later Mesolithic" (pers. comm. Prof. P. Woodman, UCC).
CO100-015	Redundant record	Listed as a 'potential site – aerial photo' in the SMR (1988) and the RMP (1998). The evidence is not sufficient to warrant accepting this as the location of an archaeological monument.
CO100-038	House - vernacular house	In settlement cluster, named Lahard, on 1842 OS 6-inch map of which little else remains. Front of 3 bays; central doorway. Hipped-roof of thatch. Off-centre chimney to right. Occupied.
CO100-014	Ringfort - rath	In tillage, on SSE-facing slope. Depicted as D-shaped area (c. 30m N-S; c.20m E-W), with straight edge to E defined by field boundary, on 1842 OS 6-inch map. Field boundary removed; marked sharp drop to stream valley. Enclosure levelled; no visible surface trace.
CO100-056	Prehistoric site - lithic scatter	Concentration of flint found in ploughed field contained 'several small, well made scrapers - post-mesolithic in date' (Woodman 1984, 9).
CO100-018	Enclosure	Cropmark (GSI, W254) shows univallate circular enclosure; possibly one of the two 'lioses' referred to by Power (1940, 103) as having 'been demolished long since'.
CO100-019	Redundant record	Listed as a 'potential site – aerial photo' in the SMR (1988) and the RMP (1998) based on a feature visible on an aerial photograph (GSI W254). The evidence is not sufficient to warrant accepting this as the location of an archaeological monument.
CO100-020001	Ringfort - rath	In pasture, on level patch of ground, on S-facing slope. Depicted on 1842 OS 6-inch map as hachured circular enclosure (diam. c. 22m) conjoined on SW side to circular enclosure (CO100-02002-). Earthen bank (H 0.8m), with external fosse, survives from SSE to junction with conjoined enclosure at SSW.
CO100-020002	Ringfort - rath	In pasture, on level patch of ground, on S-facing slope. Depicted on 1842 OS 6-inch map as hachured circular enclosure conjoined on NE side to circular enclosure (CO100-02001-). Interior (23m E-W; 24.5m N-S) defined by earthen bank (int. H 1.2m) NE->WNW; external fosse to E (max. D 1.25m). Levelled elsewhere.
CO100-021	Redundant record	Listed as a 'potential site – aerial photo' in the SMR (1988) and the RMP (1998) based on a semi-circular feature visible on an aerial photograph (GSIAP W254/5). On the current edition of the OS 6-inch map this area is defined on the N (L 35m E-W), E (L 31m N-S) and W side by linear field boundaries. The linear field boundary at W (L 85m N-S) has a slightly curved kink along its length. This area forming the NW corner of a field is cut off from the rest of the field by a slightly concave broken line (L 78m). The interior of this area is indicated as rough ground. The evidence is not sufficient to warrant accepting this as the location of an archaeological monument.

Record Number:	Classification:	Description:
CO100-022	Ringfort - rath	In tillage, on level ground. Circular area (35.4m N-S) enclosed by earthen bank (max. int. H 1.4m) SE->NE, with external fosse; outer earthen bank (H 1.2m) S->NE, incorporated into field fence system, insubstantial to N.
CO100-039	House - vernacular house	Roadside. Front (W) of 4 bays; off-centre doorway to left. Thatched roof partially collapsed, gabled to left, hipped to right. Two off-centre chimneys to right.
CO100-027	House - vernacular house	Roadside. Front (E) of 4 bays; off-centre doorway to left; hipped-roof of thatch. End chimney to right. Occupied.
CO100-013002	Church	Near centre of graveyard (CO100-01301-), just to S of C of I church (CO100-013003-), overgrown courses of wall run E-W for c. 11m; no trace of return at either end; probably remains of N wall of ancient parish church of Inch, which was in ruins by 1615 (Brady 1863, vol. 2, 232).
CO100-013003	Church	At N end of graveyard (CO100-01301-). C of I church built 1831 (Brady 1863, vol. 2, 233): plain rectangular gabled structure; roof intact; perpendicular tracery in E window, switchline tracery in lancets in S and N walls; bellcote on W gable added 1898, gabled vestry at W end is also late addition.
CO100-013001	Graveyard	Approached by short passage from crossroads to E; roughly square graveyard (c. 50m N-S; c. 50m E-W), still in use. Earliest headstone noted dates to 1725 and is decorated with first occurence in Imokilly of 'Circle around the Cross and Sacred Monogram' (O'Shea 1988, 70). Near centre, remains of parish church of Inch (CO100-01302-). At N end, C of I church built 1831 (Brady 1863, vol. 2, 233): plain rectangular gabled structure; roof intact; perpendicular tracery in E window, switchline tracery in lancets in S and N walls; bellcote on W gable added 1898, gabled vestry at W end is also late addition.
CO100-013004	Ritual site - holy well	In field by roadside. Well enclosed by circular stone structure (H 1m; diam. 1.5m). Roofed with slabs and cement; hole in roof. Pipe at base carries water away; pumphouse nearby. According to Power (1940, 104) 'No devotions are now performed at the reputed holy well'.

Kinsale Area Decommissioning Project

Appendix D

Positive, Minor or Negligible Impacts

Appendix D: Positive, Minor or Negligible Issues

From the identification process (see **Section 6.2** of the EIAR), a number of environmental interactions were identified, with associated issues being judged to have positive, minor or negligible effects. The impacts identified have been scored based on their likelihood and severity using the scale shown in **Table D.1**, the definitions for which are the same as those used in **Section 6.2**. The identified impacts are accompanied by a brief consideration of their potential level of impact and any related mitigation or controls of relevance in **Table D.2**.

Table D.1 Scoring of positive, minor or negligible effects

		Likelihood				
Consequence		Definite	Likely	Possible	Unlikely	Remote
		5	4	3	2	1
Severe	A	A5	A4	A3	A2	A1
Major	B	B5	B4	B3	B2	B1
Moderate	C	C5	C4	C3	C2	C1
Negligible	D	D5	D4	D3	D2	D1
Positive	E	E5	E4	E3	E2	E1
None foreseen		-	-	-	-	-

Table D.2 Assessment of positive, minor or negligible effects

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Consent Application 1				
Well decommissioning (platform and subsea wells)				
Fugitive emissions from fuel & chemical storage (platform and subsea well decommissioning)	**Land, soil, water, air, climate**: Air & climate	D4	Fugitive emissions may be generated from cement tanks, mudpits, diesel storage and cooling/refrigeration systems and may comprise emissions and dust/particulates, VOCs, HFCs etc. dependent on source. Such emissions are minor in the context of that from combustion of fuel for power generation and in view of the location and prevailing meteorological conditions, these emissions are not considered to be a significant source of air pollutants.	**Mitigation**: No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Drainage, sewage, treated seawater and other well decommissioning related discharges (platform and subsea well decommissioning)	**Biodiversity**: Plankton, Fish & shellfish **Land, soil, water, air, climate:** Water quality	D4	Liquid discharges from the rig include those from domestic effluent (sewage and grey water – catering, sink and shower wastes) which will contain soluble and particulate organic matter and detergent residues, and surface drainage from decks and non-contained drainage areas. Surface drainage may contain small quantities of rigwash detergent. The rig will have a personnel complement of around 100 persons and will be in the Kinsale Area for approximately 159 days, including contingency. Should a LWIV be used, the crew levels will not be substantially different (between 70 and 100), though the time in the field for the well abandonment will be shorter (~99 days). Additional accommodation on KB will be provided by a temporary accommodation module providing up to 24 beds, with up to 11 persons per shift required for platform well abandonment over 155 days (including a 25% contingency). It is not expected that there will be any substantial difference in the manning numbers on KA compared with routine operation. In the water depth (90-100m) and tidal currents (~0.5m/s) of the area, discharges are not expected to have detectable effects.	**Mitigation**: No additional mitigation is proposed. **Legally required standards & controls**: The rig and any vessels used in the well decommissioning will meet MARPOL requirements (e.g. in relation to Annex I and Annex IV on the prevention of pollution by oil and sewage from ships respectively under the *Sea Pollution Act 1991* as amended). Vessels and drilling rigs are required to hold a Shipboard Oil Pollution Emergency Plan (SOPEP) which is in accordance with guidelines issued by the Marine Environment Protection Committee of the International Maritime Organisation. Where relevant[1], ships will also carry an International Sewage Pollution Prevention Certificate (see the *Sea Pollution (Prevention of Pollution by Sewage from Ships) Regulations 2006*). Kinsale Energy will ensure that plans are in place as part of standard contractor management.

[1] See Marine Notice No. 44 of 2008: http://www.dttas.ie/maritime/english/marine-notice-no-44-2008-compliance-marpol-annex-iv-sewage-pollution-prevention

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Rig surface noise and light	**Biodiversity**: Water & seabirds, Conservation sites	D4	Light and noise generated by rigs and vessels associated with the decommissioning activities may potentially cause displacement and/or other behavioural responses in birds. Most species from relevant SPAs within foraging range of the Kinsale Area have been judged to have a low to moderate sensitivity to disturbance by shipping traffic (e.g. gannet, fulmar, kittiwake, gulls, auks; Old Head of Kinsale SPA 25km distant; Saltee Islands SPA 116km distant; see Garthe & Hüppop 2004). No SPAs designated for more sensitive species, e.g. divers, scoters which generally forage in coastal waters of ≤20m depth (Fox *et al*. 2003) are located near the Kinsale Area (all are ≥ 400km distant). While rafting birds may move in response to vessels in transit, such effects are of low magnitude and short duration, and will represent negligible additional disturbance over routine vessel movements. The potential effects of light on birds have been raised in connection with offshore oil and gas for several decades (e.g. Hope Jones 1980; Weise *et al*. 2001; Montevecchi 2006; Bruinzeel & van Belle 2010). Of most concern is attraction to infrastructure resulting in direct mortality from collisions and flare interaction, or subsequent mortality associated with exhaustion from prolonged disoriented flying (see review by Runcinid *et al*. 2015, and references therein). Although the issue remains poorly studied, evidence suggests that migrating passerines are those most likely to be impacted, particularly thrushes, with mass collision events (i.e. tens to hundreds of bird fatalities) being episodic and coinciding with large numbers of migrating birds and increasingly adverse weather conditions (e.g. Hüppop *et al*. 2016). Although the offshore decommissioning activities may occur during periods of bird migration, significant effects from rig and vessel lights are considered to be unlikely. The scale and duration of the KADP well operations will be small in relation to the existing presence of the Kinsale platforms (up to 159 days, see above).	**Mitigation**: No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Platform surface noise and light	**Biodiversity**: Water & seabirds, Conservation sites	D2	While noting the above effects in relation to surface noise and lighting in relation to rig presence, lighting on the platforms will not be significantly different to existing light levels which have been present since the installation of KA and KB, and their removal will eliminate a source of potential light-induced disturbance.	**Mitigation**: No mitigation proposed.
Venting (platform and subsea well decommissioning)	**Land, soil, water, air, climate**: Air & climate	D4	A small quantity of gas may be vented during the well decommissioning process. These will be minor in the context of wider KADP decommissioning emissions.	**Mitigation**: No mitigation proposed.
Offshore facilities preparation: topsides, pipeline degassing and displacement of umbilical contents				
Flushing and cleaning of topsides	**Biodiversity**: Plankton **Land, soil, water, air, climate:** Air & climate, Water Quality, Soils & Seabed **Material assets, cultural heritage and landscape**: Waste Treatment & Landfill resource	D2	The platform topsides piping will be flushed and cleaned prior to decommissioning work commencing. This will reduce the potential for the loss of any chemicals or residual hydrocarbons to sea once decommissioning activities commence. The nature of the produced hydrocarbons (dry gas with limited condensate – see Section 3.1 of the EAR) limits the potential for any hydrocarbon residues to be present and therefore lost. All remaining inventories of fuels and chemicals will be retained and returned to shore.	**Mitigation**: No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Removal of WEEE	**Material assets, cultural heritage and landscape**: Waste Treatment & Landfill resource	D2	All wastes returned to shore will be handled, recycled and disposed of in accordance with relevant waste legislation and the waste hierarchy.	**Mitigation**: No mitigation proposed **Legally required standards & controls**: All regulatory and company procedures for segregation, transport and disposal, as set out in the project Resource and Waste Management Strategy, will be strictly adhered to and only fully permitted and licensed waste facilities will be used for recycling or disposal. Should disposal take place outside Ireland, this will be undertaken in accordance with the relevant legislation and requirements (e.g. relevant to the transfrontier shipment of waste).
Displacement of contents of pipelines and umbilicals	**Biodiversity: Plankton,** Fish & shellfish **Land, soil, water, air, climate:** Water quality	D2	Pipeline contents and umbilical chemical lines will be displaced by seawater to subsea/platform wells from Kinsale Alpha. The 24” Kinsale Head export pipeline (and possibly the 18” Seven Heads export pipeline) will be filled with ~15,800m^3 (~21,500m^3 for both export lines) of inhibited water to preserve these for potential future uses during the timescale of the decommissioning works. The displacement of these pipelines does not involve any marine discharges such that no effects are foreseeable. Note that any release of inhibited water, either as part of future use scenarios or in the event that no other use is identified, are considered further in **Section 7**.	**Mitigation:** No mitigation proposed.
Cutting, welding and rigging of structures to be lifted	**Land, soil, water, air, climate** :Air & climate	D2	Depending on the chosen topside removal option, some additional material may be required for strengthening, rigging and seafastening for removal and transport which will generate a small increment to atmospheric emissions. The quantity of material required will be subject to detailed design, but will be small in relation to the main steel components of the topsides to be returned to shore, and ultimately recycled. Some airborne noise will be generated; though this will be some distance from the shore (at least 40km).	**Mitigation:** No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Utilities preparation and temporary accommodation on Kinsale Bravo	**Land, soil, water, air, climate:** Water quality **Material assets, cultural heritage and landscape**: Waste Treatment & Landfill resource	D2	Additional accommodation will be required on KB during the well abandonment phase and preparation work for topside removal, with existing accommodation facilities being used on KA. Increased personnel levels on KB (up to ~24 persons) will result in a small increment to the discharge of domestic waste to that associated with historical field operation, and as part of the wider Kinsale Area decommissioning works. It is expected that preparatory work for topside removal will take between 48 and 70 days for both KA and KB, for the reverse-installation and single lift removal methods respectively. Given the water depths (90-100m) and tidal currents (~0.5m/s) in the area, discharges are not expected to have detectable effects.	**Mitigation:** No mitigation proposed.
Consent Application 2				
Jacket removal				
Surface lighting	**Biodiversity**: Water & seabirds, Conservation sites	D5	As noted above in relation to rig and vessel presence, light associated with the decommissioning activities has the potential to cause displacement and/or other behavioural responses in birds. Aids to navigation added to platform jackets, should they be placed in "lighthouse mode", will include lighting which could be in place for up to 10 years. This will not add to existing lighting levels associated with the platforms.	**Mitigation**: No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Relevant to Consent Applications 1 & 2				
Socio-economic effects	**Population & human health**	D5	Loss of *ca*. 60 permanent jobs (on- and offshore) and related contributions to local economy.	**Mitigation**: No mitigation proposed.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Support and other vessels associated with the decommissioning				
Drainage, sewage & other discharges	**Biodiversity:** Plankton, Fish and shellfish **Land, soil, water, air, climate:** Water quality	D4	Additional vessel numbers from the wider Kinsale Area decommissioning works may result in a small increment to the discharge of domestic waste compared to that from existing field operation. Such waste is treated to MARPOL Annex IV standards.	**Mitigation**: No mitigation proposed **Legally required standards & controls:** Any vessels used in decommissioning the Kinsale Area faculties will meet MARPOL requirements (e.g. in relation to Annex I and Annex IV on the prevention of pollution by oil and sewage from ships respectively, under the *Sea Pollution Act 1991* as amended). Vessels are required to hold a Shipboard Oil Pollution Emergency Plan (SOPEP) which is in accordance with guidelines issued by the Marine Environment Protection Committee of the International Maritime Organisation. Where relevant, ships will also carry an International Sewage Pollution Prevention Certificate (see the *Sea Pollution (Prevention of Pollution by Sewage from Ships) Regulations 2006)*. Kinsale Energy will ensure that plans are in place as part of standard contractor management.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Litter	**Biodiversity:** Marine Reptiles Marine Mammals **Land, soil, water, air, climate:** Water quality Soils & Seabed	D4	Any litter produced during the decommissioning works will be retained on the vessel, as their discharge is prohibited under MARPOL Annex V.	**Mitigation**: No mitigation proposed **Legally required standards & controls:** All vessels used in the decommissioning of the Kinsale Area facilities will meet MARPOL Annex V requirements. This includes the implementation of a Garbage Management Plan (under the *Sea Pollution Act 1991* as amended and the Sea *Pollution (Prevention of Pollution by Garbage from Ships) Regulations 2012* as amended) which details specific waste management procedures, documents the segregation and safe handling and storage of waste and waste reduction measures. Litter will be disposed of a suitable reception facility on return to shore. Kinsale Energy will ensure that such management plans are in place as part of standard contractor management.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Airborne noise and lighting	**Population & human health** **Biodiversity**: Water and seabirds **Material assets, cultural heritage and landscape**: Landscape/seascape	D4	Light and noise generated by vessels associated with the decommissioning activities may potentially cause displacement and/or other behavioural responses in birds. Most species from relevant SPAs within foraging range of the Kinsale Area have been judged to have a low to moderate sensitivity to disturbance by shipping traffic (e.g. gannet, fulmar, kittiwake, gulls, auks; Old Head of Kinsale SPA 25km distant; Saltee Islands SPA 116km distant; see Garthe & Hüppop 2004). No SPAs designated for more sensitive species, e.g. divers, scoters which generally forage in coastal waters of ≤20m depth (Fox *et al*. 2003) are located near the Kinsale Area (all are ≥ 400km distant). While rafting birds may move in response to vessels in transit, such effects are of low magnitude and short duration, and will represent negligible additional disturbance over routine vessel movements. The scale and duration of the KADP operations will be small in relation to the existing presence of the Kinsale platforms, and their removal will eliminate a source of potential light-induced disturbance.	**Mitigation**: No mitigation proposed.
Potential for introduction of alien species in ballast	**Biodiversity**: Benthic fauna, Plankton	C1	The vessels to be used during the campaign will most likely come from a North Sea location and therefore the potential for introduction of alien species will be limited.	**Mitigation**: No mitigation proposed **Legally required standards & controls:** As part of the contractor management process, Kinsale Energy will ensure that the vessels used as part of the campaign have procedures in place as part of ship specific ballast water management plans, to limit the potential spread of alien species. Such plans are now a requirement for ships in international traffic under the International Convention for the Control and Management of Ships' Ballast Water and Sediments.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Onshore (Decommissioning of offshore structures)				
Refurbishment and reuse	**Land, soil, water, air, climate:** Air & climate **Material assets, cultural heritage and landscape**: Other Uses & Resources Waste Treatment & Landfill Resources	E4	The refurbishment and reuse of equipment can reduce the overall emissions from the KADP by deferring those generated during recycling and the loss of any materials to landfill that cannot be recycled. Reuse potential will be explored as part of a waste hierarchy approach, however where no reuse function can be established, materials will be preferentially recycled.	Opportunities for reuse will be explored through a waste hierarchy approach and in accordance with the waste management strategy.
Covered in site planning permission; not relevant to Decommissioning Plan consent applications				
Onshore (Decommissioning of Inch Terminal)				
Lighting and noise associated with dismantling works	**Population & human health** **Biodiversity**: Onshore habitats & species **Material assets, cultural heritage and landscape**: Landscape/seascape	D4	A preliminary assessment of the terminal demolition works has been undertaken, with noise impacts considered at the nearest sensitive receptors to the proposed works. Worst-case noise levels are predicted to occur at the two nearest sensitive receptors to the main demolition works, with the nearest residence being approx. 200 m distant (there is a residence located southwest of the site boundary and a residence located southeast of the site boundary). The results of the construction assessment indicate that the construction daytime noise limit of 70dB L_{Aeq} can be complied with at both nearby noise sensitive locations.	**Mitigation**: In the unlikely event that demolition works will occur during winter, limited time will be spent working in darkness where temporary lighting would be required. **Legally required standards & controls**: Compliance with Transport Infrastructure Ireland (TII) noise limits & the recommendations set out in appropriate codes of practice (BS5228).

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Vehicle emissions and dust	**Population & human health** **Biodiversity**: Onshore habitats & species **Land, soil, water, air, climate:** Air & climate	D2	The UK Highways Agency Design Manual for Roads and Bridges (DMRB, 2007) states that if daily traffic flows change by <1,000 annual average daily traffic (AADT) or Heavy Duty Vehicle (HDV) flows change by <200 AADT then the impact on air quality can be considered neutral. The predicted change in traffic volumes for the demolition phase is less than the DMRB criteria. Therefore, no significant impact on air quality is envisaged. CO_2 emissions from the decommissioning of Inch Terminal are in the order of 110t CO_2eq., an increment of some 0.05% on overall estimated offshore KADP emissions. Significance criteria was adopted from the TII air quality guidelines for the assessment of the potential impact of construction dust off site. The potential for dust emissions will only arise during demolition, site clearance and excavation in dry weather, and during such activities the levels of dust are likely to be small. In accordance with TII guidance, the impact of the proposed development is deemed to be of a minor scale, with soiling impacts predicted at distances up to 25m from the site works and potential for PM_{10} and vegetation effects within 10m. As there are no sensitive receptors within 25m of the works, no construction dust impacts are likely.	**Mitigation**: Mitigation of the impacts of the demolition activities will be achieved through the implementation of measures to minimise construction dust emissions and exhaust emissions from plant use. The mitigation measures will take into account best available techniques such as those outlined in the document 'Control of Dust from Construction and Demolition Activities' (BRE/DTI, 2003). A dust minimisation plan will be prepared and implemented by the Contractor.
Road transport of waste/materials	**Population & human health** **Land, soil, water, air, climate:** Air & climate	D3	The surrounding road network is lightly trafficked. It is estimated that c. 11 HGV movements per day, for a short period, will be generated by the demolition works. This is considered a minor increase which will not have significant impact on the operation of the surrounding road network.	**Mitigation**: A demolition management plan will be prepared and implemented which will provide designated traffic routes, timing and parking arrangements. Only permitted waste hauliers will be used.

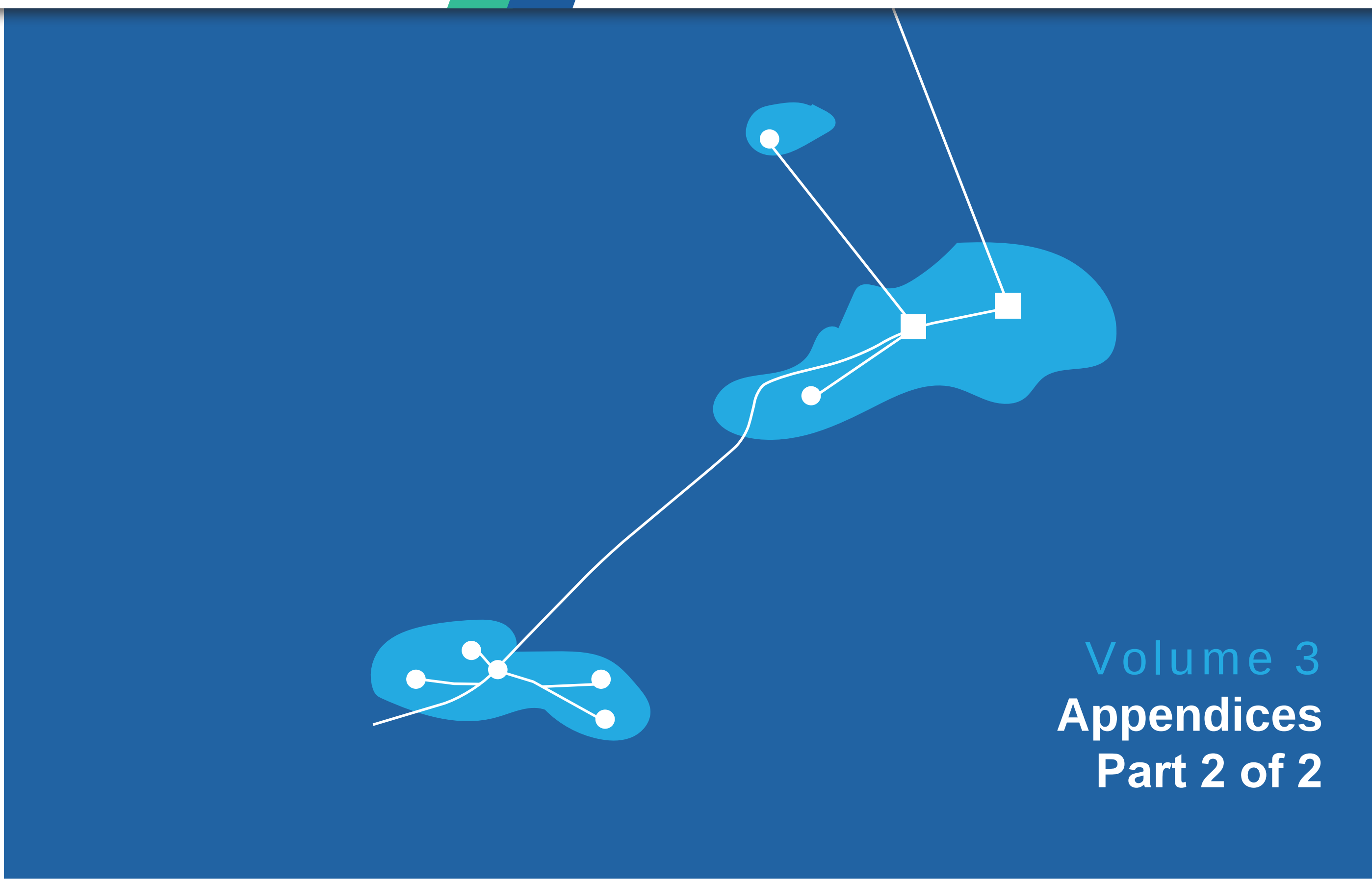
Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Materials recycling/recovery	**Land, soil, water, air, climate:** Climate/air quality **Material assets, cultural heritage and landscape**: Waste treatment & landfill resource	D2	It is estimated that the main waste types generated from the terminal demolition works are concrete and hardcore (c.5,339 tonnes) and steel (c.110 tonnes). No significant impact envisaged from waste associated with the demolition works.	**Mitigation**: A Demolition Resource and Waste Management Plan will be developed by the contractor prior to commencement of the works with material reuse, recycling and recovery undertaken where possible. Wastes generated on site will be source segregated into recyclables, biodegradable and residual fractions to facilitate recycling. All wastes generated during demolition works will be transported off site to a suitably approved facility by a valid waste collection holder. Where feasible all wastes will be recycled. The demolition contractor will maintain a log of materials removed from site. This log will include contractors used for recovery or disposal, the ultimate destination of the waste and details of the permits required for transportation and recovery or disposal activities.

Activity/Source of Potential Impact	Relevant Environmental Factor and related receptor	Impact score	Narrative to Assessment	Environmental Management Commitments and Mitigation Measures
Landfill of residual waste	**Material assets, cultural heritage and landscape**: Landscape/seascape Waste treatment & Landfill resource	D2	It is estimated that the main waste types generated from the Inch terminal demolition works are concrete and hardcore (c.5,339 tonnes) and steel (c. 110 tonnes). No significant impact envisaged from waste associated with the demolition works.	**Mitigation**: A Demolition Resource and Waste Management Plan will be developed by the contractor prior to commencement of the works. The Contractor will minimise waste disposal so far as is reasonably practicable. Waste from the proposed scheme will be transported by authorised waste collectors in accordance with the *Waste Management (Collection Permit) Regulations, 2007* as amended. Waste from the proposed scheme will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996-2016
Reinstatement to original land condition	**Population & human health** **Biodiversity**: Onshore habitats & species **Material assets, cultural heritage and landscape**: Landscape/seascape	E5	The terminal site will be returned to grassland, in keeping with the natural surrounds. This is a positive long term impact.	**Mitigation**: No mitigation proposed
Accidental events				
Hydraulic fluid loss from subsea tools and Equipment	**Biodiversity**: Plankton Fish and shellfish **Land, soil, water, air, climate:** Water quality	D2	Hydraulic fluid usage will be monitored.	**Mitigation**: The accidental discharge of hydraulic fluid, like other chemical losses, is largely preventable through provision of appropriate equipment, maintenance, procedures and training. Mitigation will be provided through appropriate contractor audit and management.

KINSALE ENERGY

Kinsale Area Decommissioning Project

Environmental Impact Assessment Report



Volume 3

Appendices Part 2 of 2

253993-00-REP-08 | 30 May 2018

Hartley Anderson

ARUP

Table of Contents

Appendices

KINSALE ENERGY

Kinsale Area Decommissioning Project

Appendix E

Comparative Assessment

Hartley Anderson

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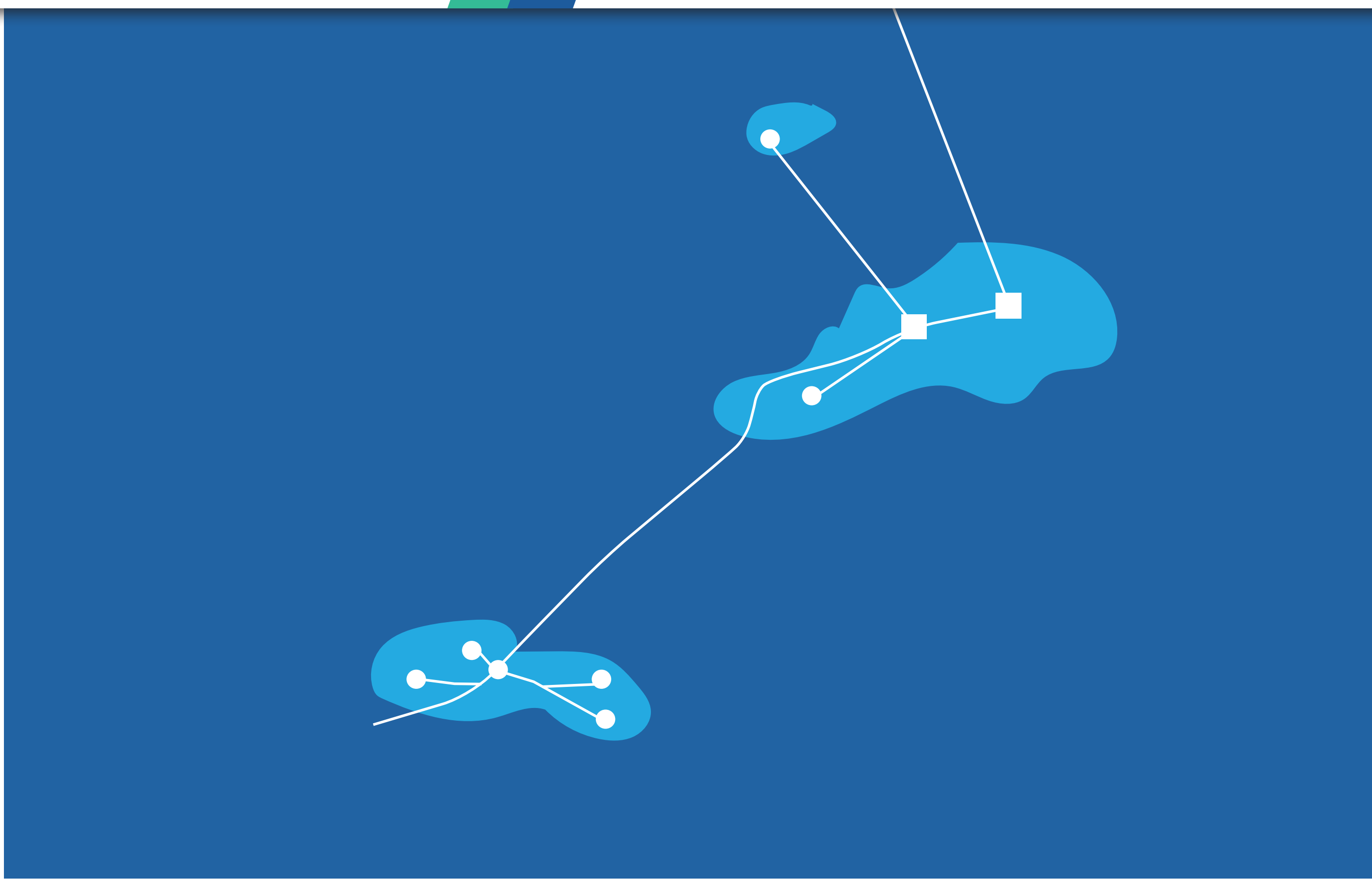
KINSALE ENERGY

Kinsale Area Decommissioning Project

Comparative Assessment Report



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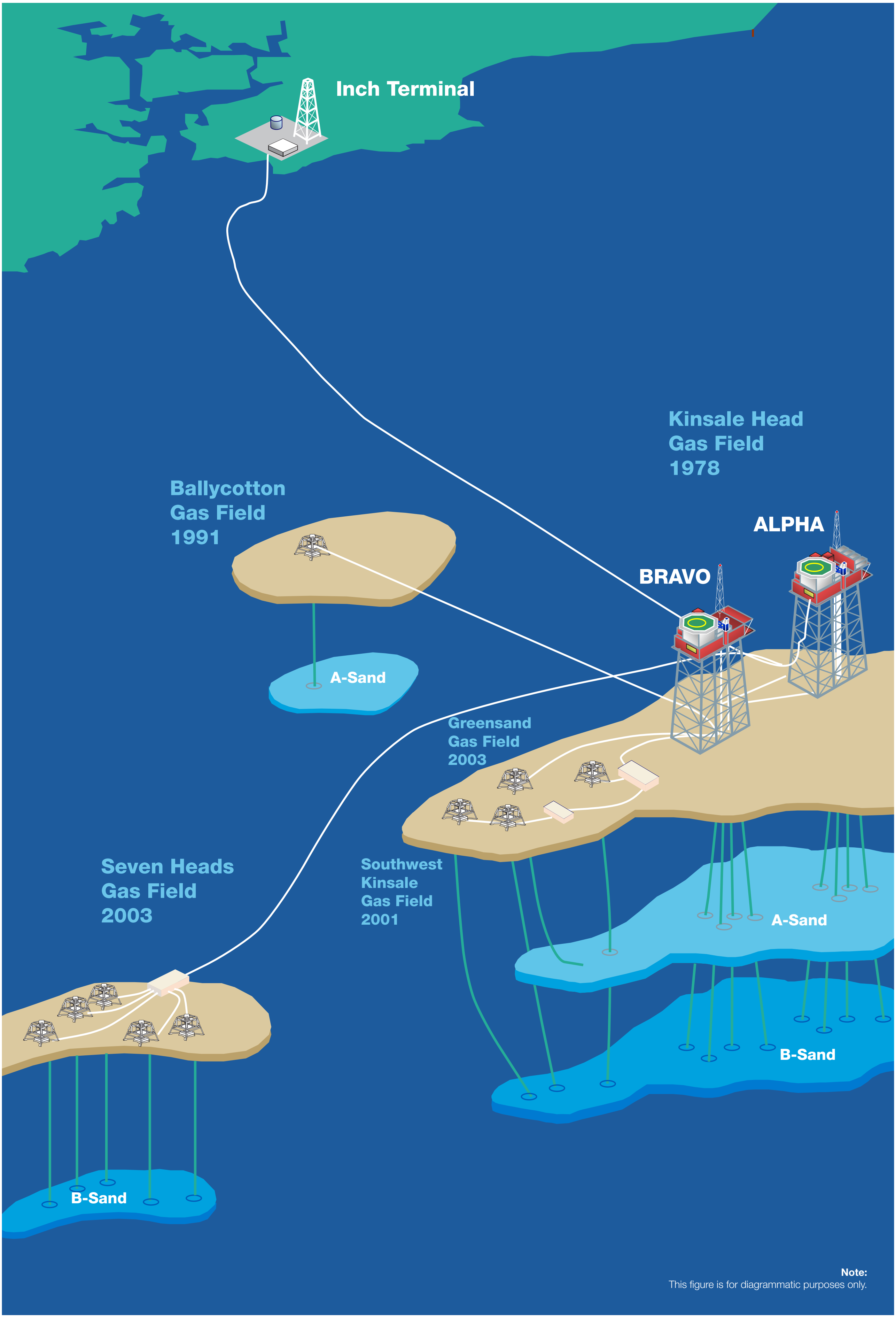

Note:
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Contents

Tables

Figures

Appendices

Abbreviations and glossary

Term	Explanation
AIS	Automatic Identification System
CA	Comparative Assessment
CCS	Carbon Capture and Storage
CO_2	Carbon dioxide
Concrete mattress	A series of concrete blocks usually connected by polypropylene ropes resembling a rectangular mattress, used for the weighting and/or protection of seabed structures including pipelines
CoP	Cessation of Production: the stage at which, after all economic development opportunities have been pursued, hydrocarbon production ceases.
DCCAE	Department of Communications, Climate Action and Environment, formerly the Department of Communications, Energy and Natural Resources (DCENR)
DECC	UK Department of Energy & Climate Change, now the Department for Business, Energy & Industrial Strategy
IRPA	Individual Risk Per Annum
KA	Kinsale Alpha
KADP	Kinsale Area Decommissioning Project
KB	Kinsale Bravo
km	kilometre: 1,000m, equivalent to 0.54 nautical miles
NEBA	Net Environmental Benefit Analysis
NUI	Normally Unmanned Installation: an installation with minimal facilities which is not permanently crewed and is controlled from a remote location (e.g. other platform or shore)
OCNS	Offshore Chemical Notification Scheme
OGUK	Oil & Gas UK, formerly the United Kingdom Offshore Operators Association (UKOOA)
PAD	Petroleum Affairs Division of the Department of Communications, Climate Action and Environment
PLEM	Pipeline End Manifold
PLL	Potential Loss of Life
ROV	Remotely Operated Vehicle: a small, unmanned submersible used for inspection and the carrying out of some activities such as valve manipulation
SAC	Special Area of Conservation: established under the Habitats Directive
SPA	Special Protection Area: established under the Birds Directive
SWK	Southwest Kinsale
TEG	Triethylene glycol
VMS	Vessel Monitoring System
WDC	Western Drill Centre

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Kinsale Area Decommissioning Project

Section 1

Introduction and Context

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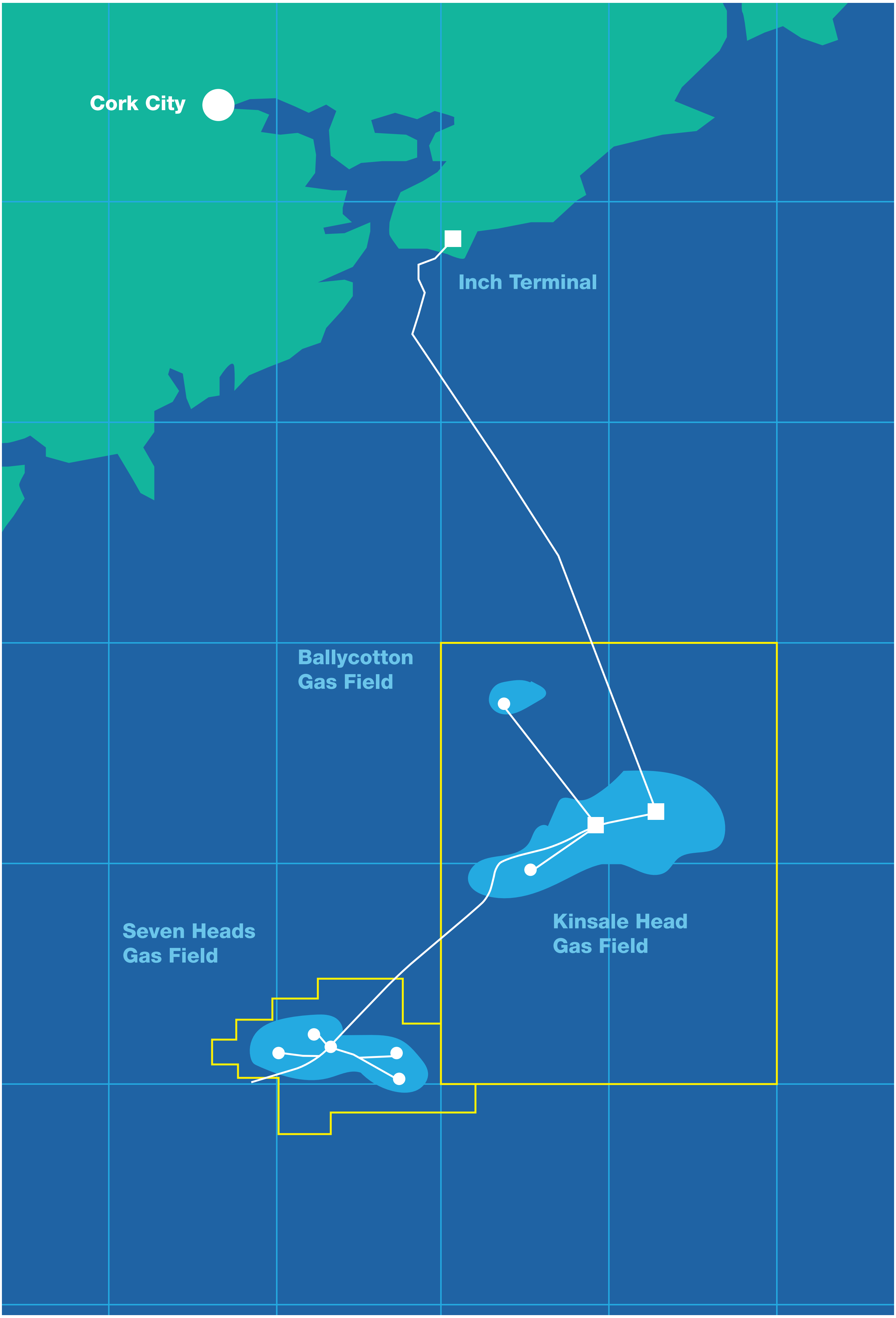

Cork City
Inch Terminal
Ballycotton
Gas Field
Seven Heads
Gas Field
Kinsale Head
Gas Field

1 Introduction and Context

1.1 Purpose

PSE Kinsale Energy Limited (Kinsale Energy) is preparing for the future decommissioning of the Kinsale Area gas fields, including the Seven Heads field, and facilities following the end of their productive life (referred to as the Kinsale Area Decommissioning Project (KADP)).

This report describes the Comparative Assessment (CA) process undertaken by Kinsale Energy of the feasible options for decommissioning the Kinsale Area pipelines, umbilicals and associated protection materials. The CA is a systematic process by which various options are examined leading to the identification of preferred options for decommissioning.

The report describes the infrastructure considered in the CA for decommissioning, the options considered, the CA method followed, and the findings.

1.2 Regulatory Context

The development and administration of policy in relation to Ireland's petroleum resources is the responsibility of the Petroleum Affairs Division (PAD) of the Department of Communications, Climate Action and Environment (DCCAE).

Under Section 13A of the Petroleum and other Minerals Development Act 1960 (as amended) ("1960 Act"), the consent of the Minister for Communications, Climate Action and Environment ("Minister") is required prior to carrying out the plan of decommissioning of the Kinsale Area facilities.

In line with leasing/licensing conditions, Kinsale Energy is preparing a Decommissioning Plan which will set out the proposals for the decommissioning[1] of all facilities. The Decommissioning Plan will be supported by a linked series of documents, including this CA, an Environmental Impact Assessment Report (EIAR) covering all facilities, and other supporting studies.

Ireland is a Contracting Party to the 1992 Convention for the Protection of the Marine Environment of the North East Atlantic (the OSPAR Convention). OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations sets out OSPAR Contracting Parties' obligations on the decommissioning of offshore installations. In line with the requirements and thresholds in Decision 98/3, all the Kinsale Area platforms (including topsides and jackets), and subsea manifolds and well head protection structures will be removed as part of the Decommissioning Plan. These are therefore not assessed within this CA.

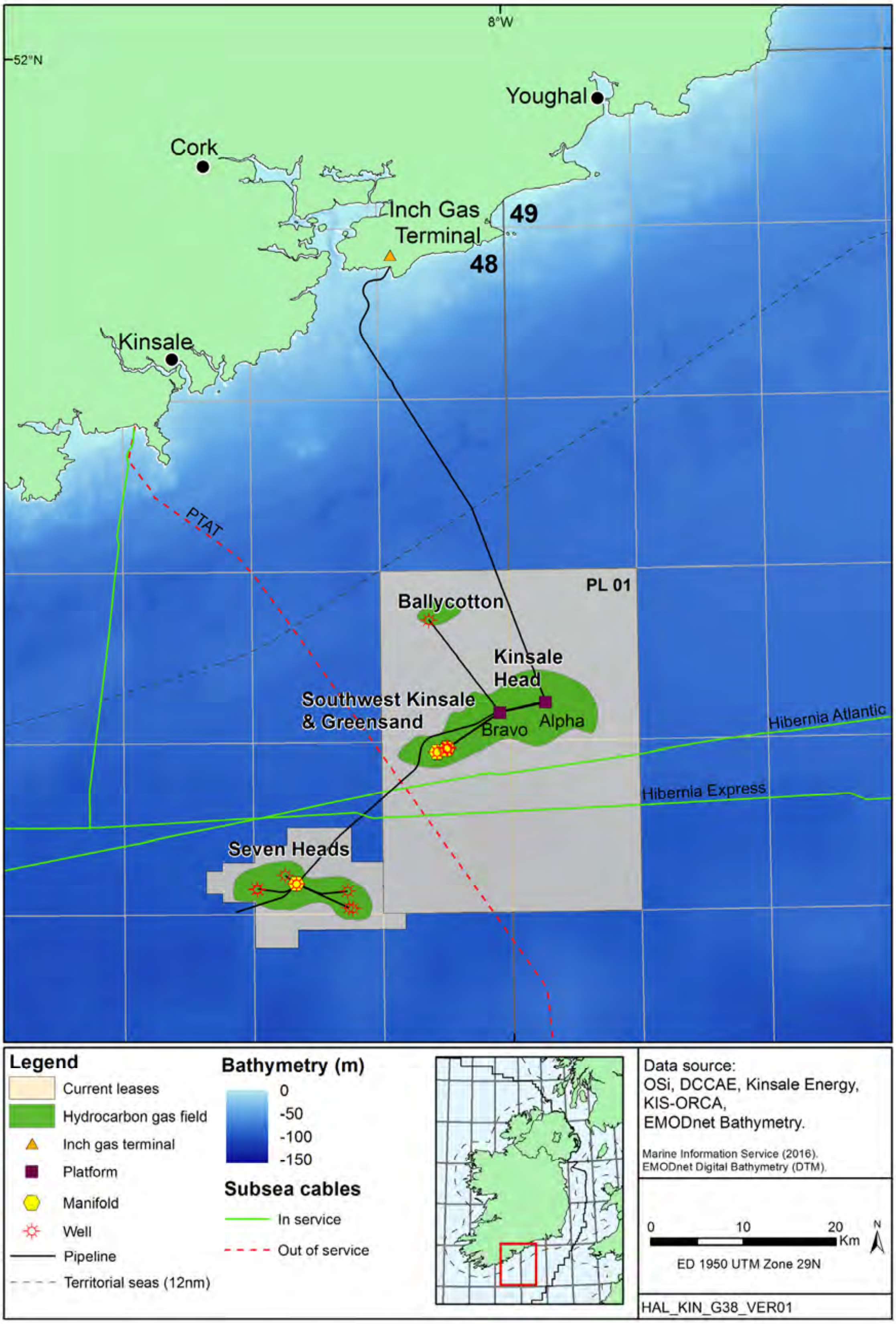
Offshore pipelines are not covered by Decision 98/3 and Kinsale Energy has therefore undertaken this CA to decide on the best methods to decommission the Kinsale Area pipelines, umbilicals and related protection materials. This CA has been undertaken consistent with established guidelines and methods used elsewhere in the OSPAR area (e.g. DECC 2011, OGUK 2015).

1.3 Kinsale Area Background

The Kinsale Area fields and production facilities are located in the North Celtic Sea Basin approximately 40-70km offshore County Cork and onshore at Inch, Co. Cork (see Figure 1). The facilities were installed between 1977 and 2003 with gas production commencing in 1978 and seasonal gas storage operations taking place between 2001 and 2017. The fields are coming to the end of their productive life and are expected to become uneconomic around 2020/2021. Cessation of Production (CoP) is the term used to mark the stage at which all production ceases.

[1] Meaning the removal, part removal or leaving in place of any installation or facility.

Figure 1 Location of the Kinsale Area



1.3.1 Petroleum Authorisations

The Kinsale Area Petroleum Leases are summarised in Table 1 below.

Table 1 Lease details

Lease	Commencement Date	Block No.	Area (km²)	Participants (* = Operator)	% Interest
Offshore Petroleum Lease No. 1: Kinsale/ Ballycotton	7 May 1970	48/20, 48/25, 49/16 & 49/21	1,003.03	*PSE Kinsale Energy Limited	100%
Seven Heads Petroleum Lease	13 November 2002	48/23 (p), 48/24 (p), 48/29 (p) & 48/30 (p)	168.5	*PSE Seven Heads Limited	86.5%
				Island Oil and Gas Plc.	12.5%
				Sunningdale Oils (Ireland) Limited	1%

Note: (p) = part block

1.3.2 Development History

A brief summary of the development history for the various facilities is given in Table 2 below. The Kinsale Head field was developed with two fixed steel platforms with gas export by pipeline to the onshore Inch Terminal. The other fields are connected to the platforms by a series of pipelines and umbilical cables.

Table 2 Summary of Development History for the Kinsale Area Fields

Lease	Field	No. of Wells	Facilities	Date/First Production	Status (2017)
PL-01	Kinsale Head	14	**Kinsale Alpha**		
			Manned Platform with production, drilling & accommodation 7 x platform wells	1978	Producing
			Compression added	1992	
			Kinsale Bravo		

Lease	Field	No. of Wells	Facilities	Date/First Production	Status (2017)
			Manned Platform with production, drilling & accommodation 7 x platform wells	1979	Producing (1 well shut-in)
			Compression added	1993	
			Converted to Normally Unmanned Installation	2001	
	Ballycotton	1	Ballycotton Subsea well	1991	Shut-In
	Southwest Kinsale *	3	3 x Subsea wells	1999 – 2001	Producing
	Greensand	1	1 x Subsea well	2003	Producing
Seven Heads	Seven Heads	5	Subsea Manifold 5 x Subsea wells	2003	Producing (1 well shut-in)

Note * In 2001 Southwest Kinsale was redeveloped to enable gas from the adjacent offshore gas fields to be stored in the reservoir. In 2006, further modifications were made to convert the field into an offshore storage facility for gas from the onshore network. The last of the storage gas was withdrawn from Southwest Kinsale reservoir in March 2017 and the field currently operates as a gas production reservoir only.

1.3.3 Environmental and Human Context

A high level overview of the environment and of human uses of the Kinsale Area is given in Table 3 below.

Table 3 Environmental summary for the Kinsale Area

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Location	The Kinsale Area is located in the Celtic Sea, some 40-70km off the County Cork coast and approximately 75km to the west of the Ireland/UK median line.											
Water column	The seafloor is generally flat in the area encompassing the Kinsale Area fields with gentle slopes across the region. Water depths extend from the intertidal area at the landfall of the main export pipeline at Powerhead Bay, to approximately 90-100m across the Kinsale Head, Southwest Kinsale, Ballycotton and Seven Heads areas. Offshore waters are thermally stratified in spring, breaking down through autumn with the onset of storms. The region is particularly susceptible to rough seas due to strong to gale force southwesterly winds.											

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Plankton	A plankton bloom (phytoplankton) occurs in spring, usually from mid-April, in response to increasing light levels. The abundance of zooplankton (which mainly feed on phytoplankton), increases in late spring. The development of a thermocline (a surface layer of warm water over cooler water at depth) in summer restricts nutrient availability and plankton density declines. Autumn gales lead to the breakdown of stratification, initiating a second, smaller plankton bloom.											
	Key: Period of increased plankton abundance shown in darker blue											
Seabed and fauna	Seabed sediments are a mix of fine to very coarse sediments ranging from clays to coarse gravels, with areas of underlying chalk bedrock exposed. Seabed bedforms (e.g. mobile sand ribbons) indicate a high energy environment characterised by a range of relatively impoverished heterogeneous benthic habitats. These are characterised by robust infaunal polychaetes, mobile crustaceans and bivalves. No habitats listed in Annex 1 of the Habitats Directive have been revealed by surveys undertaken in the area. Results from the 2017 pre-decommissioning survey of the Kinsale Area indicate that for most samples the concentrations of hydrocarbons and metals are at or below background assessment concentrations as defined by OSPAR.											
Fish	The Kinsale Area overlaps or abuts reported spawning grounds of eleven commercially important fish and shellfish species (herring, sprat, cod, whiting, plaice, lemon sole, haddock, megrim, mackerel, horse mackerel and *Nephrops*). Mackerel, cod, whiting, lemon sole, blue whiting, ling, hake and *Nephrops* all use the area as a nursery area at low intensity, while it is a high intensity nursery area for monkfish.											
	5	**7**	**9**	**7**	**7**	**6**	**5**	**4**	**2**	**1**	**1**	**2**
	Key: 1 = 1 species spawning, 2 = 2 species spawning etc											
	Basking sharks are particularly common off the southern Irish coast, with numerous sightings reported annually in the summer months. Other species of conservation interest that may be present include common skate, as well as migratory species such as salmon, lampreys and shads associated with south coast rivers and estuaries.											
Birds	Gulls commonly found in coastal areas include herring gull, lesser black-backed gull, great black-backed gull, black-headed gull and kittiwake. Most gulls are resident to the area, and are frequently recorded along the coast throughout the year. Other residents include guillemot, razorbill, puffin and black guillemot. The Old Head of Kinsale (25km from the export pipeline) is the largest seabird colony on the south coast, supporting nationally important populations of kittiwake and guillemot, as well as significant populations of herring gull, razorbill, fulmar and shag. Seasonal visitors to the area include various terns, skuas and shearwaters. Highest densities of gannets occur off the south coast in spring and summer. The rivers, estuaries, bays and coastal areas of southern Ireland are of great importance to wintering and passage wildfowl, as well as for breeding waders and other waterbirds.											
Marine mammals	The common dolphin and harbour porpoise are frequently recorded off the south coast, both close to shore and further out to sea; common dolphin are often observed in large groups and are by far the most abundant marine mammal in the region. Small groups of bottlenose dolphins are occasionally observed in the region, mostly closer to shore, with regular sightings of a small community of individuals in the Cork Harbour reported until recent years. All three of these species occur year-round in the region. Minke whale are seasonal visitors, appearing in spring and observed in increasing numbers throughout the summer to a peak in autumn. Fin whales and, to a lesser extent, humpback whales are also seasonally present from late summer to winter and feed on aggregations of small pelagic fish off the south coast; sightings peak in autumn. Small groups of Risso's dolphins are occasionally observed off the south coast of Ireland, mostly commonly in summer months and near to the coast, while there are also a few records of small groups of killer whales.											

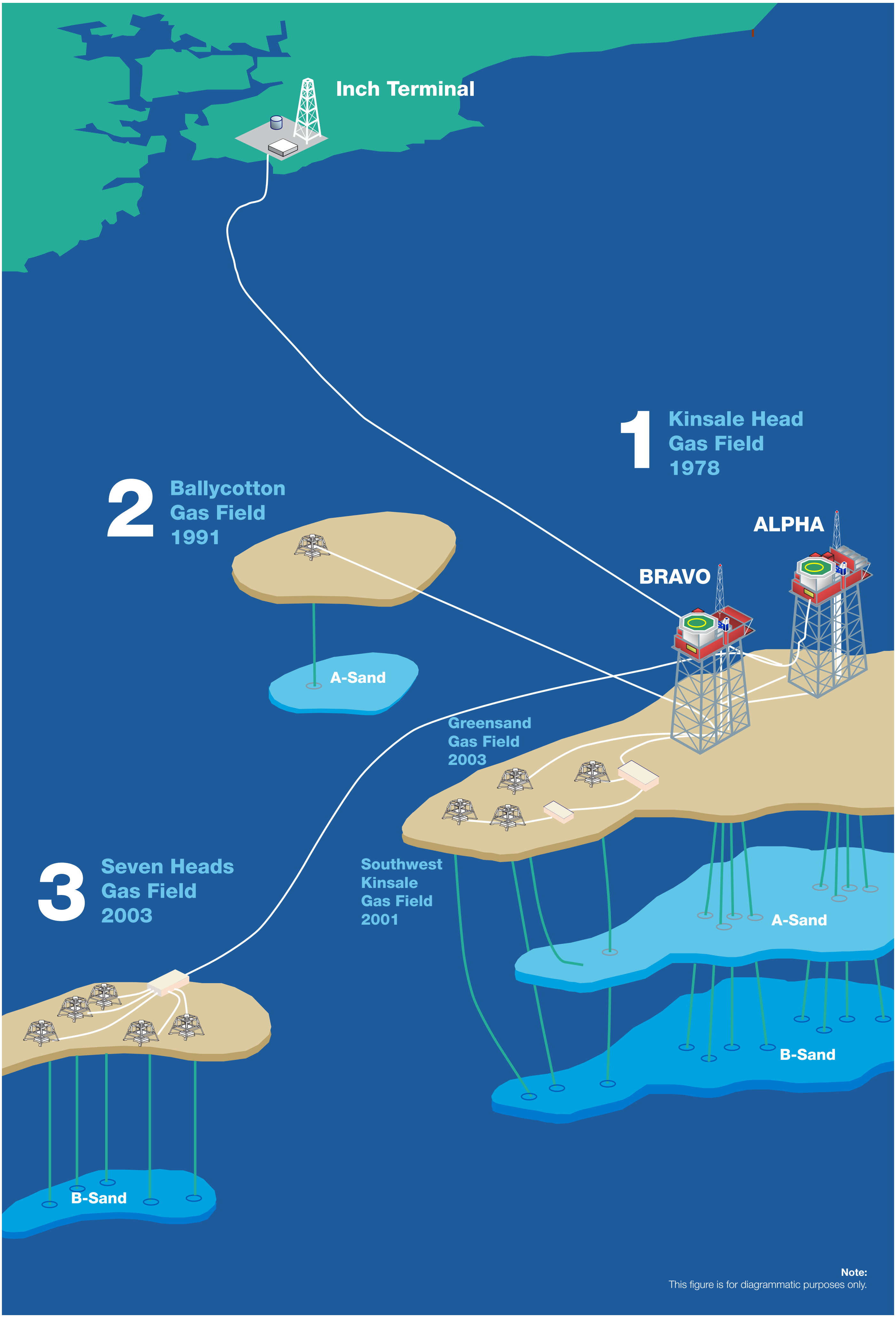
Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Key: Darker colours reflect months when marine mammals are most frequently observed off the coast of Cork While grey and harbour seals are found around the coast of Ireland, their occurrence offshore of the south coast and in the Kinsale Area is very low. The closest conservation site for marine mammals is Roaringwater Bay and Islands SAC, 76km to the west of the Kinsale Area, where both harbour porpoise and grey seal are designated features. Both these species are protected under the Habitats Directive and are listed on Annex II, and all cetaceans are listed on Annex IV..											
Marine reptiles	Five species have been recorded in the seas around Ireland: leatherback turtle, loggerhead turtle, Kemp's ridley turtle, green turtle and hawksbill turtle, with the leatherback turtle making up a significant majority of the sightings. Sightings in the wider region are concentrated off the south and west of Ireland, the southwest of England and the west coast of Wales. Most sightings occur in the summer, peaking in August.											
Conservation sites	Conservation sites in proximity to the Kinsale Area include Natura 2000 sites (SACs and SPAs), some of which are also OSPAR MPAs or coincident with Ramsar designations (e.g. Cork Harbour, Ballycotton Bay and Blackwater Estuary) which are designated as wetlands of international importance. With the exception of the export pipeline which is 4km from the closest conservation site (Cork Harbour SPA), the Kinsale Area facilities are at least 25km from the closest conservation site (Old Head of Kinsale SPA). National designations along the coast include Natural Heritage Areas and proposed Natural Heritage Areas, and are protected from damage, though they have largely terrestrial components.											
Other users	**Fisheries** Fisheries in the area provide valuable landings of primarily demersal fish but also of pelagic species and shellfish. The dominant fishing method in the area is demersal (otter) trawling, which is, in the waters around the Kinsale Area, mainly used to catch *Nephrops*, haddock and whiting. A monthly count of fishing vessels over 2014 and 2015 (by Anatec) showed the busiest months to be May (2014) and October (2015). Fishing effort by otter trawl is greatest in areas which correlate with muddy sediments where small but productive *Nephrops* grounds are located. There is an exclusion zone, bounded by a line of which is 500 metres at all points from a straight line joining the KA and KB platforms. This results in an elongated 500 metre exclusion zone around the KA, KB platforms and the entire stretch between them. where no fishing is allowed. The largest fishing ports near the Kinsale Area are Castletownbere and Dunmore East, which are both among the top four ports (by landings) in Ireland. Of the more local ports, the most significant are Cobh, Union Hall and Kinsale. ***Key: Darker colours reflect periods of increased fishing effort*** **Offshore energy** No offshore wind farms are located within or in close proximity to the Kinsale Area. There are a number of standard exploration licence areas (e.g. EL1/11 and EL4/05) and licensing options (e.g. LO17/2, LO16/30) adjacent, or in close proximity, to the Kinsale Area. **Ports and shipping** Shipping density in the coastal regions of the Celtic Sea is generally moderate, and higher along routes connecting major ports in the south including Cork and Waterford. These ports handled approximately 22% of goods handled by Irish ports in 2015. A charted anchorage area is present on the approaches to Cork Harbour, in addition to a larger informal area to the west of the export pipeline where ships, including tankers, anchor. No International Maritime Organisation (IMO) routeing measures are located in or close to the Kinsale Area. **Military activity** There is a military firing range (Danger Area D13) 21km to the west of the Kinsale Area and the UK air force danger area D064A 35km to the south east is for air combat training and high energy manoeuvres. **Subsea cables**											

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	The Seven Heads pipeline and umbilical cross the active Hibernia Atlantic "D" and the disused PTAT telecommunications cables. A separate Hibernia Express cable crosses over the Seven Heads pipeline and umbilical to the south of these. Two cables connecting Ireland France which may interact with Kinsale Area facilities are proposed/in planning: a 600km electricity interconnector (the Celtic Interconnector) and a fibre optic cable (Ireland France subsea cable). **Aggregates and marine disposal** No significant marine aggregate extraction takes place in Ireland, with areas to potentially supplement terrestrial aggregate sources identified in the western Irish Sea to the north. Permits have been granted for the disposal of up to 1.8 million tonnes of dredged material from Ringaskiddy, Cork Port and the Haulbowline Naval Base to the Roche's Point disposal site, located to the east of export pipeline. **Recreation and tourism** Recreational activities include sea angling, sailing/boating and whale and dolphin watching, primarily from Cork Harbour and Kinsale, as well as other smaller centres along the Cork coast.											
Cultural heritage	Wrecks over 100 years old and archaeological objects are present underwater in the study area, particularly in coastal waters and at the mouth of Cork Harbour, including two sunken U-boats. These are protected under the National Monuments (Amendment) Acts 1987 to 2004. The closest of these wrecks is UC42 which is located within 200m of the export pipeline to the Inch Terminal and 5.5km south east of Roches Point. The shipwreck of the Elizabeth Jane, sunk in 1916, is also noted to be located approximately 560m from the export pipeline (Ramboll, 2017b). Additionally, a number of other charted shipwrecks are located throughout the wider Celtic Sea area. No prehistoric or archaeological remains are known in the immediate vicinity of the Kinsale Area infrastructure.											
Climate, Meteorology and Air Quality	The area has a mild maritime climate with mean air temperatures varying between approximately 6-9°C in winter to 15-16°C in summer (seasonal mean temperatures for 1981-2010, Walsh 2012 and M5 Wexford Coast buoy observations 2004-2016, Met Eireann website). The predominant winds over the open waters south and west of Ireland are from the west and southwest (DCENR 2011), with mean winter winds (October to March) of 5.9m/s, and mean summer winds (April to September) of 4.9m/s. Sea fog is most frequent in summer. Ambient air quality monitoring at Monkstown, Cork Harbour (air quality zone D – rural background area) between August 2007 and March 2008 indicated that air quality metrics were generally below their respective lower assessment thresholds.											
Oceanography and Hydrology	The Celtic Sea is particularly susceptible to rough seas due to strong to gale force southwesterly winds. Swell distributions are dominated by swells from a south-west and west direction throughout the year, with mean significant wave heights varying between 1-1.5m in summer to 3m in winter (data for 15/07/2016 and 15/01/2016 respectively from Marine Institute monthly model means). Surface water temperatures range from 8-10°C in winter to 15-16°C in summer, while bottom temperatures show less variation and remain at around 8-10°C throughout the year (Connor et al. 2006).											
Ambient Underwater Noise	The Kinsale Area is a high-energy environment which experiences frequent strong winds in winter and considerable precipitation; as such, natural physical noise from waves and precipitation will be important components of ambient underwater noise in the area, particularly in winter. Moderate levels of noise from commercial shipping are to be expected, with notable contributions from passing vessels (≥750 per annum; mostly cargo) transiting to/from Cork and support vessels operating servicing the Kinsale platforms (DCENR 2011). Operations on the Kinsale platforms will also contribute to the ambient noise, generally emitting continuous wide-spectrum and tonal sounds (e.g. from rotating machinery such as turbines, generators, compressors) which are qualitatively similar to those from ships (DECC 2016). Noise from fishing vessels (e.g. propellers, winches, sonar, trawled gear in contact with the seabed) will also contribute to anthropogenic ambient noise in the area.											

Kinsale Area Decommissioning Project

Section 2

Overview of Infrastructure included in the Comparative Assessment


Inch Terminal
1
Kinsale Head
Gas Field
1978
2
Ballycotton
Gas Field
1991
ALPHA
BRAVO
A-Sand
Greensand
Gas Field
2003
3
Seven Heads
Gas Field
2003
Southwest
Kinsale
Gas Field
2001
A-Sand
B-Sand
B-Sand
Note:
This figure is for diagrammatic purposes only.

2 Overview of Infrastructure included in the Comparative Assessment

2.1 CA Relevant Infrastructure to be Decommissioned

The Kinsale Area facilities assessed within this CA have been defined with reference to the regulatory position outlined in Section 1.2 and do not include seabed and sea surface piercing structures which are not open to derogations under the definitions in OSPAR 98/3. The technical boundaries of the CA are:

- All pipelines and umbilicals, including spool pieces and jumpers at connecting points to infrastructure such as manifolds, wellheads, tees and platform J-tubes. The onshore section of pipeline to the Inch Terminal is also included.
- Protection materials including concrete mattresses, concrete culverts, grout bags and rock cover. This includes two infield crossings of the Ballycotton pipeline close to the Kinsale Bravo (KB) platform, and two telecommunications cable crossings of the Seven Heads export pipeline.

An overview of the pipelines, umbilicals and related protection materials considered in the CA is provided below (Section 2.2 and 2.3 and in Tables 4 to 6) and shown in Figures 2 to 5.

2.1.1 Residual Hydrocarbons

The hydrocarbons produced from the Kinsale Area fields are dry gas with a high methane content (~98.5mol%) and only very small quantities of hydrocarbon condensate (1-2m^3 annually) are expected to be produced at the time of decommissioning from the Seven Heads field. It is therefore not expected that the pipelines will contain any appreciable residual hydrocarbons, under all possible decommissioning scenarios, the pipelines will also have been displaced with seawater or inhibited seawater (seawater containing corrosion inhibiting chemicals).

It should also be noted in the consideration of decommissioning options, where activities around platforms and subsea tied-back well locations may disturb seabed sediments, that oil based drilling muds were only used in the drilling of one well in the Kinsale Area (Well 48/24-6), and only for the reservoir section; all cuttings were contained and removed for cleaning and disposal onshore. No material was discharged.

2.1.2 Chemical and Hydraulic Lines

Prior to decommissioning, all of the chemical lines within the umbilicals will have been displaced with seawater, eliminating discharges to sea from this source during or after decommissioning activities. These lines contain methanol and triethylene glycol (TEG) used for the prevention of hydrate formation. Both of these chemicals are in the Offshore Chemical Notification Scheme (OCNS) group E (those considered to have the least potential environmental hazard), methanol is categorised to Pose Little or No Risk to the environment (PLONOR).

It is proposed that the waterbased hydraulic fluid[2] used in the subsea hydraulic control system will remain in the lines, all or part of which may be lost during decommissioning and/or over time due to degradation of the umbilical, depending on the chosen options.

The total volume of hydraulic fluid in all the Kinsale Area umbilicals is approximately 29.5m^3. The hydraulic fluid is aqueous and has low toxicity to aquatic life. It is readily biodegradable and is not expected to bioaccumulate. Any release would, under the influence of local currents, rapidly disperse and dilute and will not result in in significant environmental effects.

[2] HW540 control fluid.

2.2 Inventory of Kinsale Area Pipelines and Umbilicals

The following summarises the pipelines and umbilicals assessed in the CA; their locations are shown in Figures 2, 3, 4 and 5.

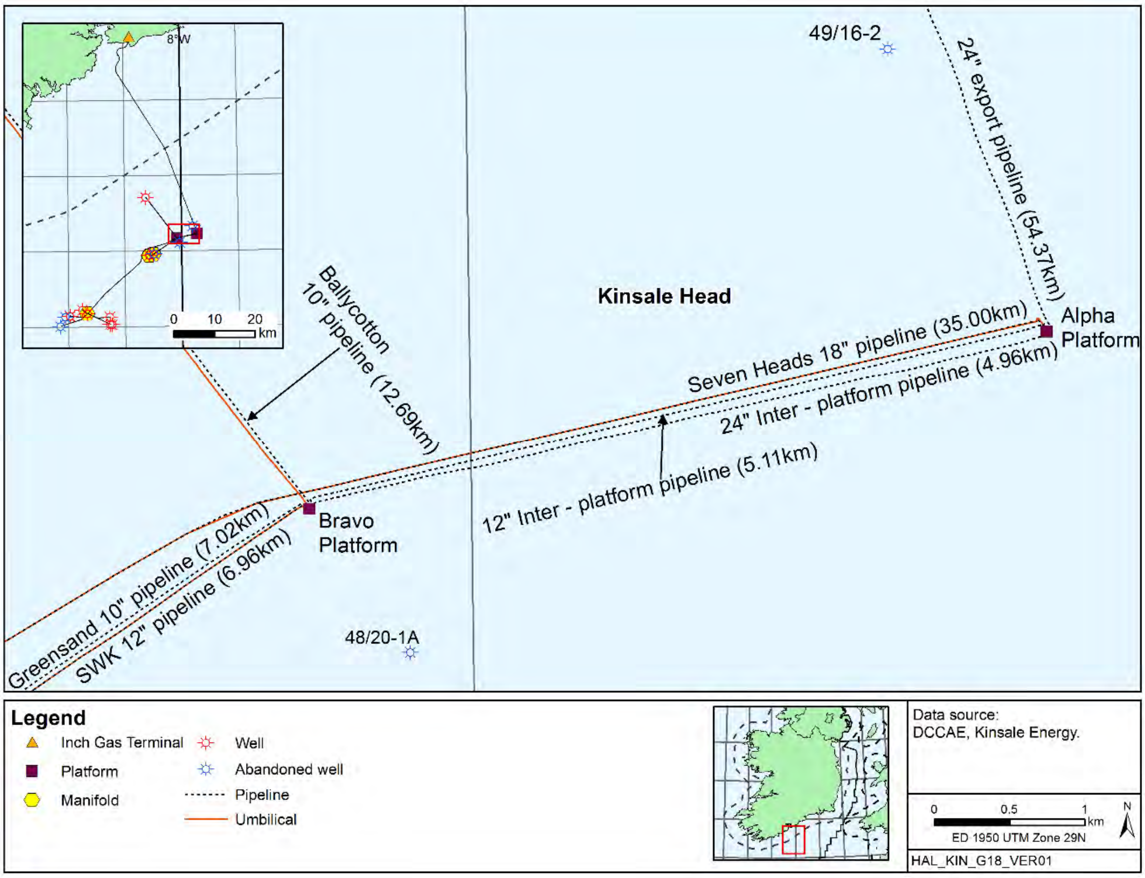
Export pipeline:

- The main export line from KA to the Inch Terminal consists of a 55.57km, 24” concrete coated pipeline installed in 1977.
- The pipeline is largely surface laid but with some buried sections and rock placement at strategic locations.
- The pipeline is buried from 2km seaward of the landfall and 1.2km inland of the landfall where it enters the Inch Terminal.

KA to KB infield pipelines:

- Two pipelines connect the KA and KB platforms, these are a 24” concrete coated pipeline (4.96km) and a 12” three layer polypropylene (3LPP) coated pipeline (5.11km).
- The pipelines were installed in 1977 and 2001 respectively and are both surface laid, with rock having been placed at strategic locations along the 24” pipeline.

Figure 2 Facilities overview: Kinsale Head

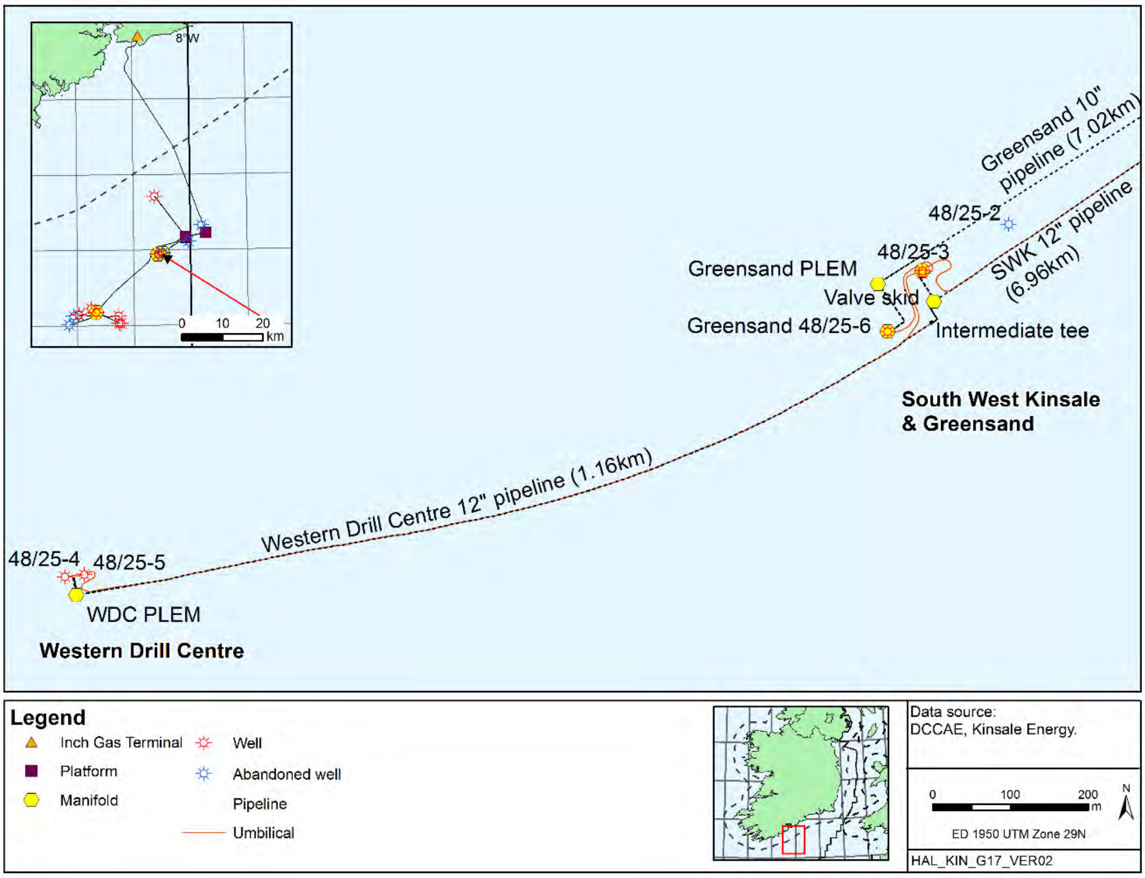


Southwest Kinsale and Greensand:

- Southwest Kinsale (SW Kinsale) is connected to the KB platform via a 6.87km, 12" pipeline installed in 1999, which is partially trenched or rock covered where required trenching depths could not be reached. Concrete protective mattresses cover its approach to the SW Kinsale valve skid and at its connection with KB.
- The SW Kinsale valve skid is tied into well 48/25-3 and an intermediate tee skid which connects the Western Drill Centre (WDC) extension.
- The WDC extension is a similar 12" pipeline 1.16km in length installed in 2001, which is rock-covered along its length.
- The WDC pipeline terminates at the WDC Pipeline End Manifold (PLEM) and is connected via spool pieces to the 48/25-4 and 48/25-5 wells.
- A subsea well completion (Greensand) in the "A" sand zone of SW Kinsale was installed in 2003 and the infrastructure is immediately adjacent to that of SW Kinsale, featuring a 7.02km 10" export pipeline which is rock-covered along its length to KB with the exception of a short section approaching the Greensand PLEM.
- Spool pieces connect the Greensand PLEM to well 48/25-6.

A common umbilical serves the SW Kinsale and Greensand infrastructure and runs parallel with the SW Kinsale pipeline and under the same protection materials. In the immediate vicinity of the SW Kinsale and Greensand wells/subsea infrastructure there are control umbilicals which are under concrete protection mattresses.

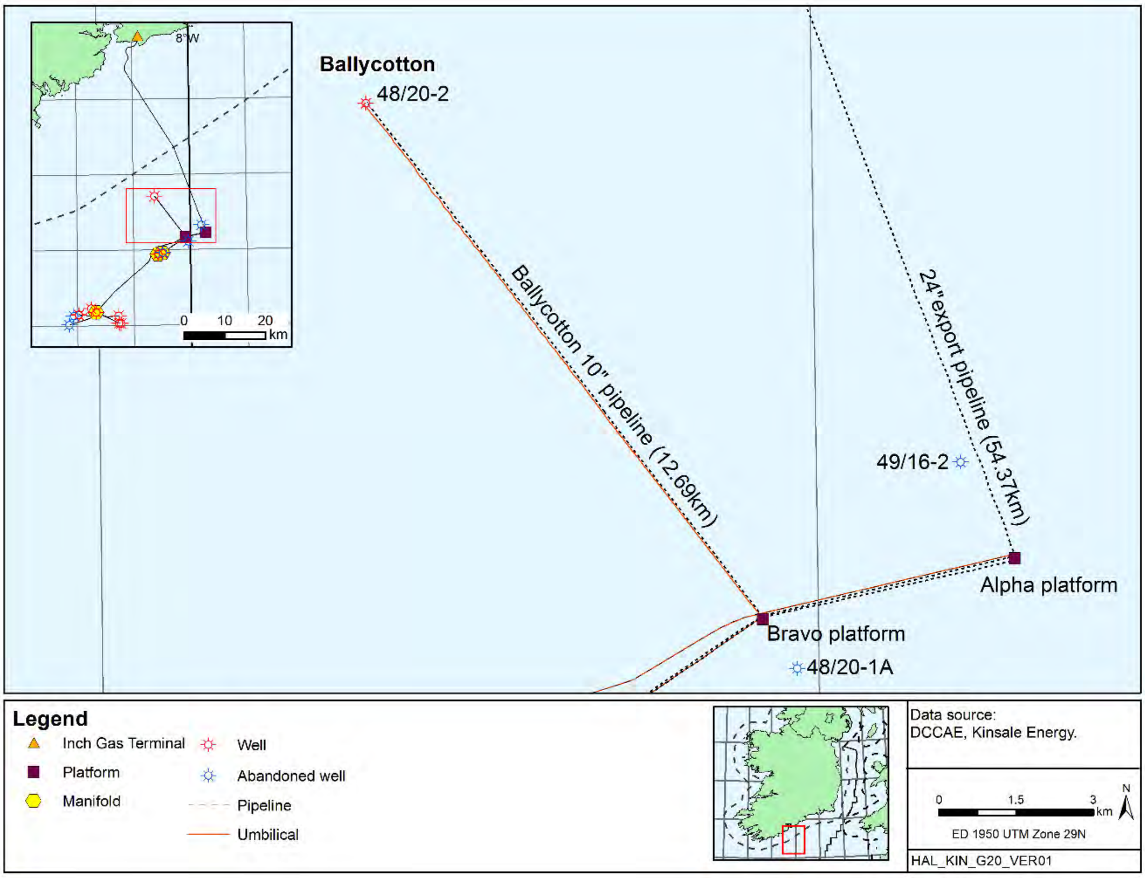
Figure 3 Facilities overview: Southwest Kinsale and Greensand



Ballycotton:

- The 12.69km 10" Ballycotton pipeline was installed in 1991, and connects well 48/20-2 to KB and is trenched throughout most of its length though with some exposed sections and mattress protection, particularly at the wellhead end which is extensively protected.
- The umbilical is trenched separately to the pipeline and is of similar length (13.00km).

Figure 4 Facilities overview: Ballycotton



Seven Heads:

- Seven Heads is connected to KA via a 35.00km concrete coated 18" pipeline installed in 2003, which is variously buried, exposed or rock covered.
- The control umbilical is laid alongside the pipeline and is subject to the same protection materials.
- The 18" pipeline terminates at the Seven Heads manifold, which connects the export line to six separate 8" flowlines and umbilicals of various lengths (0.06-7.45km).
- Only five of the infield pipelines and umbilicals are connected to active subsea wells, but all have rock cover or mattress protection.

Pipeline/umbilical crossings:

- The Seven Heads pipeline and umbilical cross the active Hibernia Atlantic "D" and the disused PTAT telecommunications cables. A separate Hibernia Express cable crosses over the Seven Heads pipeline and umbilical to the south of these (refer to Figure 1)..
- Additionally there are two infield crossings of the Ballycotton pipeline close to KB by the Seven Heads pipeline and umbilical, each of which is protected with concrete mattresses (Figure 4).

Figure 5 Facilities overview: Seven Heads

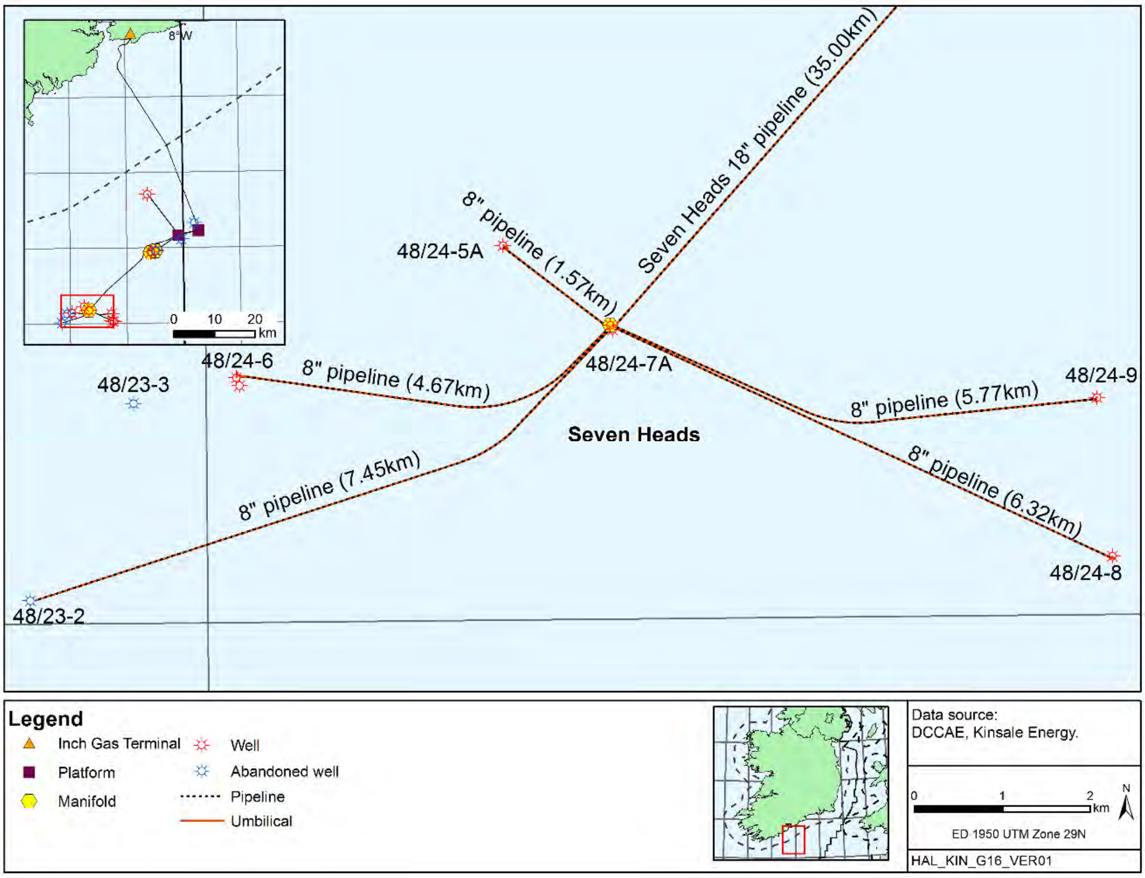


Table 4 Pipelines subject to Comparative Assessment

Pipeline	Description	Year installed	Status	Tie-in spools	Protection materials	Comments
Onshore						
Inch Terminal export pipeline to Inch Beach landfall	24″ X60 steel, 1.2km long	1977	Active	Inch Terminal pipeline entry buried with Inlet Stop Valve P149 in pit	25mm concrete coated section from the vegetation zone above the beach to 150m from Lowest Astronomical Tide (LAT)	
Kinsale Head, Southwest Kinsale, Greensand & Ballycotton						
Inch Beach landfall to Kinsale Alpha pipeline	24″, X60 steel, coal-tar epoxy and concrete coated 54.37km long	1977	Active	50mm concrete coated tie-in at KA.	Intermittent grout bag supports at 11 locations. Rock cover totals 5.8km, covering a number of strategic locations.	Significant number of non-critical freespans detected*. Cumulative freespan length 1,822m
Kinsale Alpha (KA) to Kinsale Bravo (KB) pipeline	24″ X52 steel, coal-tar epoxy and concrete coated 4.96km long	1977	Active	50mm concrete coated tie-in at KA and KB.	Rock cover totals 96m, covering a number of strategic locations.	12 non-critical freespans detected. Cumulative freespan length 205m
KA to KB pipeline	12″ X52 steel, 3LPP coated 5km long	2001	Active	25m spool underneath each jacket, 40m spool connecting pipeline at KA end.	No pipeline protection. 2 support ramps of grout bags at KA and KB tie-in spools. 34 mats (6x3x0.15m) used at each tie-in location at KA and KB.	8 non-critical freespans detected. Cumulative freespan length 188m
Southwest Kinsale pipeline	12″ X52 steel, 3LPP coated 6.96km long	1999	Active	36m spool at KB, vertical leg to riser end. Single spool between valve skid and 48/25-3 tree.	Rock cover totals 2.6km. 4 mats (5x3x0.15m) at SWK end and 20 mats (5x2.2x0.15m) at the KB end. Tie-in spools include 6 mats (5x2.2x0.15m) at KB and 8 mats (6x3x0.15m) at SWK.	No freespans identified.

Pipeline	Description	Year installed	Status	Tie-in spools	Protection materials	Comments
Extension pipeline to Western Drill Centre	12″ X52 steel, 3LPP coated 1.16km long	2001	Active	2 x 6" L-spools to WDC 48/25-4 and 48/25-5 trees. 34m long z-spool between skids at SWK.	Rock cover along entire length. 8 mats (5x3x0.15m) at WDC on PLEM to tree spools. 6 mats (5x3x0.15m) on spool between skids at SWK. 4 mats (5x3x0.15m) at SWK on pipeline end. 4 mats (5x3x0.15m) at WDC on pipeline end.	No freespans identified.
Greensand pipeline	10″ X52 steel, 3LPP coated 7.02km long	2003	Active	Two 10″ spools at KB. Two 6″ spools between the Greensand well (48/25-6) and PLEM and one 10″ spool connecting the PLEM to the greensand pipeline.	Rock cover along entire length. 10 mats (6x3x0.15m) at Greensand pipeline end and 13 mats at KB pipeline end. Spools with groutbag support at KB. KB spool protection includes 9 mats (6x3x0.15m). Well spool protection includes 13 mats (6x3x0.15m).	No freespans identified.
Ballycotton pipeline	10″ X52 steel, 0.5mm FBE coated 12.69km long	1991	Not active, well shut in	30m tie-in L- spool to 48/20-2 tree and 20m Z-spool at KB.	44 mats used for pipeline protection. Groutbag support at Ballycotton tree and KB spools. Grout bag L-shaped berm 8m long at tee spool. 4 kennel-type protection tunnel for 20m on tree tie-in spool along with 3 mats (5x3x0.15m). 105 mats on pipeline end at tree. 9 stabilisation mats (2.5x1.5x0.15m) on pipeline end at KB.	8m freespan identified.

Pipeline	Description	Year installed	Status	Tie-in spools	Protection materials	Comments
Seven Heads						
Seven Heads export pipeline	18″ X52 steel, concrete coated 35.00km long	2003	Active	Two 14″ tie-in spools, 44m and 36m in length at the manifold end. Two 14″ tie-in spools, 42m and 39m in length at the KA end.	10 mats (6x2x0.15m) and 25 mats (5x3x0.15m) at the manifold end. 41 mats (5x3x0.15m) on the pipeline end at KA. 3 mats (5x3x0.15m) at each of the two crossings over the Ballycotton pipeline and umbilical.	There are 3 communication cable crossings. The Seven Heads pipeline crosses over the Hibernia Atlantic "D" and the disused PTAT cable, while the Hibernia Express cable installed in 2015 crosses over the Seven Heads pipeline.
Seven Heads well pipelines	8″ X52 steel, PPL coated	2003	-	-	-	-
48/24-5A	1.57km long	2003	Active	8" spool, 44m long at the manifold.	22 mats (6x3x0.15m) and 4 mats (6x2x0.15m) at the manifold. 17 mats (6x3x0.15m) at the well.	No freespans identified.
48/24-6	4.67km long	2003	Active	Two 8" spools, 23m and 27m long at the manifold.	24 mats (6x3x0.15m) and 16 mats (6x2x0.15m) at the manifold. 27 mats (6x3x0.15m) at the well.	No freespans identified.
48/24-7A	0.06km long	2003	Active	8" spool, 60m long at the manifold.	12 mats (6x3x0.15m) and 3 mats (6x2x0.15m) at the manifold.	No freespans identified.
48/24-8	6.32km long	2003	Active	Two 8" spools, 39m and 35m long at the manifold.	16 mats (6x3x0.15m) and 5 mats (6x2x0.15m) at the manifold. 37 mats (6x3x0.15m) at the well.	No freespans identified.
48/24-9	5.77km long	2003	Active	Two 8" spools, 51m and 34m long at the manifold.	24 mats (6x3x0.15m) and 4 mats (6x2x0.15m) at the manifold. 12 mats (6x3x0.15m) at the well.	No freespans identified.

Pipeline	Description	Year installed	Status	Tie-in spools	Protection materials	Comments
48/23-2 (abandoned)	7.45km long	2003	Not active	Two 8” spools, 33m and 25m long at the manifold.	26 mats (6x3x0.15m) and 19 mats (6x2x0.15m) at the manifold. 8 mats (6x3x0.15m) at the well.	No freespans identified. Well F flowline is inactive and was never used; filled with seawater since installation; well not tied-in.

Source: Genesis (2011), Xodus (2016a), Anatec (2017), KEL as-built data for Seven Heads

**Non-Critical freespans are those which are too small to meet the criteria defined by the FishSAFE unit, which was developed to protect fishing vessels in UK waters from various hazards associated with the offshore industry, including pipelines, and includes information on spans that are considered to present a higher risk to fishermen. A FishSAFE span is defined as a span that is greater than 0.8m high and over 10m in length. Spans that satisfy the FishSAFE criteria are considered to present a higher risk from fishing gear snagging than smaller spans.*

Table 5 Pipeline burial status

Pipeline	Current burial status (m length surveyed)				
	Cumulative freespan length	Exposed	Buried	Rock cover	Mattressed
24" export pipeline from Inch Terminal to Inch Beach landfall	-	-	1,200	-	-
24" export pipeline from Inch Beach landfall to Kinsale Alpha	1,822	35,946	13,388	2,362	-
24" Kinsale Alpha (KA) to Kinsale Bravo (KB) pipeline	205	4,196	347	223	-
12" KA to KB pipeline	188	4,574	-	-	316
12" Southwest Kinsale pipeline	-	-	4,118	2,573	210
12" Extension pipeline to Western Drill Centre	-	7	-	1,130	19
10" Greensand pipeline	-	-	-	6,767	240
10" Ballycotton pipeline	8	1,534	10,802	15	310
18" Seven Heads export pipeline	-	13,480	12,436	8803	210
8" Seven Heads well pipelines:	-	-	-	-	-
Well 48/24-5A flowline	-	13	1,051	303	196
Well 48/24-6 flowline	-	4	2,322	1,916	373
Well 48/24-7A flowline	-	-	5	-	51
Well 48/24-8 flowline	-	9	1,944	4,151	195
Well 48/24-9 flowline	-	11	2,301	3,274	199
Well 48/23-2 flowline	-	5	5,778	1,407	284

Source: Fugro (2017) pipeline integrity survey

Note: The inshore section of the 24" pipeline is fully buried with no exposure

2.3 Inventory of Protection Materials

The protection materials used around the pipelines and umbilicals include:

- concrete mattresses on umbilical and pipeline approaches to manifolds, platforms and wellheads,
- concrete tunnels or culverts
- rock placement used as the main form of pipeline/umbilical protection or for freespan/exposure remediation, and
- grout bags used as supports.

The protection materials used for each of the pipelines and umbilicals is given in Tables 4 and 5 and is summarised in Table 6 below.

Table 6 Summary of pipeline and umbilical protective materials

Pipeline/umbilical	Length of rock cover (m)	No. concrete mattresses	Grout bags/concrete culverts
Pipelines			
24" export	2,362	-	Intermittent at 11 locations
24" KA to KB	347	-	-
12" KA to KB	-	68	2 support ramps at each KA and KB tie-in location
10" Ballycotton	15	161	Support at tree and KB tie-ins. L-shaped berm formed of grout bags 8m long at tee spool. Over 20 kennel-type ridged concrete protection tunnels at tree tie-in spool.
12" SW Kinsale	2,573	38	-
12" Western Drill Centre	1,130	22	-
10" Greensand	6,767	45	Support at KB tie-in
18" Seven Heads	8,803	82 (35 at manifold, 41 at KA, 6 at crossings)	-
8" well flowlines	11,052	272	-
Umbilicals			
Ballycotton	-	15	-
Greensand	-	23	-
SW Kinsale	As per pipeline	28	Used at pipeline crossing near KB, and 5 bags used for a ramp at J-tube entry. Used at WDC umbilical crossing.
Western Drill Centre	As per pipeline	38	-
Seven Heads	As per pipeline	As per pipeline at manifold plus 18 at KA	-

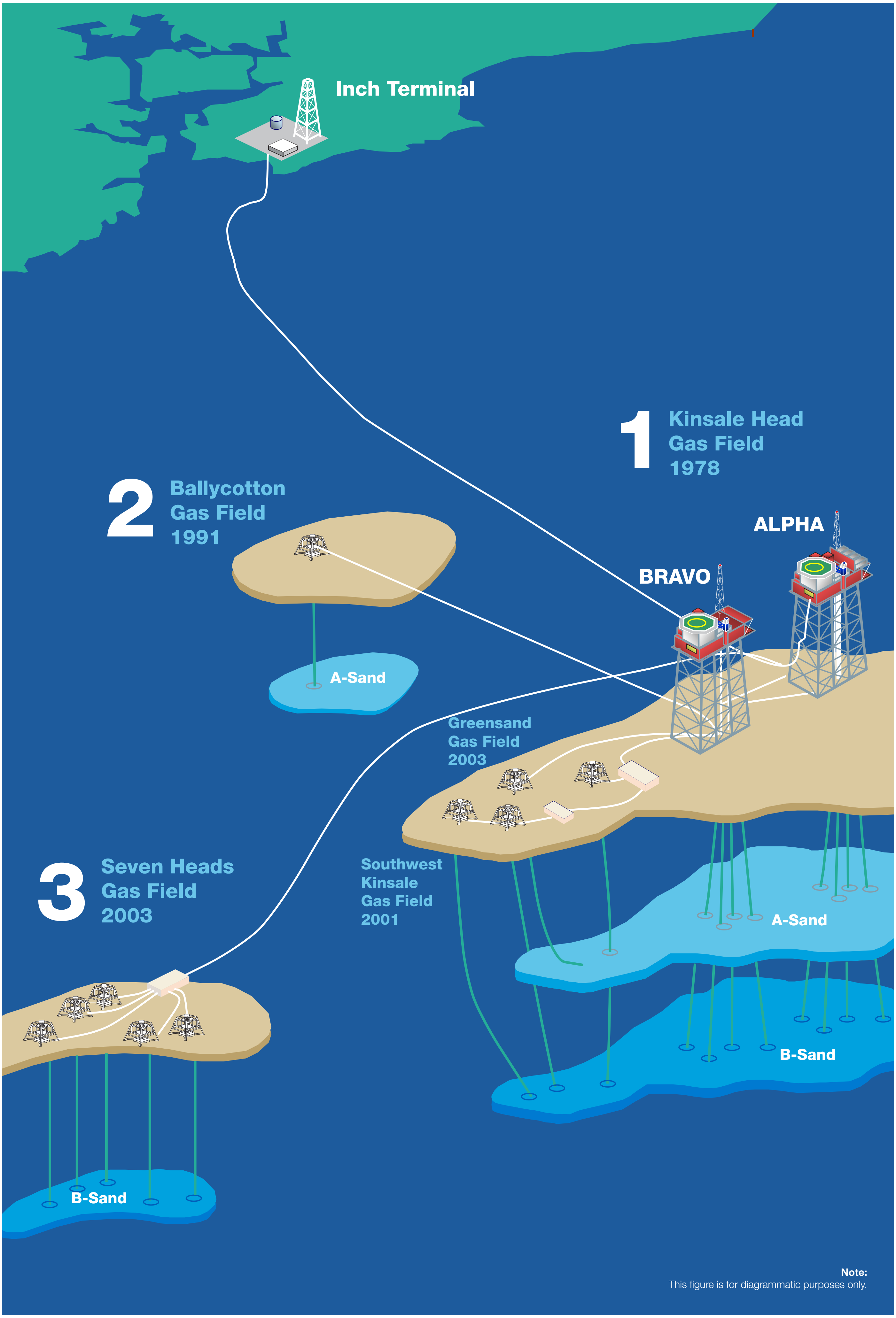
Pipeline/umbilical	Length of rock cover (m)	No. concrete mattresses	Grout bags/concrete culverts
Seven Heads infield umbilicals	As per pipeline	45	-
Total	**33,049**	**855**	

Notes: includes concrete mattresses used on pipeline approaches and to cover spool pieces at tie-in locations. Specific number of grout bags used is uncertain.
Source: Genesis (2011), Xodus (2016a), Fugro (2017), KEL as-built data for Seven Heads

Kinsale Area Decommissioning Project

Section 3

Decommissioning Options included in the Comparative Assessment



Inch Terminal
1 Kinsale Head Gas Field 1978
2 Ballycotton Gas Field 1991
ALPHA
BRAVO
A-Sand
Greensand Gas Field 2003
3 Seven Heads Gas Field 2003
Southwest Kinsale Gas Field 2001
A-Sand
B-Sand
B-Sand
Note:
This figure is for diagrammatic purposes only.

3 Decommissioning Options included in the Comparative Assessment

As part of the CA process the first step is to consider the options for re-use. Once completed then options for decommissioning(removal, part removal or leaving in place) were considered as detailed in the following sections.

3.1 Consideration of Infrastructure Re-use

The Kinsale Area facilities have been designed for dry gas production and processing, and for the majority of the facilities are close to or beyond their original design lives. Notwithstanding this, parts of the facilities may be suitable for re-use, depending on the service, particularly the main Kinsale and Seven Heads export pipeline.

Three potential re-uses have been considered at a high level. These are hydrocarbon production, offshore transport and storage aspects of carbon dioxide capture and storage (CCS) from onshore emitters, and offshore wind energy production.

Hydrocarbon Production:
The Kinsale Area facilities are not designed for liquid hydrocarbon or wet gas production and are unlikely to be suitable for such use. Some of the facilities could potentially be re-used for a future dry gas development as host infrastructure, however, there are currently no known commercial dry gas discoveries in the vicinity nor is Kinsale Energy aware of any firm drilling plans for dry gas prospects within tieback distance of any of the facilities. There are a number of appraisal wells planned in the Barryroe field and the 18" pipeline from Seven Heads to Kinsale Alpha, could possibly be used for export of associated gas from a potential development of that field.

Carbon Capture and Storage:
Kinsale Energy has carried out technical studies which would indicate that the main Kinsale Head reservoir may be suitable for CCS and also that some of the Kinsale Area facilities may be suitable for CO_2 transportation. There is currently no commercial case for a merchant CCS service as CO_2 prices are too low to justify the required investment, but this may change in the coming years. It is also noted that there is a proposal in Ireland's National Mitigation Plan for DCCAE to explore the feasibility of utilising suitable reservoirs for CO_2 storage within the next 5 years. A feasibility study into the use of the Kinsale Head reservoir for CCS is being undertaken by Ervia.

Offshore Wind Energy Production:
The main 24" export line/landfall could possibly have a use as a cable conduit. Kinsale Energy is not aware of any wind farm development being considered for the vicinity of any the Kinsale Area facilities, so no proposal is considered further.

Should future circumstances change with respect to the potential for any of the re-use options identified above, then the leave *in situ* options, particularly with regard to the 18" Seven Heads export and main 24" export pipeline and landfall, could facilitate the re-use of that infrastructure in the future. In view of this, the *in situ* decommissioning options for the two export pipeline assume that these pipelines will be filled with inhibited seawater to enable potential re-use following decommissioning.

No other re-use options have been identified at present.

3.2 Decommissioning Options Assessed

The options to decommission the pipelines and umbilicals have been studied and informed through a number of preceding reports which have made use of decision trees largely considering safety, technical and cost criteria (Xodus 2016b), and a broader study incorporating Net Environmental Benefit Analysis (NEBA) which included those previously mentioned aspects in addition to having a more environmental focus, taking an ecosystem services approach (Ramboll 2017a, b). These studies considered a variation on four high level options considering complete or partial removal, and the leaving of infrastructure *in situ* with varying degrees of remediation.

Technical input was provided by Kinsale Energy and the respective report authors such that the options derived from those studies were considered to be realistic and technically feasible. The technical feasibility of any option was considered in relation to industry experience to date, including from proposed approaches to the decommissioning of pipelines for fields in the North Sea, and related summary reports of experience to date (e.g. OGUK 2013).

For the onshore section of the export pipeline (defined as that landward of the high water mark) the following four options were initially taken forward to the comparative assessment:

1. Removal and disposal of the pipeline in its entirety.
2. Leave pipeline *in situ* and fill with grout.
3. Leave pipeline *in situ* and fill with inhibited water.
4. Leave pipeline *in situ* and undisturbed.

For the offshore pipelines and umbilicals, the options initially taken forward to comparative assessment were:

1. Full removal of the pipeline or umbilical.
2. Partial removal of the pipeline or umbilical, with more than 50% exposed sections removed.
3. Leave pipelines and umbilicals *in situ* with more than 50% exposed section subject to rock cover.
4. Leave pipelines and umbilicals *in situ* with minimal intervention (disconnection). Rock cover applied to mattresses when left *in situ*.

3.2.1 Refinement of Options

Offshore

An initial consideration of the above options was made for each individual pipeline and umbilical described in Section 2.2 against the criteria outlined in Section 4, which resulted in 41 individual option considerations. On review of the initial results from this CA process, and also the output from Ramboll (2017a, b), it was considered that certain pipelines and umbilicals could be grouped and assessed together in view of their similarity (e.g. type and burial status). Additionally, as indicated in Section 2.2, with the exception of Ballycotton all umbilicals are laid next to their associated pipelines and share the same protection materials (e.g. rock or concrete mattresses). The initial set of options included those for umbilicals separately to those of pipelines, including for full removal or the removal and remediation of umbilical ends. In practice, it is unlikely that the decommissioning of the umbilicals would take place separately and it was regarded that these could be assessed alongside their respective pipelines. Ramboll (2017a, b) considered all infrastructure individually as per the initial set of options, and noted that this may be overly conservative in some instances, and concluded that it was realistic that the option chosen to remove pipelines would correspond to that for the umbilicals. Moreover, the similarity in the decommissioning options for each pipeline or umbilical resulted in CA scoring which was either not significantly different or the same for multiple options. For these reasons, and to avoid the consideration of the same potential impact twice (for example the removal of concrete mattresses, deburial or the removal of rock cover shared by the infrastructure), umbilicals and pipelines were considered together. As the Ballycotton pipeline and umbilical are laid separately they were assessed as such, but in keeping with the results of the initial CA process and their comparable installation method and burial status, it was regarded that whichever option was chosen for pipeline and umbilical decommissioning would be the same. The grouping resulted in two types of offshore pipeline/umbilical being defined along with their associated options. These groups were:

- pipelines which are surface laid or exposed along much of their length and,
- pipelines and umbilicals which are largely under protective materials or buried.

In addition to refining the process by grouping similar pipelines/umbilicals, the initial consideration also allowed for the further definition of options for these groups. For example the consideration of partial removal for those pipelines largely under protective materials or buried was not considered to be appropriate (e.g. as the results would not be appreciably different to the full removal option), and the results from the initial consideration also noted that the additional safety, technical and environmental risks from partial removal were not met by notable reductions in third party risks, for example, compared to the equivalent option using rock cover. The following options were taken forward for further consideration in the Comparative Assessment:

For surface laid pipelines and those exposed along much of their length (larger pipelines and the 12” KA-KB pipeline):

- fully remove,
- leave *in* situ and rock cover more than 50% exposed sections and ends, or
- leave *in situ* and rock cover ends and any freespans

For pipelines and umbilicals largely under protective materials or buried (smaller infield pipelines):

- fully remove, or
- leave *in situ* and rock cover ends and any freespans

Onshore

Consideration was given to the effects of continued degradation of the pipeline materials post decommissioning, and whether this could result in possible future effects. Onshore, it may result in eventual pipeline and trench collapse under the local road and through agricultural land. Therefore, on review of this consideration it was considered that the last onshore option, leave pipeline *in situ* and undisturbed, was not a technically suitable option.

Following the above process of options refinement, a consideration was made of a reduced set of 16 options listed in Table 7 below.

Table 7 Options considered for the Comparative Assessment of Kinsale Area pipelines and umbilicals

Option No.	Description
Onshore	
1x	Full removal
1y	Leave *in situ* and fill with grout
1z	Leave *in situ* and fill with inhibited water
Offshore: Kinsale Head, Southwest Kinsale, Greensand & Ballycotton	
1x	24" export pipeline: Full removal
1y	24" export pipeline: leave *in situ* and rock cover on pipeline where 50% or more exposed. Removal of pipeline ends and remediate with rock cover
1z	24" export pipeline: leave *in situ* and rock cover freespans. Removal of pipeline ends and remediate with rock cover
2x	24" and 12" KA to KB pipelines: Full removal
2y	24" and 12" KA to KB pipelines: leave *in situ* and rock cover on pipeline where 50% or more exposed. Removal of pipeline ends and remediate with rock cover
2z	24" and 12" KA to KB pipelines: leave *in situ* and rock cover freespans. Removal of pipeline ends and remediate with rock cover
3x	12" SW Kinsale pipeline, 12" Western Drill Centre, 10" Greensand, 10" Ballycotton & all associated umbilicals: Full removal
3z	12" SW Kinsale pipeline, 12" western drill centre, 10" Greensand, 10" Ballycotton & all associated umbilicals: leave *in situ* and rock cover freespans (only 1 has been identified on the Ballycotton pipeline). Removal of pipeline/umbilicals ends and remediate with rock cover
Seven Heads	
1x	18" export pipeline and umbilical: Full removal
1y	18" export pipeline and umbilical: leave in situ and rock cover on pipeline where 50% or more exposed. Removal of pipeline ends and remediate with rock cover
1z	18" export pipeline and umbilical: leave *in situ*. Removal of pipeline ends and remediate with rock cover
2x	8" flowlines and well umbilicals: Full removal
2z	8" flowlines and well umbilicals: leave *in situ*. Removal of flowline/umbilicals ends and remediate with rock cover

3.2.2 Assumed Decommissioning Options Methodology

High level decommissioning method statements (refer to Appendix B) were prepared to outline the assumed approach to each of the above options to provide context to the assessment of options (see Section 5). These are consolidated from the method statements produced as part of the NEBA

(Ramboll 2017a, b) process to reflect the reduced set of options. The approaches are summarised below for each option.

Table 8 High level summary of removal methods

Option type	Overview of methods
Onshore Pipeline	
x - full removal	• Excavate pipe trench • Cut pipeline into manageable lengths • Remove pipeline sections Fill trench with suitable material and reinstate to pre-existing condition
y - leave *in situ* and fill with grout	• Plug pipeline at seaward end of onshore pipeline • Fill pipeline with grout from terminal
z - leave *in situ* and fill with inhibited water	• Plug pipeline at seaward end of onshore pipeline • Fill pipeline with inhibited water from Kinsale Alpha
Offshore Pipelines and Umbilicals	
x – full removal	• Mass flow excavate any rock covering. • Excavate buried pipeline sections. • Remove protective materials (mattresses and grout bags). • Mechanical shears are used to cut the pipeline into 24m sections. • Remove spools and pipeline sections using a cut-and-lift method. • Rock placement in excavated trench.
y – leave *in situ* and remediate exposed (>50%) sections and ends	• Remove protective materials (mattresses and grout bags) where these are located over sections of pipeline or umbilical ends to be removed. • Mechanical shears are used to cut the pipe ends/spool pieces into sections and remove using a cut-and-lift method. • Rock placement on pipeline sections >50% exposed. • Rock placement on pipeline ends and remaining protective materials.
z – leave *in situ* and remediate freespans and ends	• Remove protective materials (mattresses and grout bags) where these are located over sections of pipeline or umbilical ends to be removed. • Mechanical shears are used to cut the pipe ends/spool pieces into sections and remove using a cut-and-lift method. • Rock placement on pipeline sections containing freespans • Rock placement on pipeline ends and remaining protective materials.

3.2.3 Protection materials

Protection materials have been deployed across portions of the pipeline and umbilical infrastructure present in the Kinsale Area as shown in Section 2.3.

Options involving the removal of part or all of the pipeline/umbilical sections will also require the removal of pipeline covering, which may be onshore or offshore sediments (unburial) or rock/concrete protection materials. Rock would not be recovered from the seabed in these options but instead displaced, and additional material may be used to remediate trenches generated through pipeline excavation and/or to remediate pipeline ends. Where pipelines have existing crossings with 3rd party infrastructure (e.g. the Seven Heads pipeline and umbilical crossings), these would remain to prevent potential damage.

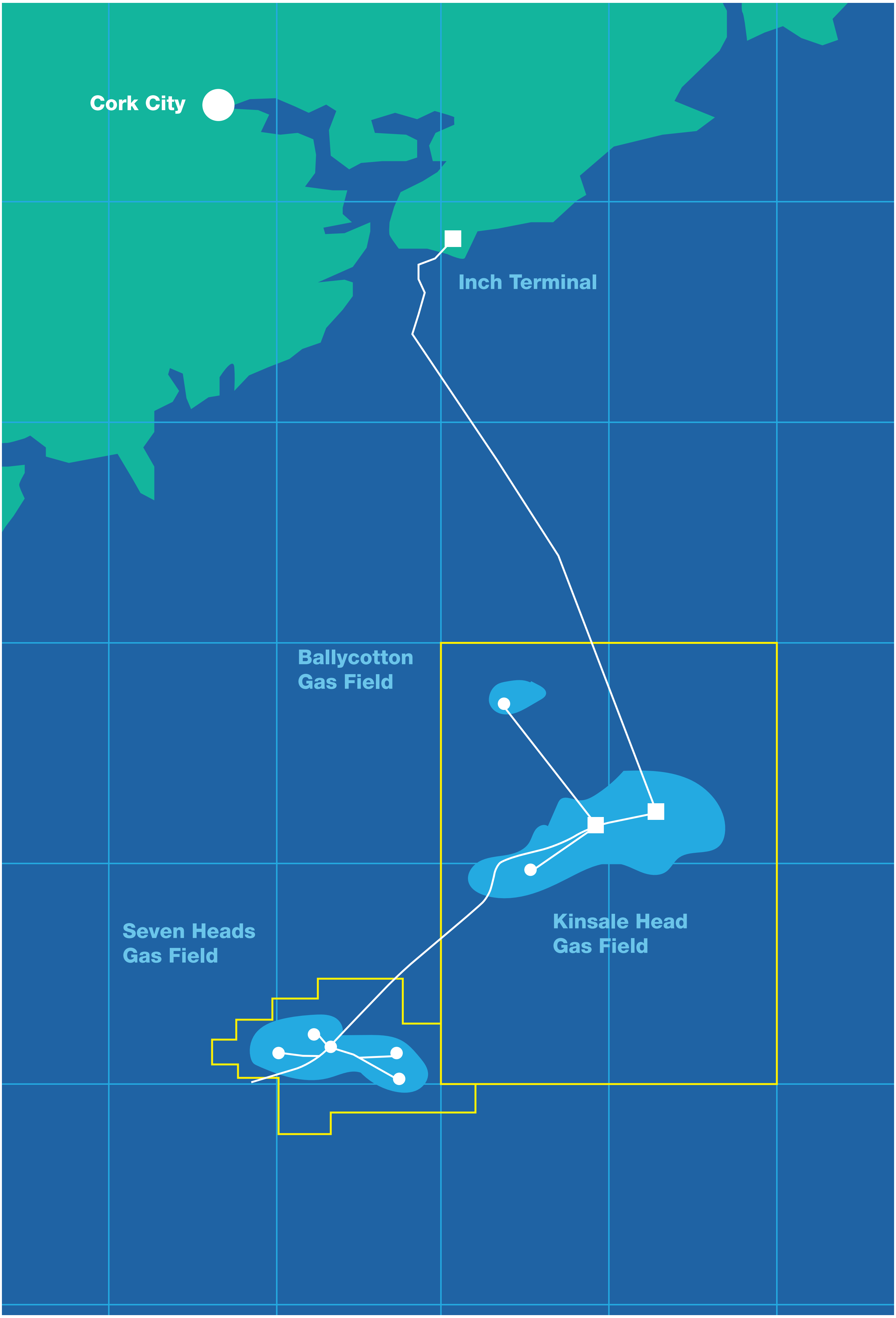
There are a number of reasons to consider leaving protection materials *in situ* including technical recoverability (e.g. where they may have become buried) and safety (e.g. where mattresses have degraded due to age). In the options considered it is assumed that the concrete mattress and grout bag materials are removed only when necessary to allow the removal of the facilities underneath. The method of removal for these items is yet to be decided, but may include speed loaders or cargo nets, and a number of other novel methods are also emerging to the market as decommissioning activity becomes more prevalent (see Jee Ltd. 2015). If any concrete mattresses and grout bags are to be left in place they will continue to provide a pipeline stabilisation and protection function. It has been assumed that rock will be placed over the mattresses, and the implications of this approach are discussed in Section 5.

Whilst the assessment assumes that waste concrete to be removed will be returned to landfill, this is yet to be confirmed and all or some concrete may be recycled. This is reflected in the uncertainty weightings for relevant sub-criteria in the assessment.

Kinsale Area Decommissioning Project

Section 4

Comparative Assessment Process


Cork City
Inch Terminal
Ballycotton
Gas Field
Seven Heads
Gas Field
Kinsale Head
Gas Field

4 Comparative Assessment Process

The framework for conducting the Comparative Assessment uses qualitative and quantitative data to evaluate the alternative decommissioning options outlined in Section 3. This framework draws from OSPAR 98/3 and OGUK (2015) guidance. The latter was developed to provide both a robust and consistent approach to Comparative Assessment for installations where derogation under OSPAR 98/3 could be considered, and in relation to pipelines, and has been widely applied to such assessments in the UK sector since its publication. The methodology uses a scoring system to assess each of the proposed decommissioning options for the pipelines, umbilicals, and protection materials with the results of this shown in Section 5.

4.1 Assessment Criteria and Scoring

Criteria for evaluating the potential impact of the various options were developed for safety, environment, technical feasibility, society and cost categories. The Comparative Assessment used a scoring matrix (see OGUK 2015). For each of these categories, a number of sub-categories were incorporated, these are:

- The potential risk to life of offshore and onshore personnel of each option considered.
- All potential impacts (including cumulative effects) on the marine environment, including exposure of biota to contaminants, other biological impacts arising from physical effects, and interference with other legitimate uses of the sea.
- All potential impacts on other environmental receptors, including emissions to the atmosphere, leaching to groundwater, discharges to surface fresh water and effects on the soil.
- Consumption of natural resources and energy associated with reuse and recycling.
- Other consequential effects on the physical environment which may be expected to result from the selected option.
- Potential risk of project failure and technical challenge.
- Potential impacts on amenities, the activities of communities and on future uses of the environment.
- Costs of each option.

The sub-categories were scored using a five point classification based on the relative risk or expected magnitude of effect from each option. The criteria and scoring matrix is shown in Table 9.

The sub-criteria were scored on a five point scale ranging from 1 (Very Low) through to 5 (Very High), where 1 represents best performance/least significant impact/lowest risk and 5 worst performance/largest significant impact/highest risk. Scores for the sub-criteria were then weighted on a three point scale (see Table 10) according to the level of definition and understanding of methods, equipment and hazards (“uncertainty”). For example, while certain proposed activities are well established and with extensive experience, their application at the scales which would be required for decommissioning are such that there is uncertainty in terms of risk and technical feasibility, or there may be uncertainty in the ability to recycle certain materials (e.g. concrete from pipeline coatings or mattresses) or less predictable variables such as weather sensitivity. The scale ranges from Low Uncertainty where there is a high definition and understanding of methods, equipment and hazards (weighting x 1), to High Uncertainty, where there is a low level of definition and understanding of methods, equipment and hazards (weighting x 2).

Final scores for each criterion were recorded in matrix format (see Appendix A) with relative ranking for each option derived from the weighted scores using the matrix in Table 11.

Where quantitative data are used, these have been based on data from supporting decommissioning studies, i.e. quantitative estimate total of PLL (Potential for Loss of Life) of offshore personnel, CO_2 emissions (tonnes), proportion of material to be recycled and cost estimates are based on the approach, data and estimates in Ramboll (2017a, b), later refined with input from Kinsale Energy. Qualitative assessment is based on a range of sources including regional and site specific data, supported by the parallel decommissioning environmental assessment process and wider expert knowledge of experience in the strategic and project level assessment of offshore oil and gas activities, developments and decommissioning activities.

Table 9 Relative risk and impact criteria scoring

Criteria	Sub criteria	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
Safety	Risk to personnel offshore during decommissioning operations (Potential Loss of Life)	>0.00001	>0.0001	>0.001	>0.01	>0.1
Safety	Risk to personnel onshore during decommissioning operations	No risk. No onshore disposal elements	Minor/first aid. Handling <500 tonnes of material	Medical aid/lost time injury. Handling >500 tonnes of material.	Permanent disability/fatality	Multiple fatalities
Safety	Risk to divers during decommissioning operations (PLL)	>0.00001	>0.0001	>0.001	>0.01	>0.1
Safety	Risk to 3rd parties and assets during decommissioning operations	No risk	Loss of access to operational area	Interference with 3rd party operations altering safety risk	Damage to 3rd party asset/damage to vessel	Damage to 3rd party asset requiring remediation/loss of vessel
Safety	Residual risk to 3rd parties	No risk	Potential snagging risk	Damage/loss of fishing gear	Damage to vessel	Loss of vessel

Criteria	Sub criteria	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
Environment	Chemical discharge	None	PLONOR chemicals only	No warnings or substitution labels RQ<1	Warning labels RQ>1	Warnings and substitution labels RQ>1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	0 - 1% of existing footprint	1 - 10% of existing footprint	10% - 50% of existing footprint	>50% - 100% of existing footprint	>100% of existing footprint
Environment	Total CO_2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock cover)	<1000t	1,000-5,000t	>5,000-10,000t	>10,000-25,000t	>25,000t
Environment	Proportion of potential recyclable material returned	>80%	50% - 80%	30% - <50%	10% - <30%	<10%
Environment	Proportion of total landfill material returned	<10%	10% - <30%	30% - <50%	50% - 80%	>80%
Environment	Conservation sites and species (including noise effects)	No impact	Potential effects but unlikely to be detectable as within normal variability	Minor detectable effects with rapid recovery	Effects detectable, not affecting site integrity or species population	Significant effects on site integrity or population
Environment	Loss of containment to the environment of chemicals, hydrocarbons	None	Slight Impact Reportable spill	Minor Impact/ Localised Impact Spill requiring Tier 1 response	Major Impact Spill requiring Tier 2 response	Massive Impact Spill requiring Tier 3 response

Criteria	Sub criteria	Very Low	Low	Medium	High	Very High
		1	2	3	4	5
Technical	Technical feasibility	Routine operations with high confidence of outcomes Very low risk of failure. Low technical complexity	Routine operations with good confidence of outcomes Low risk of failure.	Non-routine operations but with good experience base Low risk of failure. Medium technical complexity	Non-routine operations with limited experience base Moderate risk of failure.	Untried technique Higher risk of failure. High technical complexity
Technical	Weather sensitivity	Operations not weather sensitive	Operations are little affected by weather	Requires good weather window	Requires typical summer good weather window	Requires long good weather window
Societal	Residual effect on fishing, navigation or other access (including cumulative)	No effect	Access to area unrestricted	Access to area with charted obstructions	Access to area with uncharted debris and obstructions	Closed access to area
Societal	Coastal communities	No impact	Impacts within normal variability of onshore operations	Short term nuisance during onshore operations	Medium term nuisance during onshore operations	Long term nuisance during onshore operations
Economic	Total cost	<€2million	€2-5 million	€5-10 million	€10-20 million	>€20 million
Economic	Residual liability including monitoring and remediation if necessary	No residual liability	Surveys and remediation unlikely to be required	Survey requirement anticipated but at declining frequency	Surveys and remediation likely to be required in each 5 year period	Annual survey and potential for remedial work

Table 10 Uncertainty weighting

Increasing uncertainty		
x 1	**x 1.5**	**x 2**
High level of definition and understanding of methods, equipment and hazards	Moderate level of definition and understanding of methods, equipment and hazards	Low level of definition and understanding of methods, equipment and hazards

Table 11 Ranking of weighted scores

Impact / Consequence	1 (Low)	1.5 (Medium)	2 (High)
5 (Very High)	5	7.5	10
4 (High)	4	6	8
3 (Medium)	3	4.5	6
2 (Low)	2	3	4
1 (Very Low)	1	1.5	2

4.2 Comparative assessment workshop

A workshop was held to discuss the initially identified different decommissioning options involving a team with expertise in each of the assessment criteria. The team included:

Kinsale Energy

Fergal Murphy (Chief Executive Officer)

Mike Murray (Head of Engineering and Projects)

Dave Garner (Environment Lead)

John Kelleher (Marine Coordinator)

John Boyhan (Project Engineer)

Anthony McDonnell (Health Environment & Safety Manager)

Maurice McCarthy (Production Manager)

Steve Davis (Engineering & Maintenance Manager)

Jennifer Ryan (Process Engineer)

Arup

Paul Brady (Associate Director)

Clodagh O'Donovan (Associate Director)

Ria Lyden (Senior Consultant)

Sheila O'Sullivan (Senior Engineer)

Hartley Anderson

John Hartley (Director)

Richard Trueman (Principal Consultant)

The workshop commenced with a brief presentation summarising the Comparative Assessment process, the assessment criteria and that in line with OSPAR Decision 98/3, assessment conclusions should be based on scientific principles with clear links to supporting evidence and arguments.

The team reviewed and agreed the inventory of pipelines and umbilical infrastructure to be included within the assessment (see Tables 4 and 5).

The criteria and methodology drafted to assess each option were then reviewed, modified where necessary and agreed upon (see Section 4.1 and Tables 9 - 11), before progressing with the Comparative Assessment. Using the agreed criteria and methodology, the team then considered each option in turn, within their area of expertise, assigning impact values and level of uncertainty values to generate an overall assessment of the option.

The assessment of each option was informed by the method statements from the Net Environmental Benefit Analyses (NEBA, Appendices 2 of Ramboll 2017a, b) which set out the key technical assumptions with respect to the execution of the work itself, including:

- recovery methods proposed
- vessel requirements and schedule (duration of activity)
- labour and time requirements by job category
- fuel consumption associated with vessel time
- estimated costs for each engineering activity
- area of seabed directly impacted by proposed activity
- material recovery (potential waste streams)
- greenhouse gas emissions estimates for vessel use and recycling
- an assessment of overall technical complexity

Further clarifications on the decommissioning assessment were made by correspondence following the workshop, including:

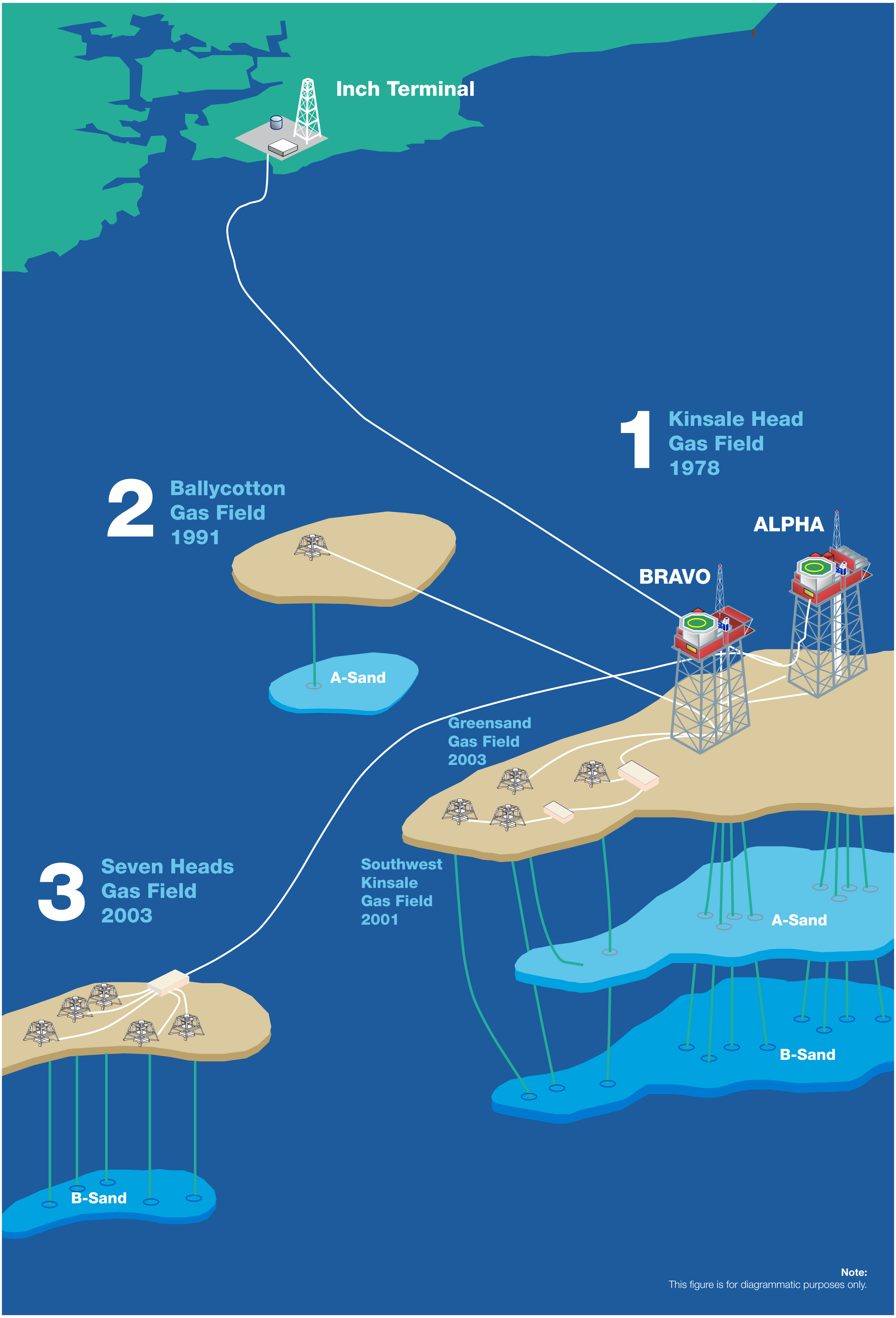
- an initial assessment narrative and outcome using the full set of NEBA options as evaluated at the workshop,
- consolidated method statements prepared by Kinsale Energy (see Section 3.2.1),
- the treatment of protection materials (see Section 3.2.3),
- resulting adjustments to final options and scores (see Appendix A for final scoresheets), and
- assessment of final options by Kinsale Energy, Arup and Hartley Anderson..

Section 5 and 6 contains the outcome of the Comparative Assessment process, including narrative consideration of options and recommendations relating to the preferred options.

Kinsale Area Decommissioning Project

Section 5

Comparative Assessment Evaluation


Inch Terminal
1
Kinsale Head
Gas Field
1978
2
Ballycotton
Gas Field
1991
ALPHA
BRAVO
A-Sand
Greensand
Gas Field
2003
3
Seven Heads
Gas Field
2003
Southwest
Kinsale
Gas Field
2001
A-Sand
B-Sand
B-Sand
Note:
This figure is for diagrammatic purposes only.

5 Comparative Assessment Evaluation

5.1 Introduction

A narrative summary of the comparative assessment outcome for each option relative to each criterion is provided below.

5.2 Safety

5.2.1 Safety Importance

Safety risks are of high importance in the consideration of the decommissioning options, particularly as experience in some of the proposed operations is relatively limited to date, the work could involve high levels of activity with multiple vessels on location for long durations, and there is the potential for integrity issues with some of the infrastructure due to its age or design (e.g. grout bags and mattresses, and where concrete coatings are present on pipelines). Operations which take long periods of time may also be subject to extension through weather (also see Section 5.4).

Despite these potential sources of effect there is the ability to influence the safety risk associated with the operations for each option, including through the adherence to Kinsale Energy's Health and Safety policy, and hazard and effects management process which must demonstrate that risks have been reduced to As Low As is Reasonably Practicable (ALARP), and through standard risk reduction procedures including (but not limited to) contractor selection and audit, and training. Additionally, risks are also posed to third parties during offshore works both in the short-term (through physical presence) and longer-term depending on the degree of removal and remediation proposed.

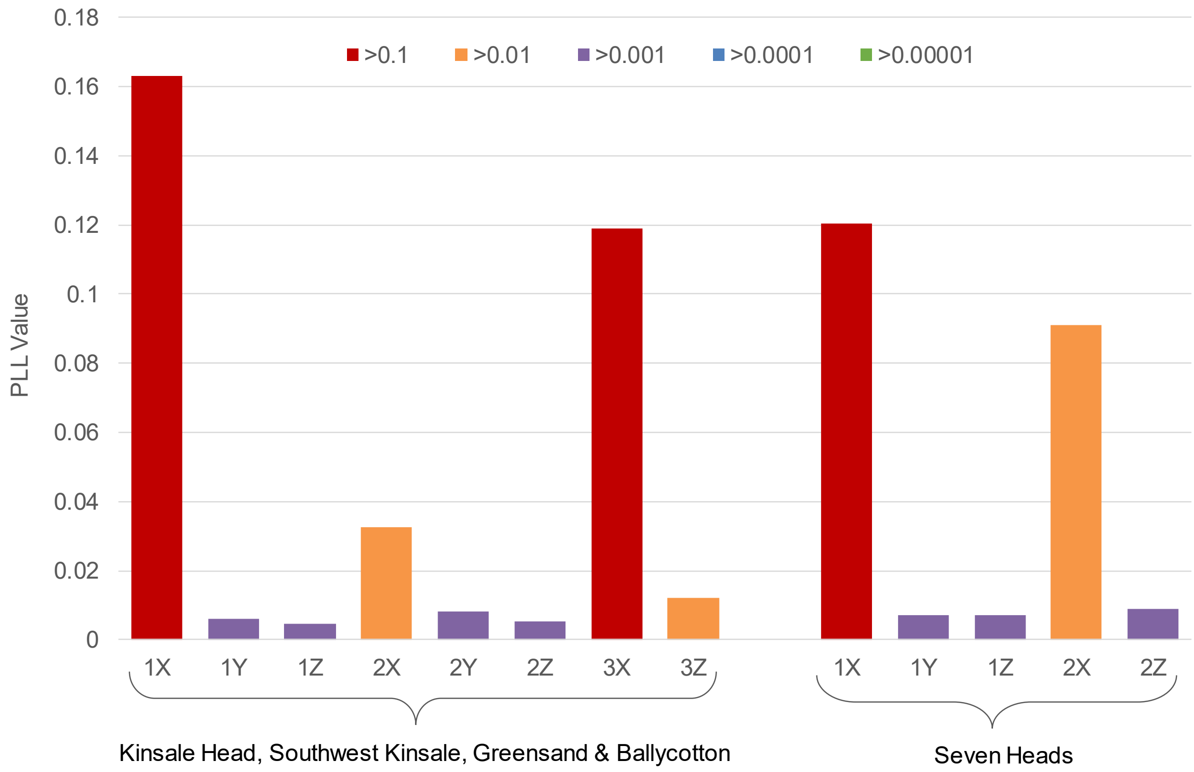
5.2.2 Risk to Personnel Offshore

Potential for Loss of Life (PLL) rates were calculated for each offshore option using offshore industry fatal accident rates (using Safetec 2005, after Ramboll 2017a, b) and estimated man hours for each task (see Figure 6). Safety risks are highest for the full removal option ("x" options) and lower for those which propose to leave pipelines or umbilicals *in situ* ("z" and "y" options are sequentially lower), which is a function of the man hours relating to each option (see Figure 6). The risks associated with the Seven Heads 1y and 1z options are comparable due to the small additional level of intervention (rock covering 984m) for option 1y. Particular safety risks are presented from pipeline removal options using a cut-and-lift approach. Whilst it is not proposed to use any divers in this process, risks associated with this type of pipeline recovery are such that they have only tended to be used for short pipeline sections (OGUK 2013). Relative man hours and technical certainty in the options considered are such that the comparative assessment scoring for this criterion (see Appendix A1-A5) were highest (i.e. with a worse safety risk) for the full removal "x" option and lower for the leave *in situ* "y" and "z" options.

Divers have not been proposed for any of the final proposed comparative assessment decommissioning option methodologies for consistency across all options. Therefore, higher risk diving activities and associated diver saturation days and vessel times are eliminated from all options. In the event that divers would be required, this is most likely to be associated with those options with higher levels of intervention (e.g. the "x" options), and therefore generate additional risk.

In addition to the consideration of risk relative to the duration of activities, and those other risk reduction measures noted above, all offshore activities would be subject to Kinsale Energy's operational risk assessment procedure.

Figure 6 PLL estimates for each decommissioning option



5.2.3 Safety Risk to Onshore Personnel

For the onshore pipeline, the highest risk is associated with the full removal option ("x" option), which will require the excavation of the pipeline trench, the removal and disposal of the pipeline and the reinstatement of the trench. While this is routine construction work, relative to the *in situ* options for the onshore pipeline, there is a higher risk to personnel onshore.

For all offshore pipeline options, the risk to onshore personnel is relative to the quantity of material to be returned to shore for processing, which results in the "x" options having the highest (i.e. worst) safety scores under this criteria. As in each of the "y" and "z" options the equivalent removals will be made, there is no difference in the onshore safety scores for these options.

5.2.4 Safety Risk to 3rd Parties During Decommissioning

Safety risks to 3rd parties during decommissioning decline with reduced time in the field (e.g. due to less potential interaction with other users). There will be some exclusion from the area of works for other users including fisheries and shipping during decommissioning activities, however this will be temporary – the highest cumulative number of days is predicted for Kinsale Head Option 1x at 677 (but some activities are likely to take place in parallel, shortening this duration), and the lowest for the "z" options at between 23 and 42 days.

Risks from vessel presence can be lowered through the application of legal standards and controls including the use of Notices to Mariners and appropriate vessel markings and lighting. Any works within existing fisheries exclusion zones (i.e. around tie-in locations at manifolds and the platforms) will already be subject to exclusion from other users, and all disconnection and end remediation works would take place within these zones.

5.2.5 Residual Safety Risk to 3rd Parties

The 2017 pipeline inspection survey (Fugro 2017) noted freespans on the 24" export pipeline, the 24" and 12" KA to KB pipelines, and the Ballycotton pipeline.

The risk posed by spans to fishermen would be eliminated or reduced under all of the available CA options. However, there remains a potential risk to fisheries from leaving the pipelines *in situ* in the long-term, where exposed sections remain. Such risks include the potential for future span evolution and also the long-term integrity of the pipelines and what future snagging risk they may present (e.g. as concrete coatings and steel degrades and pipeline walls thin making them more susceptible to damage). This is of greater concern for exposed pipelines, as those which are buried by sediments and rock cover would not interact with other users unless they became exposed, and their degradation rates are significantly less than those of surface laid pipelines (OGUK 2013b).

Generally, carbon steel pipelines such as those used in the Kinsale Area degrade at very low rates once cathodic protection has expired, at between 0.05-0.1mm/year when exposed directly to seawater or 0.01-0.02mm/year when buried, such that corrosion and collapse of the pipeline would likely take centuries (OGUK 2013b), and this may be extended by those coatings used on Kinsale Area pipelines (e.g. coal-tar epoxy and concrete, 3LPP, FBE). The umbilicals contain polymers, including PP and PVC, but also steel in the form of armour wires and copper wire cores. The polymers and copper are highly resistant to degradation and corrosion, and the key mechanisms for the degradation of polymers (e.g. thermal, photodegradation, microbial biodegradation and mechanical damage) are limited due to their location on, or in, the seafloor (e.g. see Andrady 2015 and OGUK 2013b) such that they are likely to be persistent, though are non-toxic. The steel armour wires will degrade as they become exposed to seawater.

There have been two instances of anchors from large vessels dragging the 24" export pipeline in the vicinity of an area used for anchorage outside of the limits of the Port of Cork Authority. These occurred in 1994 and 2017 and rectification works have been undertaken. Vessel monitoring arrangements have been put in place with the Cork Port Authority while the pipeline remains operational. The risks to large vessels anchoring following decommissioning are considered to be remote as the pipeline will be gas free and filled with inhibited seawater.

A fisheries study (Anatec 2017) was commissioned to understand the present level, type and crossing frequency of fishing activity within 10nm of the Kinsale Area subsea infrastructure. The study considered the fisheries activity against the current baseline situation and a series of options broadly comparable to those being considered in this CA (but excluding the full removal options as full removal removes any residual risk to 3rd parties, and with consideration of an additional option to rock cover all exposed sections irrespective of proportion exposed). An estimation of snagging risk for each pipeline and option was made based on crossing frequency of the infrastructure, angle of crossing, and data relating to the risk of accidents or fatalities from fishing gear snagging incidents on the UKCS.

For larger diameter trunk lines (18" and 24"), including the 12" KA to KB Inter Platform, the Base Case PLL based on the current status of the pipelines and following the removal of fishing exclusion zones, is presented in Table 13. Implementation of options "y" or "z" would reduce the Base Case risk levels further for all pipelines with the exception of the 18" Seven Heads export pipeline, for which option y is required to make further risk reductions (see Table 12).

It should be noted that the above PLL values represent the risk to the entire fishing community operating in the Kinsale Head/Seven Heads area. A subsequent Fishing Risk Assessment study (Anatec 2018) estimated the risk to fishermen in terms of Individual Risk Per Annum (IRPA) for each of the large diameter pipelines. These values are dependent both on the PLL described above, and on the number of fishermen exposed to the hazards (i.e. the decommissioned pipelines). The number of fishermen exposed was calculated taking into consideration the type of vessels and typical crew numbers for those vessels related to the crossings used to calculate the PLL values. Note that the average IRPA will vary for fishermen on different vessels. In addition, the IRPA values relate to a particular sea area and hazard (i.e. pipelines) and that the same fishermen will be exposed to other hazards during the course of their working year which are not considered in these calculations. Average IRPA values range from $3.2x10^{-7}$ (less than one in three million) for the 12" inter-platform pipeline "y" option to rock cover the ends and areas >50% exposed sections, to $8.1x10^{-6}$ (less than one in one hundred thousand) for the "z" option to rock cover pipeline ends and freespans for the 18" export pipeline. As the IRPA values are averages, they will vary for fishermen depending on the vessel (e.g. one which fishes for a longer duration over a particular pipeline). Due to the nature of fishing activity over the 18" and 24" export pipelines (single individual vessels fishing for longer periods and therefore accounting for a substantial portion of the overall risk), "worst case" IRPA figures have been calculated for the 24" and 18" export pipelines. These range from a minimum of $1.8x10^{-5}$ for the 18" Seven Heads export pipeline "y" option to $6.6x10^{-5}$ for the 24" export pipeline "z" option. Risks were more evenly distributed between vessels for the inter-platform pipelines. The IRPA results are also presented in Table 12.

Table 12 PLL and Average IRPA Results per Line

Pipeline	Fishermen exposed*	Base Case PLL	Option z		Option y	
			PLL	Average IRPA	PLL	Average IRPA
12" Inter Platform	96	4.05E-04	2.78E-04	2.9x10-6	3.08E-05	3.20E-7
24" Inter Platform	96	3.90E-04	2.66E-04	2.8x10-6	1.28E-04	1.30E-6
18" Seven Heads Export	160	1.30E-03	1.29E-03	8.1x10-6	1.11E-03	7.00E-6
24" Export	156	9.05E-04	6.03E-04	3.9x10-6	4.34E-04	2.80E-6

Data Source: Anatec (2017, 2018)

*Note: *for the purposes of calculating IRPA*

A summary of the PLL frequencies for the Base Case scenario for smaller pipelines (8"-12") excluding the 12" KA to KB Inter Platform, is presented in Table 12. The base case PLL figures presented (the current *in situ* status of the pipelines, but following the removal of fishing exclusion zones) are lower than for the larger diameter pipelines due to the shorter lengths and reduced exposure of these lines. The 10" Ballycotton umbilical representing the maximum annual PLL of one fatality every 9,470 years ($1.06x10^{-4}$), and the Seven Heads 8" well 48/24-6 (B) line and umbilical representing the minimum at one fatality every 1 million years ($9.53x10^{-7}$). Implementation of any additional risk reduction measures through rock placement would reduce these already low PLL values further except where complete cover already exists (e.g. the 10" Greensand pipeline) or where the level of exposure is short (Seven Heads well flowlines).

Table 13 PLL Base Case for small diameter pipelines (excluding 12" Inter Platform)

Pipeline	Base Case
8" Well 48/24-5A (A)*	5.31E-06
8" Well 48/24-6 (B)	9.53E-06
8" Well 48/24-7A (C)	Negligible
8" Well 48/24-8 (D)	1.33E-05
8" Well 48/24-9 (E)	9.36E-06
8" Well 48/23-2 (F)	2.26E-06
10" Ballycotton	7.20E-05

Pipeline	Base Case
Ballycotton Umbilical	1.06E-04
10” Greensand	2.81E-05
12” WDC	5.52E-06
12” SWK	2.99E-5

Data Source: Anatec (2017)

*Note: *letters refer to the notation used in Anatec (2017) to allow for cross referencing*

5.2.6 Overall Safety Assessment Summary

Overall, the scores achieved against the safety criteria (see Table 9) were significantly lower for the leave *in situ* options than full removal options for all pipelines and umbilicals. This is largely a function of the relative risk of removal activities, reflected in PLL values (e.g. 0.16 for the Kinsale Head option 1x compared to 0.006 and 0.005 for options 1y and 1z respectively), and also in that from enhanced onshore material handling. While the removal option would largely eliminate potential 3rd party risks from snagging, it is noted that significant reduction in PLL values compared to the Base Case scenario (i.e. the current status of the pipelines and umbilicals after exclusion zones are removed) for fisheries were estimated for the adoption of the “y” and “z” options for most pipelines. For example, risks reduced from 9.05E-04 (1 in 1,104 years) for the 24” export pipeline, to4.344 (1 in 2,304 years) and 1.09E-04(1 in 9,174 years) for the “y” and “z” options respectively. The 18” Seven Heads export pipeline was the only surface laid pipeline for which the “y” option was required to make further risk reduction on decommissioning. This pipeline has no freespans to remediate as part of any “z” option and so risk compared to the base case was not reduced appreciably under that option.

5.3 Environment

5.3.1 Residual Hydrocarbon and Chemical Discharge

The hydrocarbons produced from the Kinsale Area fields are dry gas with minimal condensate production (see Section 2.1), and no residual hydrocarbons are foreseen to be present in the pipelines. With the exception of the 24” export pipeline and potentially the 18” Seven Heads export pipeline which will be filled with inhibited seawater, all the pipelines will be filled with seawater as part of the decommissioning process. This seawater, and a small quantity of surfactants used in pipeline cleaning, will eventually be released as the pipelines degrade. The inhibited seawater (up to a total of ~21,500m^3) will be treated with a combination of corrosion inhibitor, oxygen scavenger and microbicide[5]. The inhibited water in the export pipelines would be released at sea if no re-use option is identified or in the event that a pipeline is re-used. The water depths at the discharge point (Kinsale Alpha) are ~90m, and dispersion of discharges will be rapid.

The umbilicals will have contained chemicals (methanol and TEG) used during production, which are in the OCNS group E (those considered to have the least potential environmental hazard), though only the former is categorised PLONOR. These lines would be displaced with seawater into the wells prior to decommissioning and removal, but the water-based hydraulic fluid will remain in the umbilicals and some of this will be lost to sea when they are disconnected and/or cut, or in the longer term as the umbilicals degrade.

5.3.2 Loss of containment to the environment of chemicals and hydrocarbons

The only other potential source of contamination is from a loss of hydrocarbons or chemicals from vessels. These are limited to the vessel inventories of fuel and lubricants, and their loss would be the result of an accident rather than any intended discharge.

A risk-based approach to considering such incidents is appropriate, and whilst the risk is higher with options which result in a greater duration of activity, and in locations outside of established fisheries exclusion zones (particularly “x” options), standard mitigation measures typically associated with offshore activities can be implemented to reduce this risk, including Kinsale Energy’s established procedures for contractor selection and management, and the use of Notices to Mariners. Current information indicates that shipping density in the Kinsale Area is generally moderate (DCENR 2011, 2015), and a more detailed vessel traffic survey will be undertaken to inform decommissioning planning at a later date.

It is regarded that the risk is moderate for the full removal of the 24” Kinsale Head export pipeline, and the infield pipelines/umbilicals associated with all subsea tiebacks, including Seven Heads, and low for all other options (see Appendix A1-A5).

5.3.3 Seabed Disturbance

Seabed disturbance will be generated by any of the decommissioning options, the level of which is proportionate to the level of intervention such that full removal “x” options achieve the highest scores (representing the worst case) in this criteria. The “y” options had moderate to high scores due to the level of rock placement proposed, with the “z” options having low scores due more localised seabed interaction at pipeline/umbilical ends (see Table 7 which also provides an indication of the relative lengths of pipelines/umbilicals affected).

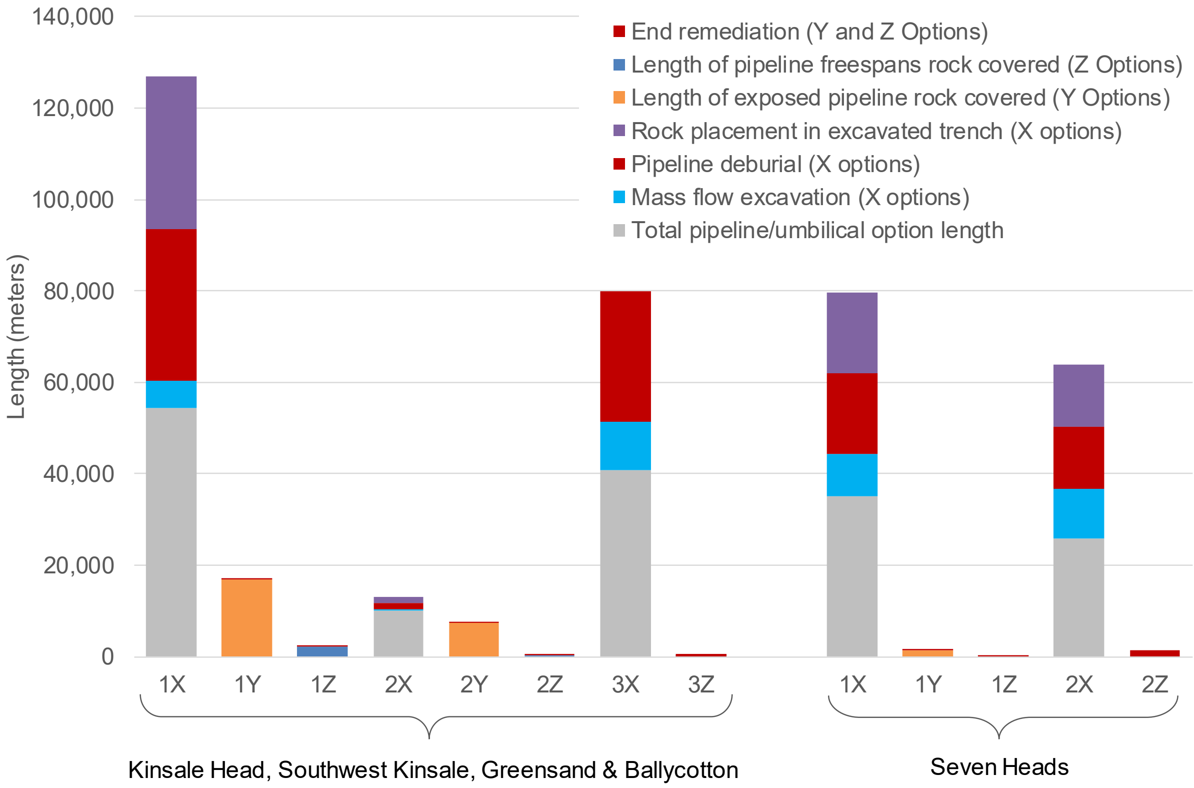
[5] Note that total chemical usage and discharge for this operation has been estimated using representative chemicals and concentrations (100-500ppm) to be in the order of 13.5m^3 for the 24” pipeline or 18.3m^3 if the 24” and 18” export lines are treated.

The interventions required to obtain access to the spools/jumpers and to expose relevant pipeline and umbilical sections under each of the “x” options to facilitate removal would involve mass flow excavation to move rock cover to expose pipelines/umbilicals, or excavation to uncover those sections which are buried beneath seabed sediments. Following exposure of the pipelines/umbilicals, these would be cut using mechanical shears into 24m sections and lifted onto the vessel deck and transported to shore for processing. The degree of this intervention is proportionate to the length of pipeline which is either buried or subject to rock cover. Where trenches have been excavated, rock may also be placed in these to achieve a level seabed. The footprint of disturbance under all of the “x” options will be greater than the existing footprint of the pipeline or umbilical and therefore are likely to represent the greatest source of impact. Displacing/removing the rock cover, seabed sediment and protective mattresses/grout bags will result in sediment re-suspension and disturbance, and disturbance to biological communities.

Specific considerations will also be required for the nearshore and intertidal beach crossing under a full removal option, as this has the potential to temporarily interact with coastal processes including sediment transport. Options with limited interaction with the onshore pipeline therefore score favourably in the environment sub-category relating to disturbance and habitat alteration (see Appendix A6).

Mass flow excavation techniques and pipeline excavation would not take place under the pipeline “y” options, reducing the footprint of effect, unless there is a large amount of pipeline exposure, such as the 24” export pipeline and the 24” and 12” KA to KB pipelines, which are largely surface laid and would therefore require a significant quantity of rock placement (approximately 57,000t for both pipelines). Seabed disturbance will still be generated at the removal point of the mattress protection and spool pieces for all “y” and “z” options. Analogous to the “x” options, the level of disturbance is proportionate to the quantity of rock placement and therefore the degree of pipeline exposure in the “y” options. An indication of the proportion of each pipeline that would be affected by rock cover under the “y” options is provided in Figure 7, which varies between 4% (Seven Heads export pipeline and umbilical) and 74% (KA to KB pipelines). The footprint of the seabed disturbance will be greater than that of the existing exposed pipeline sections, but in addition to disturbance the option also introduces hard substrate to the seabed, representing a localised change in seabed character. Graded rock would be used similar to existing rock material specifications, with all rock being placed in a controlled manner using a dedicated dynamically positioned fall pipe vessel and monitored by an ROV during placement. The “z” options require relatively little remedial rock placement, and therefore also achieve the lowest scores (see Appendix A1-A5)

Figure 7 Level of intervention required for pipeline/umbilical removal/remediation under the various options



The leaving of materials *in situ* ("y" and "z" options) represents the lowest level of seabed interaction and disturbance, and in keeping with the earlier results of Ramboll (2017a, b) also the least impact on the seabed and seabed habitats. Ramboll (2017a, b) concluded that the relative impact of the full removal options on ecosystem services is significantly higher than for the leave *in situ* options.

5.3.4 CO_2 Emissions

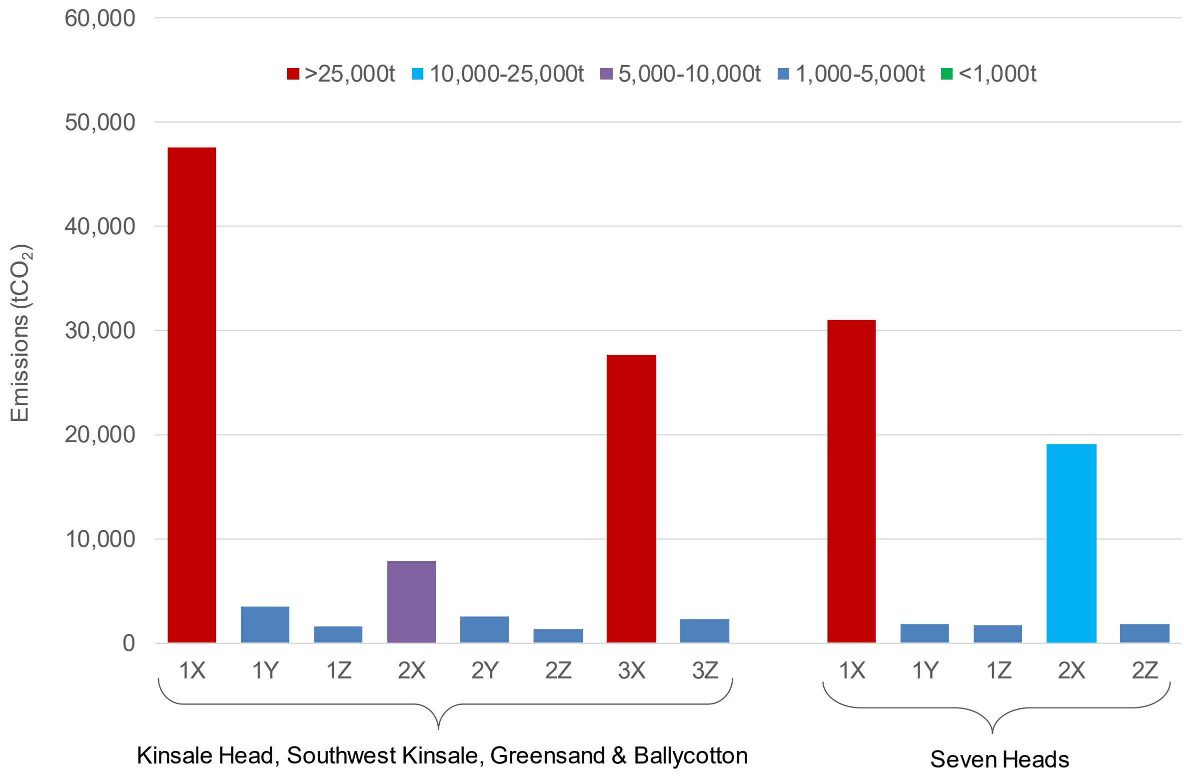
Emissions (Figure 8) of carbon dioxide (CO_2) for each of the options reflect the number of vessels involved and duration in the field and also the level of material recovery/recycling (Figure 9) – note that though it is uncertain whether the concrete will be recycled, the emissions calculations conservatively assume that this will be the case.

For all pipelines and umbilicals the highest emissions are associated with complete removal under "x" options, which would require intensive vessel use and involve large quantities of steel and concrete recovery and recycling, generating very high (>25,000tCO_2, Kinsale Head 1x and 3x and Seven Heads 1x), high (10,000-25,000tCO_2, Seven Heads 2x) or medium (5,000-10,000tCO_2, Kinsale Head 2x) impact score (see below). The remaining options present medium to low impacts (10,000-5,000tCO_2 and 5,000-1,000tCO_2 respectively), with the "z" options resulting in the lowest emissions due to low levels of vessel activity, negligible material returns to shore, and a small quantity of new material deposition which would require quarrying and transport to site (i.e. of new rock cover).

Certain indirect emissions are not considered by Ramboll (2017a, b), or the revised method statements following the initial assessment, and include the potential for recovered materials to offset the use of primary raw material (e.g. iron ore) in new products from the recycling process, and conversely the loss of that material should it be left *in situ*. Any such benefits to the life cycle of the Kinsale area pipelines/umbilicals and future products is, however, likely to be offset by the relative emissions from intensive vessel activity involved in the recovery of the pipeline for the removal options. For example, the emissions from vessel use under Kinsale Head pipeline Option 1x is approximately double that from recycling the material, though this is closer to being neutral if new material manufacture is considered[6].

In all cases, CO_2 emissions predicted to result from each of the options are small in a regional context (e.g. when compared with the 2015 total of 59.88MtCO_2eq[7]. for Ireland). The cumulative emissions from selecting a full removal or leave *in situ* approach ranges from 133,368tCO_2 to 8,779tCO_2 (~0.22% and 0.01% of the 2015 Irish National total respectively), though in view of the limited offshore activity in Ireland they represent a large relative contribution to those produced by offshore oil & gas exploration and production in 2014 on the Irish Continental Shelf (38,000tCO_2[8]). It should further be noted that the ongoing contribution to emissions in the Irish offshore oil & gas sector by Kinsale Energy (annual average of 35,700tCO_2 for 2010-2016) will effectively be eliminated following decommissioning.

Figure 8 Emissions associated with each decommissioning option



5.3.5 Recovery of Materials

Materials which could be recovered during the decommissioning process are dominated by steel and concrete, with smaller quantities of aluminium from anodes, and copper and polypropylene from umbilicals.

The largest quantities of material which would be recovered are associated with the full removal "x" options, particularly of the 24" export pipeline and 18" Seven Heads export pipeline (see Figure 9), both due to pipeline size and length, and also the presence of a concrete pipeline coating. In addition

[6] Using the metrics of IoP (2000) and Hammond & Jones (2011) puts the estimated replacement CO_2 emissions for the steel in the range 30,600-44,900tCO_2, compared to estimated vessel emissions of 32,000tCO_2.
[7] CO_2 equivalent figures include the relative radiative forcing of the complete "basket" of greenhouse gases covered by the Kyoto protocol.
[8] OSPAR (2016) report on discharges, spills and emissions from offshore oil and gas installations in 2014.

to concrete coating, concrete mattresses are also assumed to be recovered under all of the options either in their entirety ("x" options), or partially where they are moved to access pipeline/umbilical ends and spool pieces which are to be cut and recovered ("y" and "z" options). Where mattresses or grout bags remain under pipeline sections which are not proposed to be removed under any option, these will be left in place and remediated with rock cover.

Any supporting grout bags that are returned to shore will be disposed of in landfill as they have limited alternative use potential and are not recyclable.

Once removed, the concrete mattresses will be returned to shore, where they will either be recycled or disposed of in landfill if recycling is not possible. This is noted in the risk and uncertainty scores for the proportion of total landfill sub-category (see Appendix A), the level of which reflects the quantity of concrete to be returned to shore.

Figure 9a & 9b Material recovery

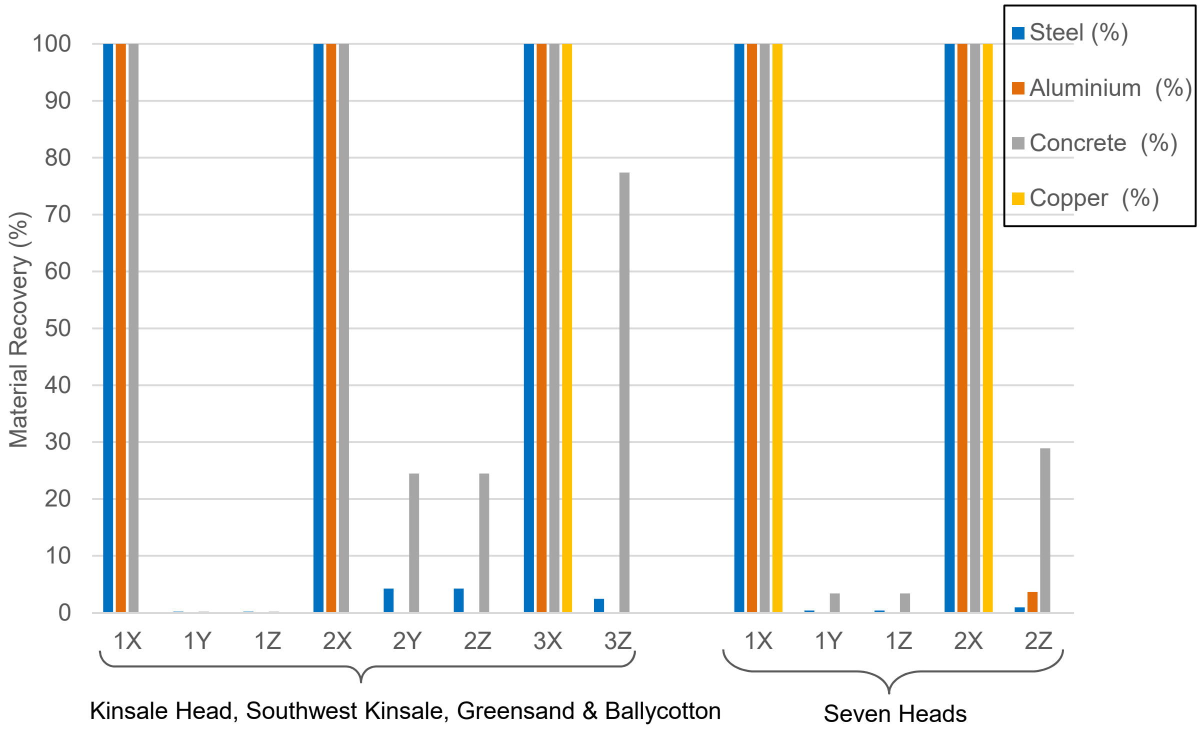


Figure 9a – Material recovery (%)

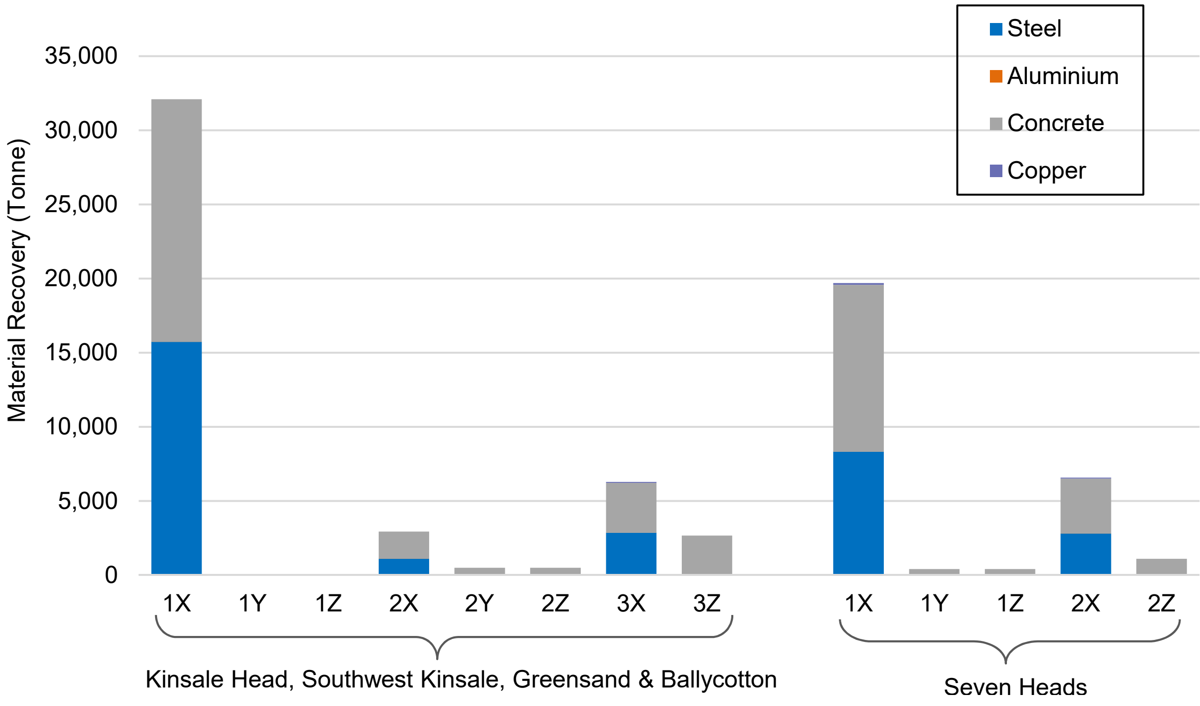


Figure 9b Material Recovery (weight)

Note: this chart may be taken to imply the level of recycling, but there is uncertainty over whether some or all of the concrete will be recycled.

The full removal of the 24” export pipeline (Kinsale Head Option 1x) and the removal of the 18” Seven Heads pipeline (Seven Heads Option 1x) result in high quantities of material recovery (~32,000Te and 20,000Te respectively), with other full removal options (e.g. Kinsale Head 2x, 4x and Seven Heads 2x) being much lower at between 3,600 and 6,700Te. All other options result in low to very low quantities (generally 63-2,600 tonnes of steel or concrete). Quantities of other materials such as copper and polypropylene from umbilicals are very low, not exceeding 250 tonnes for any option including full removal.

There is limited difference in the outcome of the scores for the waste sub-categories as the benefits of recycling under the “x” options are offset by large quantities of concrete that may be sent to landfill. Conversely, whilst only limited quantities of concrete is returned to shore under the “y” and “z” options that could contribute to landfill, the benefits of the steel and other materials which could be readily recycled are lost.

5.3.6 Conservation Sites and Species

There are a number of Natura 2000 sites located along the coast of south west Ireland, the closest site (Cork Harbour SPA) being within 6km of the export pipeline. With the exception of the export pipeline, the Kinsale Area facilities to be decommissioned are at least 34km from the closest site (Old Kinsale Head SPA), though the qualifying interests of certain sites (e.g. seals, harbour porpoise and seabirds) may be present across the Kinsale Area at some distance from site boundaries. Additionally, protected species such as those listed on Annex IV of the Habitats Directive may also be present across the Kinsale Area, and include all cetaceans (e.g. harbour porpoise, common dolphin, bottlenose dolphin, minke whale, fin whale and humpback whale) and the leatherback turtle.

No explosive cutting or other high energy noise producing activities are proposed to be undertaken as part of the pipeline/umbilical decommissioning options. Noise from vessel activity associated with the decommissioning activities has the potential to contribute to existing noise levels in the area, and though this is not expected to be a source of likely significant effect for marine species protected under Annex IV of the Habitats Directive (e.g. all cetaceans and turtles), this will be considered as part of the environmental appraisal process.

All recent benthic sampling and photographic surveys in the Kinsale Decommissioning Area have been consistent in reporting no indication of sensitive species or habitats which would be subject to protection under the EU Habitats Directive (92/43/EEC) i.e. Annex I habitats, however this information will be augmented by the results of a survey undertaken in Q2 2017. Any implications for protected sites and species will be considered as part of the environmental assessment against any chosen option, which will include a screening for Appropriate Assessment.

In view of the above consideration, scores for this criteria are low for all of the options (see Appendix A1-A5).

5.4 Technical

5.4.1 Technical Feasibility

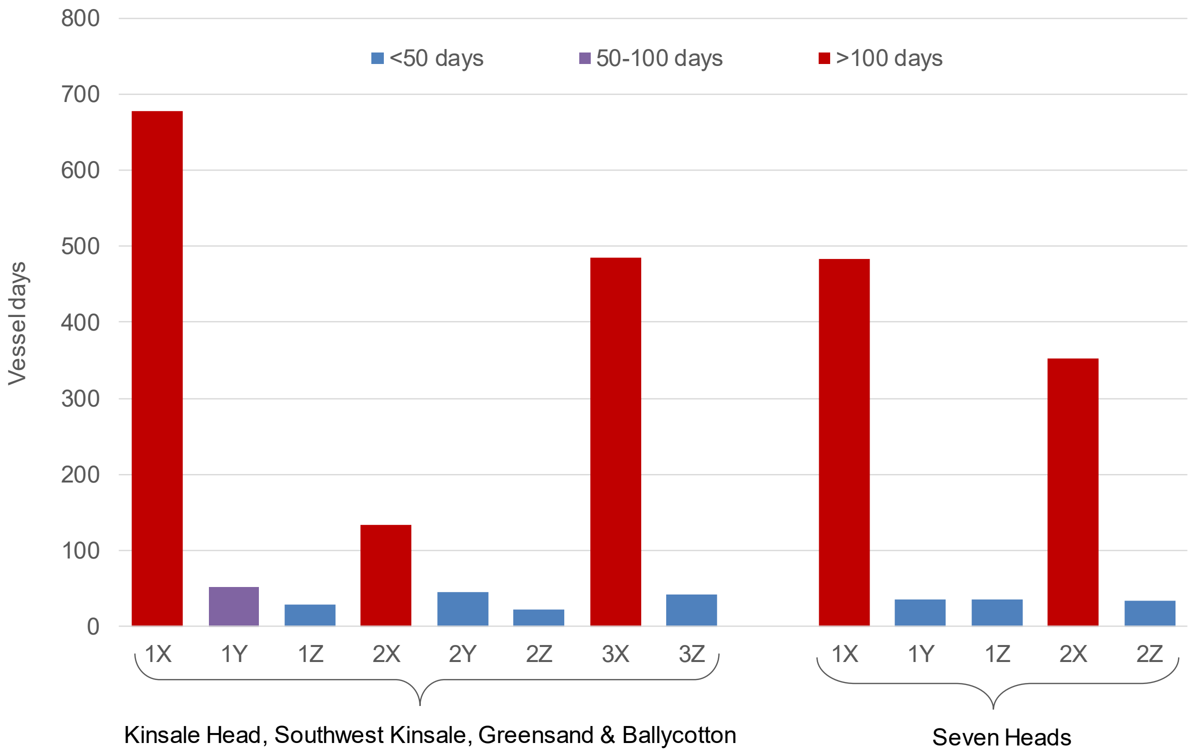
Technical risks are higher for the full removal “x” options than for those which propose to leave pipelines and umbilicals *in situ* (“y” and “z” options). The removal options are generally considered of moderate complexity, involving techniques considered standard offshore operations such as the displacement of rock cover, removal of mattress protection, deburial of pipelines and the shearing and clamping of pipelines. Though the operations are standard practice, they have previously only been undertaken on short pipeline lengths, which contrast with the proposed scale of some of the operations required for the some of the options, in particular the “x” options involving the removal of long pipelines including the 24” export pipeline and Seven Heads 18” export pipeline. This makes their overall success of greater risk than standard procedure. Additionally, the age of some infrastructure (e.g. the 24” export pipeline was installed in 1977) is such that there may be integrity issues, raising the complexity of the removal process, and potentially also presenting additional safety risks (e.g. the potential for concrete coating to spall from the pipeline). Similarly, whilst the removal of umbilicals by reverse reeling is theoretically feasible, uncertainties exist around the mechanical integrity of the armour wires (the primary source of tension capacity in the umbilical) due to age, which could compromise the recovery operation. These considerations are reflected in the uncertainty and risk scoring for this criteria (see Appendix A1-A5), for which those options using the above activities over more limited extents (“y” and “z” options) achieve the lowest scores.

5.4.2 Weather Sensitivity

The removal options tend to be more weather sensitive than the leave *in situ* options given the increased complexity of the operations and longer vessel times in the field (see Figure 10), including in excess of one year for the Kinsale Head 1x option (assuming continuous working). Working at certain times may not be possible due to weather constraints (particularly in winter months), which are likely to further extend the overall duration, particularly of the more lengthy operations associated with the 1x options.

With respect to the leave *in situ* options (“y” and “z” options), the limited cutting and removal of pipeline or umbilical ends is of relatively short duration (~8 days including mattress removal) and therefore should be little affected by weather. Remedial rock covering associated with the leave *in situ* options is considered a routine activity, relatively unaffected by weather, but longer durations in the field present marginally higher chance of weather constraint, such that the Kinsale Head "y" options have slightly higher technical score than the "z" option for the same pipelines/umbilicals. The short length of rock placement required (1,334m) to complete option "y" for the Seven Heads export pipeline results in comparable vessel days to that of the "z" option such that the options have the same technical score.

Figure 10 Vessel days associated with each decommissioning option



5.5 Society

5.5.1 Residual Effects on Access

Societal effects associated with the decommissioning options reflect the potential for residual effects on fishing, navigation or other access associated with what remains on the seabed following decommissioning, as well as potential effects on coastal communities. The residual effects refer to the long-term implications of the options considered, although there will be some temporary societal effects relating to loss of access, particularly for fisheries. The scale of this impact is relative to the duration and geographic scale of the activity and therefore interference would be greatest for the "x" options, and least for either of "y" or "z" options. The Kinsale Area represents an area of relatively high use and importance to Irish commercial fisheries, and the potential disruption of fishing activity would be restricted to temporary spatial interaction with vessels operating and in transit. This will represent a short-term increment to existing vessel presence in the area associated with field operations and wider commercial shipping. Following decommissioning, those areas of seabed subject to exclusion zones (e.g. around manifolds and platforms (not considered here) but also pipelines between KA and KB, and at South west Kinsale) would be removed and open to fisheries under all of the options considered here.

It is not regarded that any chosen option will lead to the long-term exclusion of other user activities including fishing, shipping, tourism and recreation and potential future use for marine renewable energy or carbon capture and storage (CCS). Depending on the chosen onshore pipeline decommissioning option, that part of the export pipeline (or the entire pipeline) may be left *in situ* to help facilitate future CCS deployment or hydrocarbon development by providing an intertidal crossing to act as a conduit for a new pipeline.

5.5.2 Coastal Communities

With respect to coastal communities, a range of effects could be generated from the return to shore of component parts of the pipelines and umbilicals, with the greatest quantity of such materials recovered and retuned to shore associated with the full removal "x" options. These effects could include visual intrusion (e.g. from the transit of vessels to shore and also vessels working in coastal/nearshore waters associated with the decommissioning of the 24" export line), and noise, dust, fumes and odour associated with onshore material processing (though note that only licenced yards would be used). The level of work to be undertaken onshore, and related employment continuity assuming the use of established yards, will in part depend on the selected decommissioning option. It should be noted that there are no licensed dismantling yards in Ireland and any employment impacts would be outside Ireland. For example, substantially fewer materials will be returned to shore should the pipelines and umbilicals be left largely *in situ* ("x" and "y" options).

For the onshore pipeline, disturbance impacts from the pipeline deburial activities would result from the selection of the "x" option. The key impacts would be temporary loss of access to agricultural land, temporary restricted access to the use of Inch beach and traffic management along the local roads, particularly for the road crossing deburial as there may be road diversions required. Options which leave the pipeline *in situ* avoid such interactions.

5.6 Economic

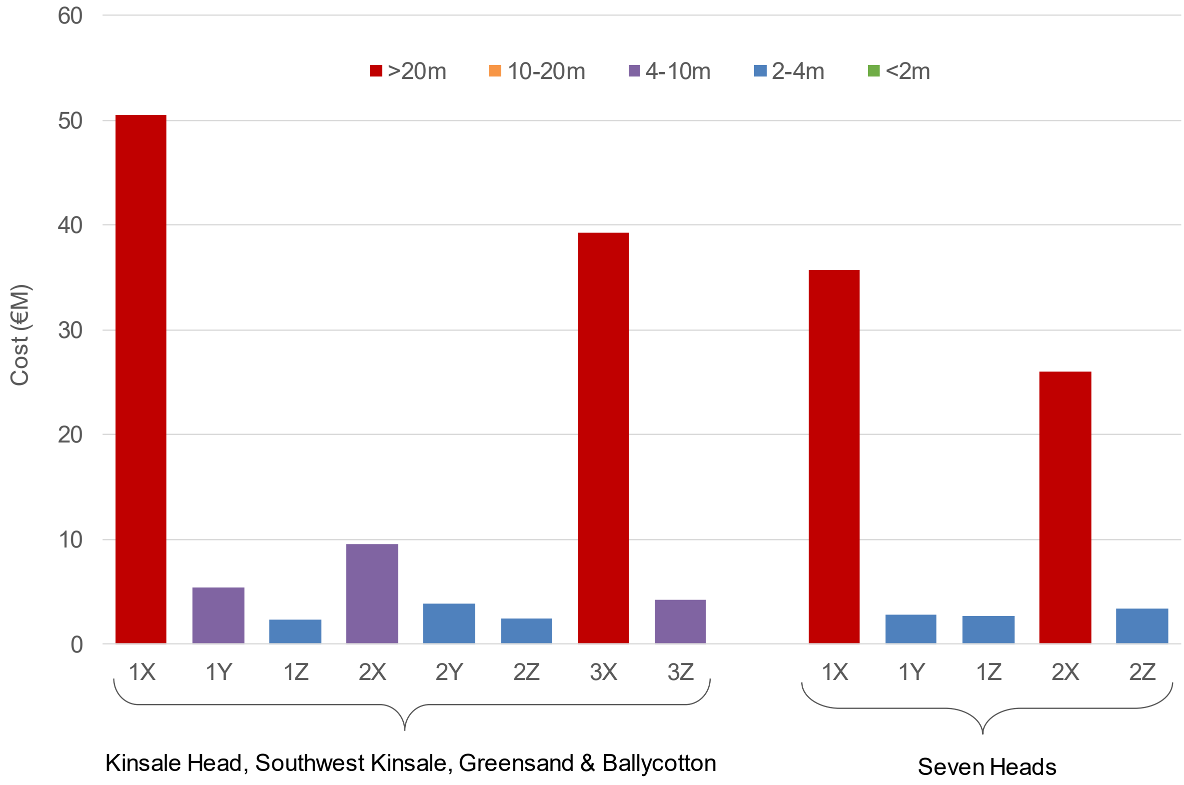
5.6.1 Total Cost

Economic risks are primarily associated with the estimated cost of each decommissioning option and these are closely linked with the number of vessel days required to complete operations (see Figure 10), though onshore processing time will also affect total time and costs. Full removal ("x") options are significantly more expensive than those which leave the pipelines *in situ* (Figure 11). Where present, the Kinsale Head "y" options to remediate exposed pipeline sections with rock cover is approximately double the indicative cost of remediating freespans, and therefore the respective "z" options for the pipelines present the lowest cost. This relative cost difference is not observed for the Seven Heads 1y and 1z options, as the length of pipe which would require rock placement under the "y" option is relatively short (1,334m).

Those options with a greater level of intervention requiring more vessels and greater time in the field will generate short-term employment, though in view of the specialist nature of the activities and the limited available domestic resources to complete the works, it is likely that vessels, disposal routes and associated employment will come from outside of Ireland. In all cases (for offshore and onshore options), few to no employment opportunities remain following the decommissioning of the pipelines.

It should be noted the cost estimates used are high-level and indicative only but are considered valid for comparative purposes.

Figure 11 Option costs



5.6.2 Residual Liability

With respect to the residual liability associated with the decommissioning options in terms of future monitoring and remediation, the least favoured option is option “z”, leave *in situ* with minimal intervention/freespan remediation. This option would leave some pipelines exposed and would not mitigate the potential for future freespans to develop. For this reason, there is the risk that additional surveys and potential remediation of the pipelines could be anticipated. Although freespans which are most at risk from snagging would be remediated under option “z”. Noting the anchor snagging incidents associated with the 24” export pipeline, this highlights a potential risk from surface laid sections remaining *in situ* in the area used for anchorage, although all pipelines are charted, and if left *in situ* would remain so.

For the other options, there would either be nothing left on the seabed (option “x”), or exposed sections would be rock covered (option “y”). For these options, no residual liability is foreseen given appropriate remediation as part of the decommissioning operations.

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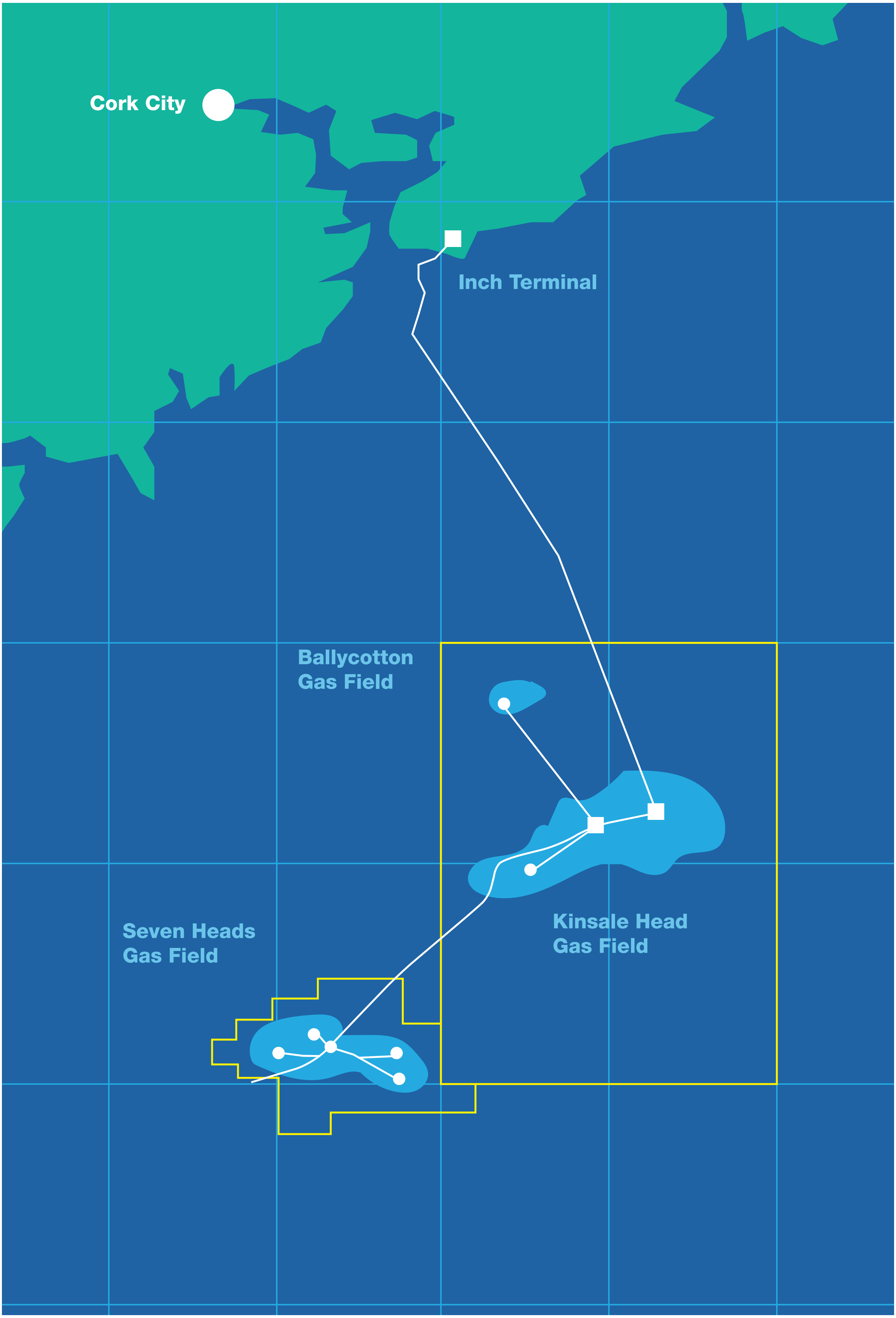
Kinsale Area Decommissioning Project

Section 6

Summary and Recommendations

Hartley Anderson

ARUP


Cork City
Inch Terminal
Ballycotton
Gas Field
Seven Heads
Gas Field
Kinsale Head
Gas Field

6 Summary and Recommendations

Summary graphs of the combined category scores are shown in Figures 12a to 12f. These graphs demonstrate that the "x" options were assessed as being a significantly higher risk than all other options and the "z" options were assessed as the overall lowest risk.

6.1 Worst Scoring – "x" Options

- Full removal "x" options scored the highest for each option across all categories.
- The option represented the highest safety risk to personnel involved in the removal and recycling of the infrastructure and greatest technical risk due to relatively limited experience to date, particularly in the removal of large pipelines.
- While the methods for removing such pipelines are transferrable from standard procedure elsewhere in the oil and gas industry, their implementation at the scale proposed by the option is not, and therefore it entails greater technical and safety risks.
- Third party risks were reduced by the complete removal of the facilities which could represent a long-term snagging hazard to fisheries, however, the snagging risks have been assessed as being very low for Options "y" and "z" (leave *in situ*) (Anatec 2017).
- The environmental scores were high, as full removal would generate an area of seabed disturbance greater than that occupied by the pipeline, and at least as great as that which would have been associated with installation. There would also be greater volumes of CO_2 emissions from longer vessel times in the field.
- Though full removal provides substantial returns to shore of recyclable material which could offset future emissions from products using the recycling materials, this was largely counteracted by emissions from vessels involved in removal, and the uncertainty relating to the recyclability of the concrete, in addition to greater onshore risks of material handling.
- The costs of full removal options were significantly larger than for any other option considered. The "x" options present a lower residual 3rd party liability risk to those which leave the pipelines and umbilicals *in situ*.

6.2 Best Scoring – "z" Options

- Overall, the lowest total score was achieved for the "z" options, to leave pipelines and umbilicals *in situ* and to rock cover any freespans, and the cut ends and mattresses not removed as part of end removal.
- The overall low values were achieved by a combination of limited interaction with the seabed, low technical risk, and low cost.
- There was a small reduction in the score for the safety category of the "z" option compared to "y" options where they were considered. This was primarily due to a reduction in risks to 3rd parties during the operations due to less time in the field.
- Whilst the same scores were achieved for residual societal risks (e.g. to fisheries) for the "y" and "z" options, the results of the fisheries study (Anatec 2017) indicate that risk could be reduced further through the adoption of option "y", or a modified version of this which applies rock cover to all exposed sections (i.e. not just those of >50% exposed).
- Leaving exposed sections of pipeline may lead to a requirement, at least for a period, of future surveys of these, and also those liabilities associated with keeping the infrastructure *in situ* would need to be assessed and appropriately addressed.

Figure 12a-f Average category option score

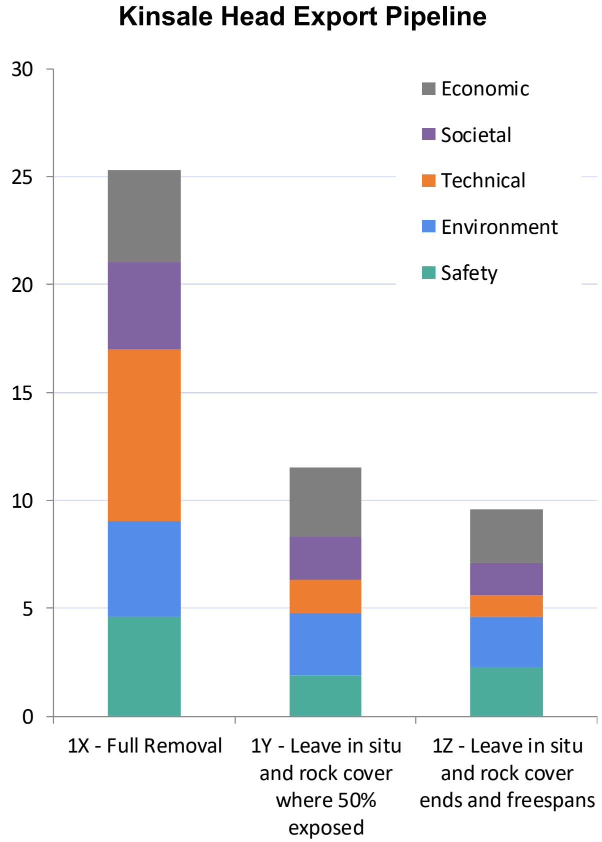


Figure 12a

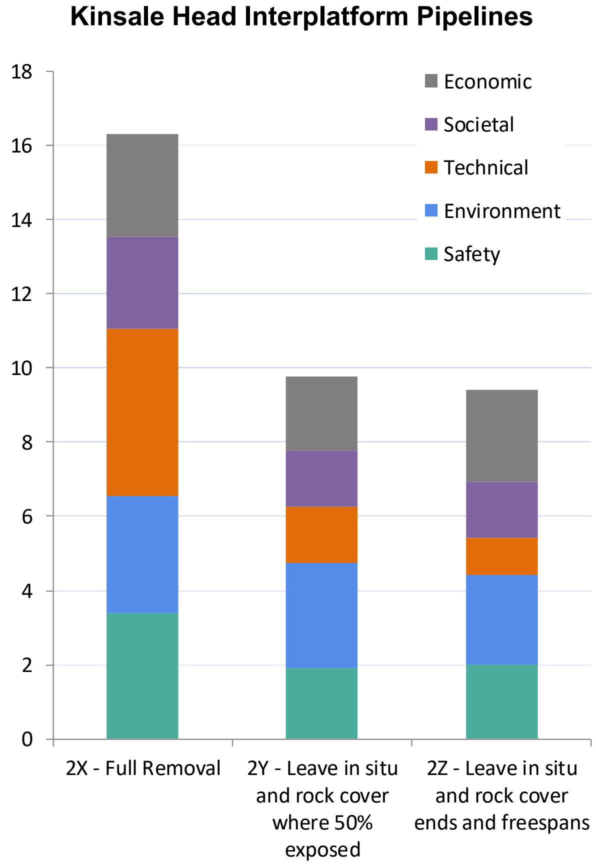


Figure 12b

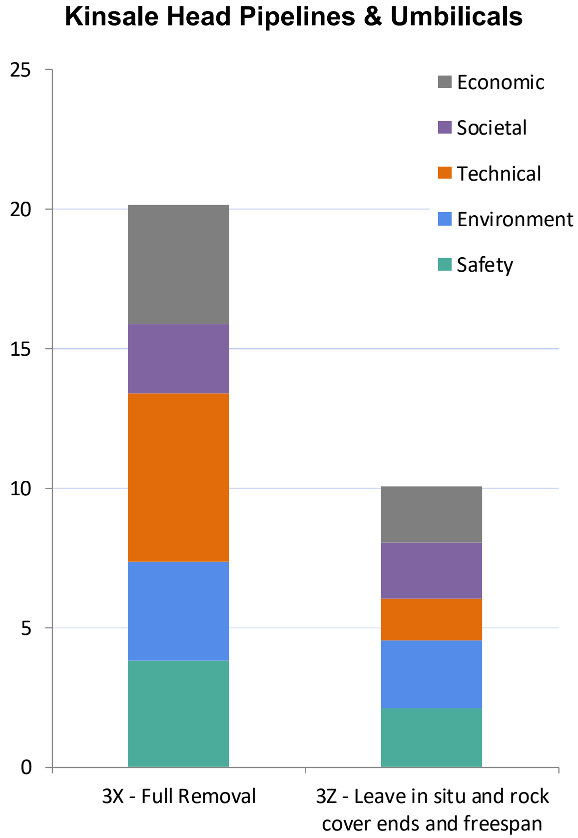


Figure 12c

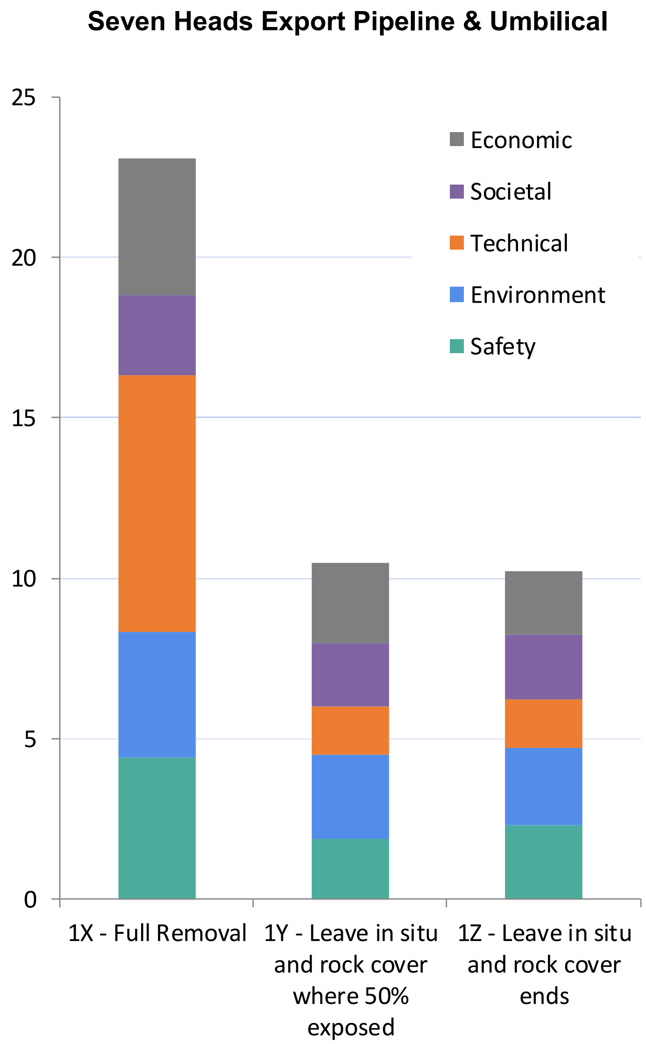


Figure 12d

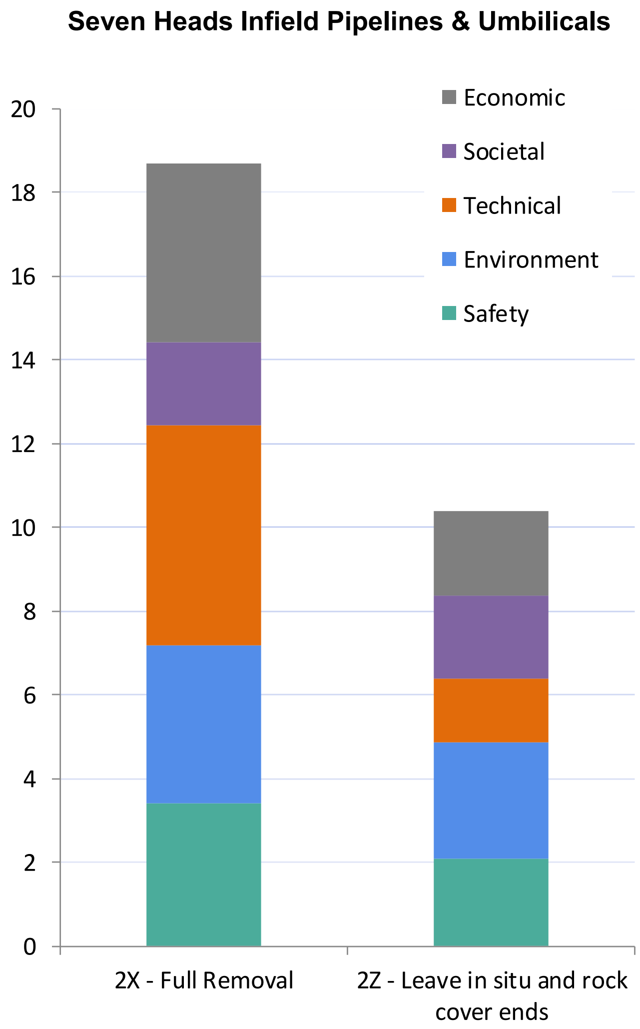


Figure 12e

Onshore Pipeline

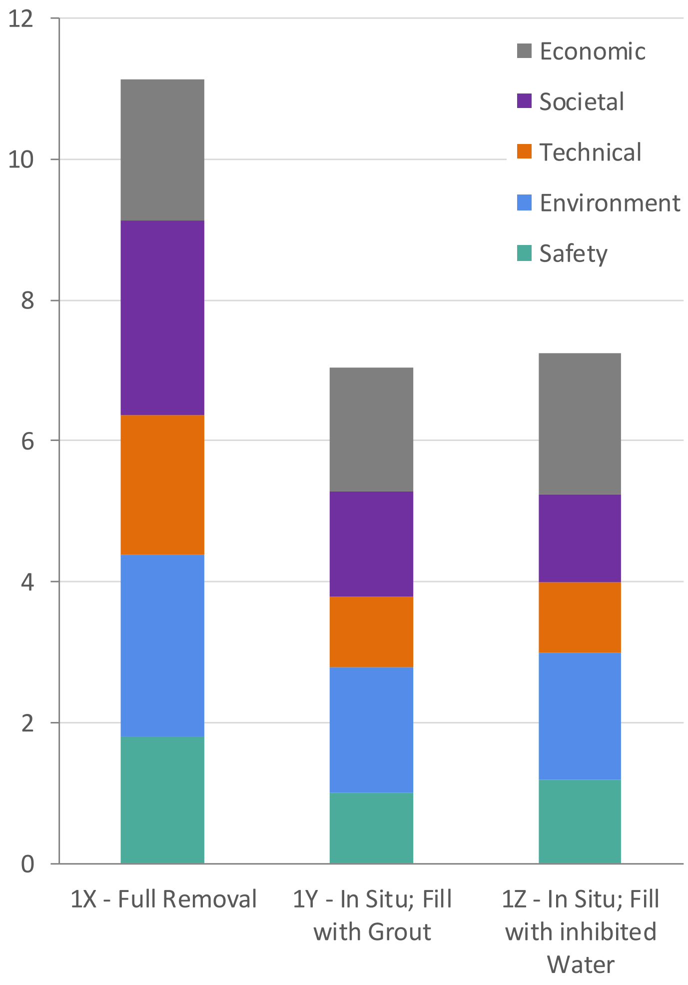


Figure 12f

6.3 Recommended Proposed Options

A summary of the proposed options for each of the pipeline and umbilical groups is presented in Table 14 below.

Table 14 Options proposed

Option	Preferred Option	Rationale for selection
Onshore		
Onshore pipeline section	1z: leave *in situ* and fill with inhibited water	This option provides the option for future alternative re-use of the pipeline, while minimising impacts.
Offshore: Kinsale Head, SW Kinsale, Greensand & Ballycotton		
24" export pipeline	1z: leave *in situ* and rock cover freespans. Removal of pipeline ends and remediate with rock cover	The option to leave the pipelines/umbilicals *in situ* clearly indicates significantly lower risks in terms of: • Safety of personnel • Seabed disturbance • Greenhouse gas emissions, • Technical feasibility, and • Cost. The "z" options are indicated as preferred, although residual risks to 3rd parties may be reduced further through the application of option "y"; subject to further evaluation.
24" and 12" KA to KB pipelines	2z: leave *in situ* and rock cover freespans. Removal of pipeline ends and remediate with rock cover	
12" SW Kinsale pipeline, 12" western drill centre, 10" Greensand, 10" Ballycotton & all associated umbilicals	3z: leave *in situ* and rock cover freespans. Removal of pipeline/umbilicals ends and remediate with rock cover	The option to leave the pipelines/umbilicals *in situ* clearly indicates significantly lower risks in terms of: • Safety of personnel • Seabed disturbance • Greenhouse gas emissions, • Technical feasibility, and • Cost. The existing *in situ* 3rd party risks are identified as low although implementation of any additional risk reduction measures associated with option "z" (leave *in situ* with rock placement at pipe ends) would reduce the PLL values further.
Seven Heads		
18" export pipeline and umbilical	1z: leave *in situ*. Removal of pipeline ends and remediate with rock cover	The option to leave the pipelines/umbilicals *in situ* clearly indicates significantly lower risks in terms of: • Safety of personnel • Seabed disturbance • Greenhouse gas emissions, • Technical feasibility, and • Cost. The "z" options are indicated as the preferred option, although residual risks to 3rd parties may be reduced further through the application of option "y"; subject to further evaluation.
8" flowlines and well umbilicals	2z: leave *in situ*. Removal of flowline/umbilicals ends and remediate with rock cover	The option presents the lowest scores across all of the sub-categories considered in the CA.

6.4 Conclusions

Available decommissioning options for the Kinsale Area pipelines and umbilicals were identified and considered against a set of criteria and a scoring system developed to allow their inter-comparison. The scoring of the criteria was undertaken by a team with a good knowledge and experience of the development, including its design and installation, and its current status.

The overarching conclusion of the CA process is that the full removal options have the highest (i.e. worst) scores and are therefore least preferable.

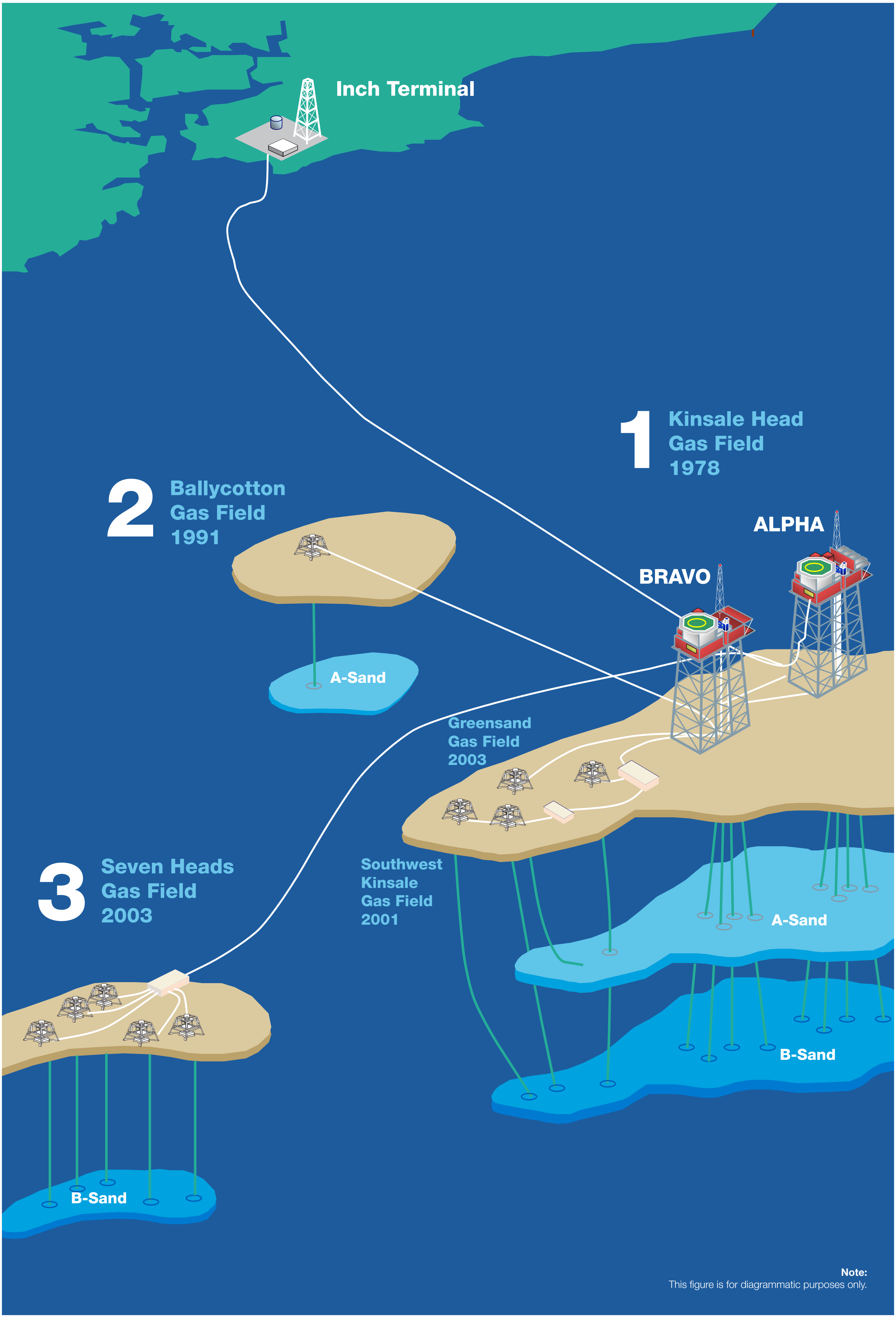
The offshore **preferred options involve leaving the pipelines and umbilicals *in situ* with rock cover used to remediate freespans and ends to reduce future risks to 3rd parties**. Though the "z" options (leave *in situ* and rock placement on freespans) score favourably overall across all the categories assessed, and the majority of sub-categories, it is recognised that there is the potential to make further reductions to 3rd party risks. This may require further evaluation of whether the "y" option (leave *in situ* and rock placement where >50% exposed) could be preferable for certain pipelines.

For the onshore pipeline the CA conclusion is that the best scoring option was to fill it with inhibited water, which also maximises the potential for an alternative re-use of this pipeline in the future.

Kinsale Area Decommissioning Project

Section 7

References


Inch Terminal
1
Kinsale Head
Gas Field
1978
2
Ballycotton
Gas Field
1991
ALPHA
BRAVO
A-Sand
Greensand
Gas Field
2003
3
Seven Heads
Gas Field
2003
Southwest
Kinsale
Gas Field
2001
A-Sand
B-Sand
B-Sand
Note:
This figure is for diagrammatic purposes only.

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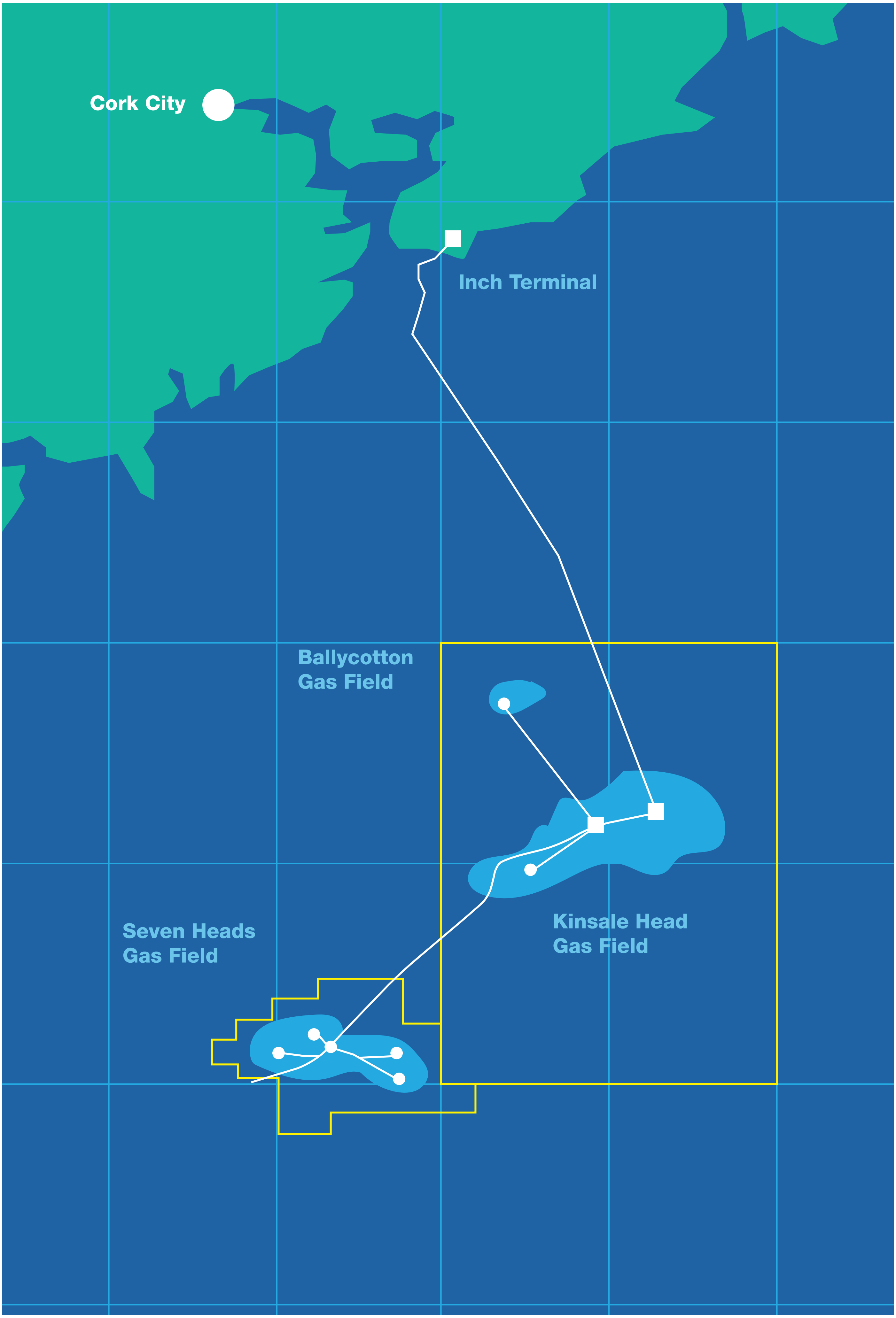
Appendix A

Comparative Assessment Scoresheets


Cork City
Inch Terminal
Ballycotton
Gas Field
Kinsale Head
Gas Field
Seven Heads
Gas Field

A1 Kinsale Head Lease score sheet: 24" Export Pipeline Options

Criteria	Sub criteria	Option 1X - 24" Export Pipeline Full removal Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 1Y - 24" Export Pipeline Leave in situ and rock cover on pipeline where 50% or more exposed. Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 1Z - 24" Export Pipeline Leave in situ and rock cover on exposed ends and freespans only Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.16. Not a standard operation and limited evidence base for PLL data.	5	2	10	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.008.	3	1	3	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.0047.	3	1	3
Safety	Risk to personnel onshore during decommissioning operations	Onshore recycling/disposal operations. Permanent disability/fatality risk. Large quantities of materials. High level of understanding of methods. 15730 Te Steels, 16360 Te Concrete, 4.3 Te Anode.	4	1	4	Onshore recycling/disposal operations. Low quantity. Minor/first aid risk. High level of understanding of methods. 31 Te Steel, 32 Te Concrete.	2	1	2	Onshore recycling/disposal operations. Low quantity. Minor/first aid risk. High level of understanding of methods. 31 Te Steel, 32 Te Concrete.	2	1	2
Safety	Risk to divers during decommissioning operations	0 diver saturation days assumed (method statements). Uncertainty to reflect possible unplanned diver intervention.	1	2	2	0 diver saturation days assumed (method statements)	1	1	1	0 diver saturation days assumed (method statements)	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	Possibility of damage to other vessels due to period of time, linear nature of works, and proximity to shore.	4	1.5	6	Loss of access to operational area. Short time of works.	2	1	2	No Risk Short time of works.	1	1	1
Safety	Residual risk to 3rd parties	Everything removed - therefore no residual risk.	1	1	1	No spans remaining but slight uncertainty with exposed pipe (albeit <50% exposed) over time and rock placement.	1	1.5	1.5	No spans remaining but slight uncertainty with exposed pipe (including pipe >50% exposed) over time and rock placement. However, with close proximity to shore potential snagging risk and damage/loss of fishing gear.	3	1.5	4.5
				Total	23			Total	9.5				11.5
				Average	4.6			Average	1.9			Average	2.3
Environment	Chemical discharge	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	Approximately 33km pipeline deburied from seabed/rock cover removed and sediment disturbance on pipeline removed (full length of pipe). Higher uncertainty associated with nearshore removal.	5	2	10	Approximately 17km of pipeline to be rockplaced.	4	1	4	Approximately 2.29km of pipeline to be rock replacement (at freespans)	2	1	2
Environment	Total CO2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock placement)	Emissions 47,619 t CO_2	5	1	5	Emissions 3,444t CO_2	2	1	2	Emmissions 1510 t CO_2	2	1	2
Environment	Proportion of potential recyclable material returned	All steel and anodes returned for recycling. Fate of concrete uncertain.	1	1.5	1.5	Less than 1% of steel returned. Fate of concrete uncertain.	5	1.5	7.5	Less than 1% of steel returned. Fate of concrete uncertain.	5	1.5	7.5
Environment	Proportion of total landfill material returned	All concrete pipe coating returned for landfill although fate uncertain.	5	1.5	7.5	Less than 1% of concrete returned for landfill although fate uncertain	1	1.5	1.5	Less than 1% of concrete returned for landfill although fate uncertain	1	1.5	1.5
Environment	Conservation sites and species (including noise effects)	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise or sediment disturbance/plumes.	3	1	3	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise or sediment disturbance/plumes.	2	1	2	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	1	1	1
Environment	Loss of containment to the environment of chemicals, hydrocarbons	Vessel fuel and lube inventory only.	3	1	3	Vessel fuel and lube inventory only.	2	1	2	Vessel fuel and lube inventory only.	1	1	1
				Total	31			Total	20			Total	16
				Average	4.4			Average	2.9			Average	2.3
Technical	Technical feasibility	Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered standard, however overall success of this technique on gross scale as proposed here is not certain. Age of pipeline and concrete coating also increases technical complexity and uncertainty.	4	1.5	6	Mechanical shear and clamp tools considered to be readily available to market. Rock FPV techniques for rock cover considered routine and standard.	1	1	1	Mechanical shear and clamp tools considered to be readily available to market. Rock FPV techniques for rock cover considered routine and standard.	1	1	1
Technical	Weather sensitivity	Requires over one year to complete.	5	2	10	Relatively short period in field and rock placement vessel relatively insensitive to weather	2	1	2	Very short period in field and rock placement vessel relatively insensitive to weather	1	1	1
				Total	16			Total	3			Total	2
				Average	8.0			Average	1.5			Average	1.0
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Additional rock placement assumed not to lead to residual effect	2	1	2	Full pipeline and augmented rock cover remains on seabed	2	1	2	Freespans remediated. Rock cover remains on seabed	2	1	2
Societal	Coastal communities	Significant quantity of materials to be returned to shore for recycling/disposal. Visual impact possible due to nearshore works.	4	1.5	6	Limited quantity of materials to be returned to shore for recycling/disposal. Significant quantities of rockplacement required.	2	1	2	Limited quantity of materials to be returned to shore for recycling/disposal. Relatively small quantity of rockplacement required (compared to Option 1Y).	1	1	1
				Total	8			Total	4			Total	3
				Average	4.0			Average	2.0			Average	1.5
Economic	Total cost	€50.5M (assuming 1.2 exchange rate)	5	1.5	7.5	€5.4M (assuming 1.2 exchange rate)	3	1.5	4.5	€2.3M (assuming 1.2 exchange rate)	2	1	2
Economic	Residual liability including monitoring and remediation if necessary	No residual liability but uncertainty given potential foreshore licence requirements.	1	1	1	Surveys and remediation unlikely to be required.	2	1	2	Survey requirement anticipated but at declining frequency	3	1	3
				Total	8.5			Total	6.5			Total	5
				Average	4.3			Average	3.3			Average	2.5
					86.5				43.0				37.5
					4.8				2.4				2.1

A2 Kinsale Head Lease score sheet: Inter-platform Pipelines Options

Criteria	Sub criteria	Option 2X - 24" & 12" KA to KB Pipelines Full removal Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 2Y - 24" & 12" KA to KB Pipelines Leave in situ and rock cover on pipeline where 50% or more exposed. Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 2Z - 24" & 12" KA to KB Pipelines Leave in situ and rock cover on exposed ends, matresses and freespans only Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	PLL values from NEBA report. Manhours calculated with engineers input.PLL value = 0.032. Not a standard operation and limited evidence base for PLL data.	4	2	8	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.008.	3	1	3	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.006.	3	1	3
Safety	Risk to personnel onshore during decommissioning operations	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. 1110 Te Steels, 1830 Te Concrete, 0.8 Te Anode.	3	1	3	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. 77 Te Steels, 448 Te Concrete.	2	1	2	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. 77 Te Steels, 448 Te Concrete.	2	1	2
Safety	Risk to divers during decommissioning operations	0 diver saturation days assumed (method statements). Uncertainty to reflect possible unplanned diver intervention.	1	2	2	0 diver saturation days assumed (method statements)	1	1	1	0 diver saturation days assumed (method statements)	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	Interference with 3rd party operations. Shorter manhours required than 24" export pipeline.	3	1	3	Loss of access to operational area. Short time of works.	2	1	2	No Risk. Short time of works.	1	1	1
Safety	Residual risk to 3rd parties	Everything removed - therefore no residual risk.	1	1	1	No spans remaining but slight uncertainty with exposed pipe (albeit <50% exposed) over time and rock placement.	1	1.5	1.5	No spans remaining but slight uncertainty with exposed pipe (including pipe >50% exposed) over time and rock placement.	2	1.5	3
				Total Average	17 3.4			Total Average	9.5 1.9			Total Average	10 2.0
Environment	Chemical discharge	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	Approximately 2km pipeline deburied from seabed/rock cover removed and sediment disturbance on pipeline removal (full length of pipe).	5	1	5	Approximately 8.5km of pipeline to be rock placed.	4	1	4	Rockplacement at ends and freespans (0.5km)	1	1	1
Environment	Total CO2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock placement)	Emissions 7,897 t CO_2	3	1	3	Emissions 2,525 t CO_2	2	1	2	Emissions 1,367 t CO_2	2	1	2
Environment	Proportion of potential recyclable material returned	All steel and anodes returned for recycling. Fate of concrete uncertain.	1	1.5	1.5	Approximately 4% of steel returned. Fate of concrete uncertain.	5	1.5	7.5	Approximately 4% of steel returned. Fate of concrete uncertain.	5	1.5	7.5
Environment	Proportion of total landfill material returned	All concrete pipe coating returned for landfill although fate uncertain.	5	1.5	7.5	Approximately 4% of concrete returned for landfill although fate uncertain	1	1.5	1.5	Approximately 4% of concrete returned for landfill although fate uncertain	1	1.5	1.5
Environment	Conservation sites and species (including noise effects)	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	2	1	2	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	2	1	2	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	2	1	2
Environment	Loss of containment to the environment of chemicals, hydrocarbons	Vessel fuel and lube inventory only.	2	1	2	Vessel fuel and lube inventory only.	2	1	2	Vessel fuel and lube inventory only.	2	1	2
				Total Average	22 3.1			Total Average	20 2.9			Total Average	17 2.4
Technical	Technical feasibility	Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover and deburial of pipeline considered standard, however overall success of this technique on gross scale as proposed here is not certain.	3	1.5	4.5	Mechanical shear and clamp tools considered to be readily available to market. Rock FPV techniques for rock cover considered routine and standard.	1	1	1	Mechanical shear and clamp tools considered to be readily available to market. Rock FPV techniques for rock cover considered routine and standard.	1	1	1
Technical	Weather sensitivity	Requires good weather window	3	1.5	4.5	Limited period in field and rock placement vessel relatively insensitive to weather	2	1	2	Rock placement vessel relatively insensitive to weather	1	1	1
				Total Average	9 4.5			Total Average	3 1.5			Total Average	2 1.0
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Additional rock placement assumed not to lead to residual effect	2	1	2	Full pipeline and augmented rock cover remains on seabed	2	1	2	Freespans remediated. Rock cover remains on seabed	2	1	2
Societal	Coastal communities	Significant quantity of materials to be returned to shore for recycling/disposal	3	1	3	Limited material returned to shore for recycling/disposal	1	1	1	Limited material returned to shore for recycling/disposal	1	1	1
				Total Average	5 2.5			Total Average	3 1.5			Total Average	3 1.5
Economic	Total cost	€9.6M (assuming 1.2 exchange rate)	3	1.5	4.5	€3.9M (assuming 1.2 exchange rate)	2	1	2	€2.4M (assuming 1.2 exchange rate)	2	1	2
Economic	Residual liability including monitoring and remediation if necessary	No residual liability but some uncertainty	1	1	1	Surveys and remediation unlikely to be required	2	1	2	Survey requirement anticipated but at declining frequency	3	1	3
				Total Average	5.5 2.8			Total Average	4 2.0			Total Average	5 2.5
					58.5 3.3				39.5 2.2				37.0 2.1

A3 Kinsale Head Lease score sheet: Infield Pipelines and Umbilicals Options

Criteria	Sub criteria	Option 3X - Infield Pipelines and Umbilicals Full removal Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 3Z - Infield Pipelines & Umbilicals Leave in situ and rock cover on exposed ends, matresses and freespans Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.116. Not a standard operation and limited evidence base for PLL data.	5	2	10	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.012.	4	1	4
Safety	Risk to personnel onshore during decommissioning operations	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. 2620 Te Steels, 3660 Te Concrete Mats, 2.8 Te Anode, 259 Te Umbilical	3	1	3	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. 70 Te Steels, 260 Te Concrete, negligible umbilical	2	1	2
Safety	Risk to divers during decommissioning operations	0 diver saturation days assumed	1	1	1	0 diver saturation days assumed (method statements)	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	Possibility of damage to other vessels due to period of time, linear nature of works.	4	1	4	Loss of access to operational area. Short time of works.	2	1	2
Safety	Residual risk to 3rd parties	Everything removed - therefore no residual risk.	1	1	1	No spans remaining but slight uncertainty with existing rock placement overtime (majority of infield pipes & umbilicals).	1	1.5	1.5
				Total	19			Total	10.5
				Average	3.8			Average	2.1
Environment	Chemical discharge	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	Whole pipelines deburied from seabed/rock cover removed and sediment disturbance on pipeline removal.	5	1	5	Rockplacement at ends only	1	1	1
Environment	Total CO2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock placement)	Emissions 27,024 t CO_2	5	1	5	Emissions 2,330 t CO_2	2	1	2
Environment	Proportion of potential recyclable material returned	All steel and anodes returned for recycling. Fate of concrete uncertain.	1	1.5	1.5	Approximately <10% of steel returned. Fate of concrete uncertain.	5	1.5	7.5
Environment	Proportion of total landfill material returned	All concrete mats returned for landfill although fate uncertain.	5	1.5	7.5	Approximately <10% of concrete returned for landfill although fate uncertain	1	1.5	1.5
Environment	Conservation sites and species (including noise effects)	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	2	1	2	No explosive cutting, vessel and operation noise. No Natura 2000 sites within effects range for noise.	2	1	2
Environment	Loss of containment to the environment of chemicals, hydrocarbons	Vessel fuel and lube inventory only.	3	1	3	Vessel fuel and lube inventory only.	2	1	2
				Total	25			Total	17
				Average	3.6			Average	2.4
Technical	Technical feasibility	Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered routine, however overall success of this technique on gross scale as proposed here is not certain	3	1.5	4.5	Mechanical shear and clamp tools considered to be readily available to market. Rock FPV techniques for rock cover considered routine.	1	1	1
Technical	Weather sensitivity	Requires over one year to complete.	5	1.5	7.5	Limited period in field and rock placement vessel relatively insensitive to weather	2	1	2
				Total	12			Total	3
				Average	6.0			Average	1.5
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Additional rock placement assumed not to lead to residual effect	1	1	1	Freespans remediated. Rock cover remains on seabed	2	1	2
Societal	Coastal communities	Significant quantity of materials to be returned to shore for recycling/disposal	4	1	4	Small quantities of materials to be returned to shore for recycling/disposal required.	2	1	2
				Total	5			Total	4
				Average	2.5			Average	2.0
Economic	Total cost	€40.5M (assuming 1.2 exchange rate)	5	1.5	7.5	€4.25M (assuming 1.2 exchange rate)	2	1	2
Economic	Residual liability including monitoring and remediation if necessary	No residual liability but some uncertainty	1	1	1	Surveys and remediation unlikely to be required	2	1	2
				Total	8.5			Total	4
				Average	4.3			Average	2.0
					69.5				38.5
					3.9				2.1

A4 Seven Heads Lease score sheet: 18" Pipeline and Umbilical Options

Criteria	Sub criteria	Option 1X - 18" Pipeline and Main Umbilical Full Removal Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 1Y - 18" Pipeline and Main Umbilical Leave in situ and rock cover on pipeline where 50% or more exposed Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 1Z - 18" Pipeline and Main Umbilical Leave in situ and rock cover on exposed ends, matresses & freespans only Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.12. Not a standard operation and limited evidence base for PLL data.	5	2	10	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.0071. Less people, time, technicallity etc. than Option 1X so uncertainty low.	3	1	3	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.007.	3	1	3
Safety	Risk to personnel onshore during decommissioning operations	Onshore recycling/disposal operations. Permanent disability/fatality risk. Large quantities of materials. High level of understanding of methods. 7892 Te steel, 800 Te Concrete Mats, 10,255 Te Concrete Pipe Coating, 4.42 Te Anode, 780 Te Umbilical	4	1	4	Onshore recycling/disposal operations. Low quantity - removal of pipeline ends and protection only. Minor/first aid risk. High level of understanding of methods. 340 Te Concrete Mat, 42.19 Te Concrete pipeline coating, 32.5 Te Steel	2	1	2	Onshore recycling/disposal operations. Low quantity - removal of pipeline ends and protection only. Minor/first aid risk. High level of understanding of methods. 340 Te Concrete Mat, 42.19 Te Concrete pipeline coating, 32.5 Te Steel	2	1	2
Safety	Risk to divers during decommissioning operations	0 diver saturation days assumed (method statements). Uncertainty to reflect possible unplanned diver intervention.	1	2	2	0 diver saturation days assumed (method statements)	1	1	1	0 diver saturation days assumed (method statements)	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	Possibility of interference with other vessels due to period of time and linear nature of works.	3	1.5	4.5	Loss of access to operational area. Short time of works.	2	1	2	No risk. Short time of works.	1	1	1
Safety	Residual risk to 3rd parties	Existing cable crossings may remain. No risk.	1	1.5	1.5	No spans remaining but slight uncertainty with exposed pipe over time and rock placement.	1	1.5	1.5	No spans remaining but slight uncertainty with exposed pipe over time and rock placement.	3	1.5	4.5
				Total Average	22 4.4			Total Average	9.5 1.9			Average	11.5 2.3
Environment	Chemical discharge	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	Approximately 18km pipeline deburied from seabed/rock cover removed and sediment disturbance on pipeline removal.	5	1.5	7.5	Approximately 1.3km of line to have rock placement	2	1	2	Rock dump at ends/matresses only	1	1	1
Environment	Total CO_2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock dump)	Emissions large due to high number of days vessel activity, 31,033t CO_2	5	1	5	Emissions 1,820t CO_2	2	1	2	Emissions 1739t CO_2	2	1	2
Environment	Proportion of potential recyclable material returned	All steel and anodes returned for recycling. Fate of concrete uncertain.	1	1.5	1.5	Less than 1% of steel returned. Fate of concrete uncertain.	5	1.5	7.5	Less than 1% of steel returned. Fate of concrete uncertain.	5	1.5	7.5
Environment	Proportion of total landfill material returned	Assumes marine growth not removed. All concrete pipe coating and mats returned for landfill although fate uncertain.	5	1.5	7.5	Approximately 2% of concrete returned for landfill although fate uncertain	1	1.5	1.5	Approximately 2% of concrete returned for landfill although fate uncertain	1	1.5	1.5
Environment	Conservation sites and species (including noise effects)	No explosive cutting, vessel and operation noise, no Natura 2000 sites within effects range.	2	1	2	No explosive cutting, vessel, operation and rock dumping noise, no Natura 2000 sites within effects range.	2	1	2	No explosive cutting, vessel, operation and rock dumping noise, no Natura 2000 sites within effects range.	2	1	2
Environment	Loss of containment to the environment of chemicals, hydrocarbons	Vessel fuel and lube inventory only.	3	1	3	Vessel fuel and lube inventory only.	2	1	2	Vessel fuel and lube inventory only.	2	1	2
				Total Average	27.5 3.9			Total Average	18 2.6			Total Average	17 2.4
Technical	Technical feasibility	Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline standard, however overall success of this technique on gross scale as proposed here is not certain. Concrete coating also increases technical complexity and uncertainty	4	1.5	6	Mechanical shear and clamp tools considered to be readily available to market. Techniques for removal of mattress protection standard.	1	1	1	Mechanical shear and clamp tools considered to be readily available to market. Techniques for removal of mattress protection considered standard.	1	1	1
Technical	Weather sensitivity	Long periods of CSV and PSV anticipated. Requires up to one year to complete.	5	2	10	Relatively short period in field and rock dump vessel relatively insensitive to weather	2	1	2	Relatively short period in field and rock dump vessel relatively insensitive to weather	2	1	2
				Total Average	16 8.0			Total Average	3 1.5			Total Average	3 1.5
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Presence of existing crossings such that some pipeline sections must remain/with rock dump at cut ends.	2	1	2	Full pipeline and augmented rock cover remains on seabed	2	1	2	Full pipeline and rock cover, including at ends, remains on seabed	2	1	2
Societal	Coastal communities.	Materials to be returned to shore for recycling/disposal	3	1	3	Portside and nearshore shipping associated with rock dump vessels. Some material returned to shore for recycling/disposal.	2	1	2	Portside and nearshore shipping associated with rock dump vessels. Some material returned to shore for recycling/disposal.	2	1	2
				Total Average	5 2.5			Total Average	4 2.0			Total Average	4 2.0
Economic	Total cost	€35.8M (assuming 1.2 exchange rate)	5	1.5	7.5	€2.86M (assuming 1.2 exhange rate)	2	1.5	3	€2.7M (assuming 1.2 exchange rate)	2	1	2
Economic	Residual liability including monitoring and remediation if necessary	No residual liability but some uncertainty	1	1	1	Surveys and remediation unlikely to be required.	2	1	2	Surveys and remediation unlikely to be required.	2	1	2
				Total Average	8.5 4.3			Total Average	5 2.5			Total Average	4 2.0
					79.0 4.4				39.5 2.2				39.5 2.2

A5 Seven Heads Lease score sheet: 8" Flowlines and Umbilicals Options

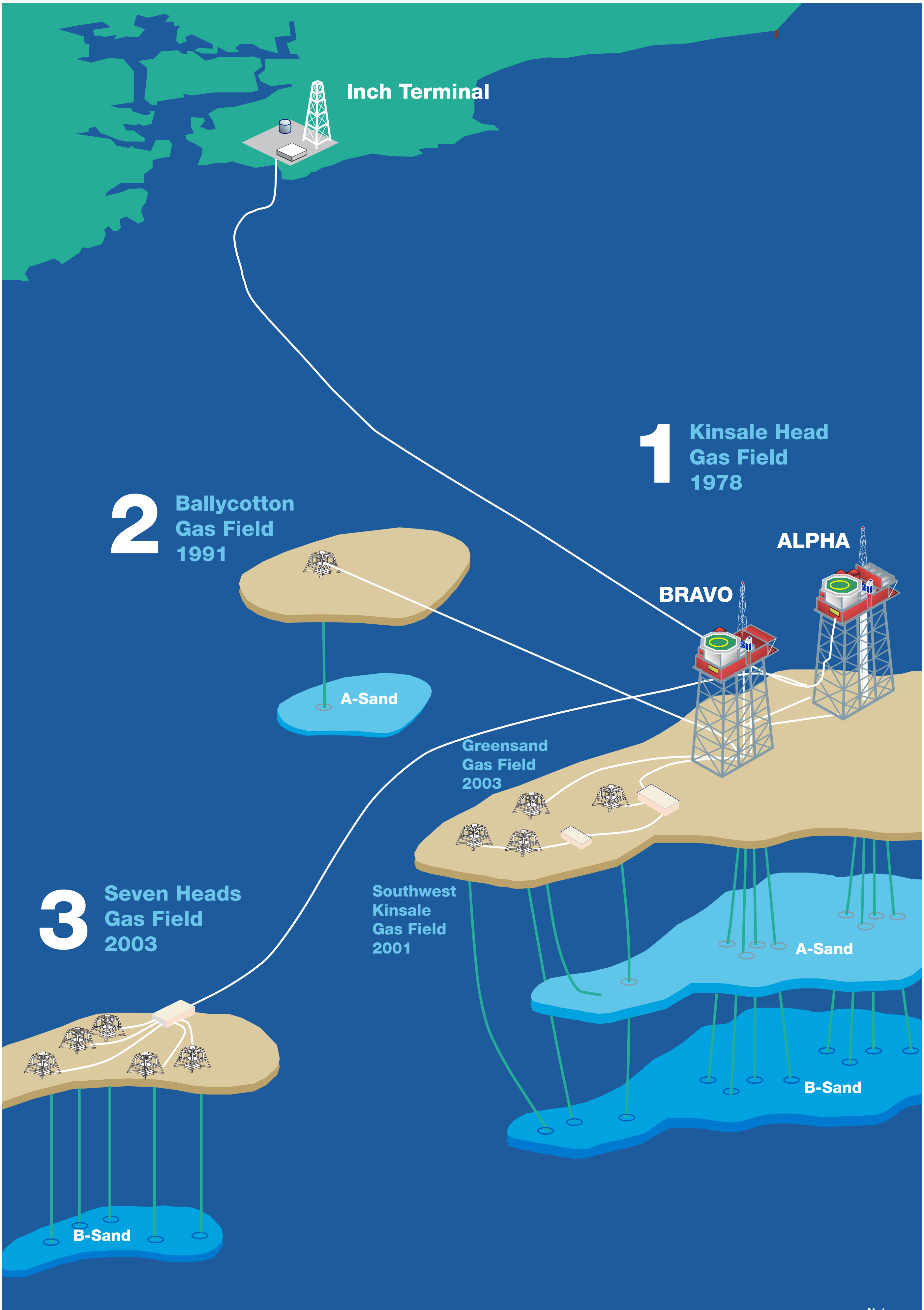
Criteria	Sub criteria	Option 2X - 8" flowlines and well umbilicals Full Removal Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Option 2Z - 8" flowlines & Umbilicals Leave in situ and rock cover on exposed ends, matresses & freespans only Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.09. Not a standard operation and limited evidence base for PLL data.	4	2	8	PLL values from NEBA report. Manhours calculated with engineers input. PLL value = 0.009.	3	1	3
Safety	Risk to personnel onshore during decommissioning operations	Onshore recycling/disposal operations. Medical aid/lost time injury risk. Large quantities of materials. High level of understanding of methods. 3700 Te concrete mat, 2580 Te steel, 3.28 Te anode, 423.8 Te umbilical	3	1	3	Onshore recycling/disposal operations. Medical aid/lost time injury risk. High level of understanding of methods. Less materials than full removal but still risk in yard. 1070 Te Concrete mat, 6.5 Te steel, 0.1 Te Anode, negligible umbilical	3	1	3
Safety	Risk to divers during decommissioning operations	0 diver saturation days assumed (method statements). Uncertainty to reflect possible unplanned diver intervention.	1	2	2	0 diver saturation days assumed	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	Possibility of interference with other vessels due to period of time and linear nature of works.	3	1	3	Loss of access to operational area. Short time of works. Current safety risk not altered.	2	1	2
Safety	Residual risk to 3rd parties	No residual risk	1	1	1	No spans remaining but slight uncertainty with existing rock placement overtime (all pipes & umbilicals).	1	1.5	1.5
				Total	17			Total	10.5
				Average	3.4			Average	2.1
Environment	Chemical discharge	No chemicals used, only seawater discharged	1	1	1	No chemicals used, only seawater discharged	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	Pipelines require to be deburied from seabed or have rock cover removed and sediment disturbance on pipeline removal.	5	1.5	7.5	Limited seabed disturbance associated with removal of pipeline ends/concrete mattresses at flowline ends.	2	1	2
Environment	Total CO_2 Emissions (resulting from energy consumption associated with vessels, treatment of recovered material and rock dump)	Emissions large due to high number of days vessel activity, 19,137t CO_2	4	1	4	Emissions 1,832t CO_2	2	1	2
Environment	Proportion of potential recyclable material returned	All steel and anodes returned for recycling. Fate of concrete uncertain.	1	1.5	1.5	Approximately 1% of recyclable material (steel, anodes) returned. Fate of concrete uncertain.	5	1.5	7.5
Environment	Proportion of total landfill material returned	All concrete mats returned for landfill although fate uncertain.	5	1.5	7.5	<30% concrete mats returned for landfill although fate uncertain.	2	1.5	3
Environment	Conservation sites and species (including noise effects)	No explosive cutting, vessel and operation noise, no Natura 2000 sites within effects range.	2	1	2	No explosive cutting, vessel and operation noise, no Natura 2000 sites within effects range.	2	1	2
Environment	Loss of containment to the environment of chemicals, hydrocarbons	Vessel fuel and lube inventory only.	3	1	3	Vessel fuel and lube inventory only. Short period in field.	2	1	2
				Total	26.5			Total	19.5
				Average	3.8			Average	2.8
Technical	Technical feasibility	Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered standard, however overall success of this technique on gross scale as proposed here is not certain.	3	1.5	4.5	Mechanical shear and clamp tools considered to be readily available to market.	1	1	1
Technical	Weather sensitivity	Requires just under one year to complete.	4	1.5	6	Relatively short period in field and rock dump vessel relatively insensitive to weather	2	1	2
				Total	10.5			Total	3
				Average	5.3			Average	1.5
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Additional rock dump assumed not to lead to residual effect	1	1	1	Flowlines largely remain buried.	2	1	2
Societal	Coastal communities.	Materials to be returned to shore for recycling/disposal	3	1	3	Some material returned to shore for recycling/disposal	2	1	2
				Total	4			Total	4
				Average	2.0			Average	2.0
Economic	Total cost	€26.0M (assuming 1.2 exchange rate)	5	1.5	7.5	€3.4M (assuming 1.2 exchange rate)	2	1	2
Economic	Residual liability including monitoring and remediation if necessary	No residual liability but some uncertainty	1	1	1	Surveys and remediation unlikely to be required.	2	1	2
				Total	8.5			Total	4
				Average	4.3			Average	2.0
					66.5				41.0
					3.7				2.3

A6 Onshore Options

Criteria	Sub criteria	Onshore Pipeline Option 1X - Full Removal (deburial) Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Onshore Pipeline Option 1Y - Fill with Grout Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score	Onshore Pipeline Option 1Z - Fill with Inhibited Water Narrative to support score	Risk/ Impact	Relative Uncertainty	Weighted Score
Safety	Risk to personnel offshore during decommissioning operations	not applicable - onshore operations only	1	1	1	not applicable - onshore operations only	1	1	1	not applicable - onshore operations only	1	1	1
Safety	Risk to personnel onshore during decommissioning operations	Relatively low risk, but higher than other options; associated with standard construction works; trench excavation, pipeline removal and reinstatement works.	3	1	3	Minimal risk - pipeline remaining in situ; only works required are filling with grout - carries minimal risk.	1	1	1	Minimal risk - pipeline remaining in situ; only works required are filling with inhibited water - carries minimal risk.	1	1	1
Safety	Risk to divers during decommissioning operations	not applicable - onshore operations only	1	1	1	not applicable - onshore operations only	1	1	1	not applicable - onshore operations only	1	1	1
Safety	Risk to 3rd parties and assets during decommissioning operations	minor risk to third parties from trenching and pipeline removal operations, particularly at road crossing.	3	1	3	Minimal risk - pipeline remaining in situ; only works required are filling with grout, which will be done from terminal site.	1	1	1	No risk, pipeline remaining in situ; only works required are filling with inhibited water, which will be done from terminal site.	1	1	1
Safety	Residual risk to 3rd parties	No residual risk - pipeline trench will be reinstated and pipeline will be removed.	1	1	1	No residual risk - pipeline will be filled with grout.	1	1	1	Minor residual risk - associated with risk of pipeline corroding and collapsing over time.	2	1	2
				Total	9			Total	5			Total	6
				Average	1.8			Average	1.0			Average	1.2
Environment	Chemical discharge	No risk of chemical discharges; pipeline discharged into wells offshore.	1	1	1	No risk of chemical discharges; pipeline discharged into wells offshore.	1	1	1	No risk of chemical discharges; pipeline discharged into wells offshore.	1	1	1
Environment	Seabed disturbance and/or habitat alteration including cumulative impact	There will be a temporary disturbance to onshore habitats during removal of pipeline, with habitats reinstated on completion. The main habitats likely to be impacted include agricultural land and hedgerows.	4	1	4	As the pipeline is being left in place, there will be no disturbance of habitat. Grouting of the pipeline should protect against any risk of eventual pipeline collapse.	1	1	1	As the pipeline is being left in place, there will be no disturbance of habitat during decommissioning works. There is a risk, eventually, if the pipeline is not maintained, of it corroding and eventually collapsing, impacting on the habitat along the pipeline route.	2	1	2
Environment	Direct CO_2 Emissions	There will be plant and equipment required for pipeline removal - trench excavation, backfilling and reinstatement. There will also be energy consumption/carbon emissions associated with recycling/reuse of pipeline materials. This scoring is marked relative to other onshore options.	3	1	3	As the pipeline is filled with grout, there will be energy consumption and CO_2 emissions associated with the production of the grout and the equipment and machinery required to fill the pipeline.	2	1	2	As the pipeline is being left in place, there will be no significant works required, other than filling with inhibited water. There will be some minor energy consumption and emissions associated with the supply of inhibited water.	1	1	1
Environment	Proportion of potential recyclable material returned	Steel pipeline to be recycled/reused where possible. No concrete lining in onshore section.	1	1	1	No materials removed, so no opportunity for recycling materials.	5	1	5	No materials removed, so no opportunity for recycling materials.	5	1	5
Environment	Proportion of total landfill material returned	Very small quantity of materials may not be recycled and will require landfilling. No concrete liner, so the quantity is likely very small.	5	1	5	As the pipeline is being left in place, there are no materials to be landfilled.	1	1	1	As the pipeline is being left in place, there are no materials to be landfilled. Should the pipeline corrode and collapse in the future, there may be a requirement for remedial works and the removal and disposal of pipeline materials.	1	1.5	1.5
Environment	Conservation sites and species (including noise effects)	Temporary impacts to birds and mammals during pipeline removal, including potential impacts on sensitive species such as Yellowhammer and Hen Harrier, through habitat disturbance and noise.	3	1	3	As the pipeline is being left in place, there will be minimal disturbance of species or impacts on conservation sites. There will be a minor impact from noise, etc during the filling of the pipeline, relative to other options, but this will be very short term.	1	1	1	As the pipeline is being left in place, there will be minimal disturbance of species or impacts on conservation sites. There will be a minor impact from noise, etc during the filling of the pipeline, but this will be very short term.	1	1	1
Environment	Loss of containment to the environment of chemicals, hydrocarbons	There is no significant risk of loss of containment for this option.	1	1	1	The pipeline is to be filled with grout in this scenario. There is a small risk of loss of containment to the environment of grout during this process.	1	1.5	1.5	There is no significant risk of loss of containment for this option.	1	1	1
				Total	18			Total	12.5			Total	12.5
				Average	2.6			Average	1.8			Average	1.8
Technical	Technical feasibility	There is little complexity in the removal of the pipeline onshore. It is standard construction work, but will involve more complexity than other options.	2	1	2	There is no particular complexity associated with this proposed option.	1	1	1	There is no particular complexity associated with this proposed option.	1	1	1
Technical	Weather sensitivity	It is unlikely that weather will impact significantly on the pipeline removal works. Heavy rainfall may delay works and measures need to be implemented to minimise runoff during such events.	2	1	2	Weather impact is not an issue, since minimal works are proposed. Measures will be put in place to minimise the risk of contaminated run-off during heavy rainfall events.	1	1	1	Weather impact is not an issue, since minimal works are proposed.	1	1	1
				Total	4			Total	2			Total	2
				Average	2.0			Average	1.0			Average	1.0
Societal	Residual effect on fishing, navigation or other access (including cumulative)	Pipeline will be removed and trench reinstated, so no residual impact on landowners along route; wayleaves can be surrendered, along with associated burdens on title.	1	1	1	As the pipeline is being left in place, there is no residual effect on local stakeholders.	1	1	1	As the pipeline is being left in place, there is no residual effect on local stakeholders. In the event of pipeline collapse, there may be some access restrictions for a short period.	1	1.5	1.5
Societal	Coastal communities	Temporary disturbance due to traffic, noise, etc during pipeline removal. Disturbance to landowners along route during pipeline removal.	3	1.5	4.5	As the pipeline is being left in place, there will be no impact on the coastal communities as a result of the decommissioning activities, save during grouting activities, which will be very short term.	2	1	2	As the pipeline is being left in place, there will be no impact on the coastal communities as a result of the decommissioning activities.	1	1	1
				Total	5.5			Total	3			Total	2.5
				Average	2.8			Average	1.5			Average	1.3
Economic	Total cost	Cost of removal of pipeline and reinstatement likely greater than other options. Scoring in this regard is relative to other options.	3	1	3	Small cost associated with filling with grout.	2	1	2	Minor cost associated with filling with inhibited water.	1	1	1
Economic	Residual liability including monitoring and remediation if necessary	No residual liability and remediation - full removal.	1	1	1	There may be a residual liability in terms of the wayleave; can this be surrendered if pipeline remains in place?	1	1.5	1.5	There may be a residual liability in terms of the wayleave; can this be surrendered if pipeline remains in place? and in the case of any risk of pipeline collapse in the future.	2	1.5	3
				Total	4			Total	3.5			Total	4
				Average	2.0			Average	1.8			Average	2.0
					11.1				7.0				7.2
					2.2				1.4				1.4

Appendix B

Decommissioning Method Statements



Note:
This figure is for diagrammatic purposes only.

Client :	Kinsale Energy
Project :	Kinsale Head Comparative Assessment
Segment:	24" Gas Export Pipeline (offshore - up to high water mark at landfall)
Option No :	1X
Option Title :	Full Removal

Method Statement

•Pipeline assumed to be filled with seawater and bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
•Remove grout bags (no matress protection on pipeline)
•Remove rock covering from 6,030m of pipeline by mass flow excavation techniques
•De-bury 19,978m (assumed pipeline can be cut when 50% exposed) plus 13,226m of pipeline where fully buried to allow cutting operations
•Cut pipeline into 24m sections using mechanical shears (including spools to platform)
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Rock placement in excavated trench where pipeline was exposed and removed (19,978m partial burial plus 13,226m full burial sections)

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (CSV and DSV and Rock FPV)	5	☑	☐	☑	☐	☐	☐	☑
Remove mats from pipeline ends and spools (not required) + remove grout bags	2	☑	☐	☐	☐	☐	☐	☐
Excavate 6,030m of rock cover	10	☑	☐	☐	☐	☐	☐	☐
Excavate 19,978m + 13,226m of seabed cover	21	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (2,225 pieces) (full 53.4km length used)	185	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	185	☑	☐	☑	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
Trench remediation by rock placement (incl 21 days remobilisations)	65	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	476	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	411	6576	32.88	45210	
DSV	0	0	0	0	
PSV	193	1930	1.93	5404	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	73	1460	7.3	1679	
Total	**677**	**9966**	**42.11**	**52293**	**0**

Affected Seabed Areas

Detail	Length (m)	Breadth (m)	Rock Height (m) if appropriate	Area Affected (m2)
Dispersed Rock from deburial	6030	10		60300
Deburied sections of pipeline	33204	30		996120
Rock Backfill of open trench due to deburial	19978	4.5	0.75	89901
Rock Backfill of open trench due to deburial	13226	6	1	79356
				0

Rock placement quantity required 73390 Cubic Metres
(198153 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	0 Mats @ approx 10 Te each; 16360 Te of concrete from pipeline coating (assuming max case, 57mm thickness, 2400 kg/m3 density)
Steel	15730 Te (assuming max case 19mm thickness at 7850 kg/m3)
Anodes	4.3 Te (Assumed to be 213 * 20 kg)

Overall Technical Complexity

Low	Medium	High
	X	

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover and deburial of pipeline considered transferrable from typical offshore operations, however overall success of this technique on gross scale as proposed here is not certain

Greenhouse Gas Emissions
Total CO2 Emissions: 47,619.12 tonnes

Risk to offshore personnel during works
PLL Value: 0.16315416

Comments/Notes:
•Method statement is a copy of the Ramboll Method Statement Option 1a (24" Gas Export Pipeline - full removal).
•This method statement is to cover the full length of offshore pipeline up to the high water mark at the landfall.
•For this analysis a CSV & PSV has been assumed to complete the work for the full length of the pipeline and no details of use of a barge for nearshore has been encorporated (as per the Ramboll Method Statement); assuming that the overall difference in cost, time and CO2 emissions would be minimal and not impact the end result of the comparative assessment conclusions.
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Kinsale Head Comparative Assessment**
Segment:	**24" Gas Export Pipeline (offshore - up to high water mark at landfall)**
Option No :	**1Y**
Option Title :	**Leave in situ and rock placement on pipeline where 50% or more exposed**

Method Statement

- Pipeline assumed to be filled with seawater and bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
- Remove grout bags at 11no. locations along pipeline
- Cut pipeline ends into 24m sections using mechanical shears (including spools to platform, assume cut into 4 pieces - 4 x 24m)
- Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- Rockplacement over sections of line 50% or more exposed (14,608m)
- Rock placement exposed pipeline end and grout bags (allow 250Te)
- Rock volumes taken directly from rock placement calculation sheet 270218

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☑	☐	☐	☐	☑
Remove grout bags	2	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (4 pieces for platform end)	0.75	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	0.5	☑	☐	☑	☐	☐	☐	☐
Rock placement for 16,897m of pipeline	21	☐	☐	☐	☐	☐	☐	☑
Interim Remobilisations for rock placement	9	☐	☐	☐	☐	☐	☐	☑
Rock placement pipeline end [included in above]	0	☐	☐	☐	☐	☐	☐	☑
Demob	3	☐	☐	☐	☐	☐	☐	☑
		☑	☐	☑	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	41.25	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	8.25	132	0.66	907.5	
DSV	0	0	0	0	
PSV	5.5	55	0.055	154	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	38	760	3.8	874	
Total	**51.75**	**947**	**4.515**	**1935.5**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Rock placement over exposed sections	14,608	73,741
Freespans	2,214.49	9,965
Rockplacement pipeline end	10	50
Mattresses	64	371
Total		**84,128**

Rock placement quantity required 35,290.5 Cubic Metres (95284.404 Tonne)

Recovered Materials to Waste Management Chain

Concrete	0 Mats @ approx 10 Te each; 32 Te of concrete from pipeline coating (assuming max case 57mm thickness, 2400 kg/m3 density)
Steel	31 Te (assuming max case 19mm thickness at 7850 kg/m3)
Anodes	negligible/none

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market.

Rock FPV techniques for rock cover considered routine and transferrable from typical offshore operations.

Greenhouse Gas Emissions
Total CO2 Emissions: 3,443.51 tonnes

Risk to offshore personnel during works
PLL Value: 0.00603876

Comments/Notes:
- Method statement is a copy of the Ramboll Method Statement Option 1c (24" Gas Export Pipeline - leave insitu, remove spools & rock placement on pipeline where 50% or more exposed).
- This method statement is to cover the full length of offshore pipeline up to the high water mark at the landfall. No change to Ramboll Method Statement as it is assumed the pipe is not exposed on the nearshore.
- Length of pipe to removed at platform end = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statement Options where pipe ends are being removed)
- Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Kinsale Head Comparative Assessment**
Segment:	**24" Gas Export Pipeline (offshore - up to high water mark at landfall)**
Option No :	**1Z**
Option Title :	**Leave in situ and rock placement exposed ends, grout bags and freespans**

Method Statement

- Pipeline assumed to be filled with seawater and water bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
- Cut pipeline end at platform into 24m sections using mechanical shears (including spools to platform, assume cut into 4 pieces)
- Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- Rock placement exposed pipeline end and grout bags (allow 250Te) and freespans (allow for 2.214km of freespans)
- Rock volumes taken directly from rock placement calculation sheet 270218

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☑	☐	☐	☐	☑
Cut pipe into 24m section (4 pieces for platform end)	0.75	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	0.5	☑	☐	☑	☐	☐	☐	☐
Rockplacement exposed pipeline end and grout bags	0	☐	☐	☐	☐	☐	☐	☑
Rock placement along freespans	3	☐	☐	☐	☐	☐	☐	☑
Demob	3	☑	☐	☑	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	12.25	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	9.25	148	0.74	1017.5	
DSV	0	0	0	0	
PSV	8.5	85	0.085	238	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	11	220	1.1	253	
Total	**28.75**	**453**	**1.925**	**1508.5**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Freespans	2,214.49	9,965
Rockplacement exposed pipeline end	10	50
Mattresses	64	371
Total		**10,387**

Rock placement quantity required 3790 Cubic Metres (10233 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	0 Mats @ approx 10 Te each; 32 Te of concrete from pipeline coating (assuming max case 57mm thickness, 2400 kg/m3 density)
Steel	31 Te (assuming max case 19mm thickness at 7850 kg/m3)
Anodes	negligible/none

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Rock FPV techniques for rock cover considered routine and transferrable from typical offshore operations.

Greenhouse Gas Emissions
Total CO2 Emissions: 1,510.10 tonnes

Risk to offshore personnel during works
PLL Value: 0.004707

Comments/Notes:

- Method statement is based on the Ramboll Method Statement Option 1d (24" Gas Export Pipeline - leave insitu & rock placement on pipeline exposed ends) but with pipeline ends removed at the platform also for consistency with Ramboll Method Statements for Seven Heads do minimium leave Insitu options (taken from Ramboll Method Statement Option 1c) and rock placement along freespans.
- This method statement is to cover the full length of offshore pipeline up to the high water mark at the landfall, although no freespans are assumed to be within the nearshore section of pipe.
- Length of pipe to removed at platform end = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statement Options where pipe ends are being removed)
- Rock placement along freespans and at exposed pipeline ends assumed to be completed as per Ramboll Method Statement Option 1a & 1c rock placement on a pro-rata basis (approx 4500te placed per day and remobilisation after 25,000te vessel capacity is used).
- Rock placement along freespansbased on 2.127 km length span x 5m breadth x 1.5m depth

KINSALE ENERGY

Client : Kinsale Energy
Project : Kinsale Head Comparative Assessment
Segment: 24" KA to KB Pipeline & 12" KA to KB Pipeline
Option No : 2X
Option Title : Full Removal

Method Statement

•Pipeline assumed to be filled with seawater and water bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
•Remove matress protection at pipeline platform ends (only required on 12" line)
•Remove rock covering from 302m of pipeline by mass flow excavation techniques only required on 24" line
•De-bury 1,219m (assumed pipeline can be cut when 50% exposed) plus 196m of pipeline where fully buried to allow cutting operations (only required on 24" line)
•Cut pipeline into 24m sections using mechanical shears (including spools to platforms, assume cut into 4 pieces each end)
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Rock placement in excavated trench where pipeline was exposed and removed (1,219m partial burial plus 196m full burial sections) (only required on 24" line)

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (CSV and DSV and Rock FPV)	5	☑	☐	☑	☐	☐	☐	☑
Remove 68 mats from pipeline ends and spools+ remove grout bags	5	☑	☐	☐	☐	☐	☐	☐
Excavate 302m of rock cover	0.25	☑	☐	☐	☐	☐	☐	☐
Excavate 1,219m + 196m of seabed cover	1	☑	☐	☐	☐	☐	☐	☐
Cut pipes into 24m section (208 x 2 = 416 pieces)	34	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	34	☑	☐	☑	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
Trench remediation by rock placement	1.75	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	84	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	82.25	1316	6.58	9047.5	
DSV	0	0	0	0	
PSV	42	420	0.42	1176	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	9.75	195	0.975	224.25	
Total	**134**	**1931**	**7.975**	**10447.75**	**0**

Affected Seabed Areas

Detail	Length (m)	Breadth (m)	Rock Height (m) if appropriate	Area Affected (m2)
Dispersed Rock from deburial	302	10		3020
Deburied sections of pipeline	1415	30		42450
Rock Backfill of open trench due to deburial	1219	4.5	0.75	5485.5
Rock Backfill of open trench due to deburial	196	6	1	1176
				0

Rock placement quantity required 2645 Cubic Metres
(7141.5 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	68 Mats @ approx 10 Te each (12" line); 1150 Te of concrete from pipeline coating (44 mm thickness, 2400 kg/m3 density) (24" line)
Steel	1110 Te (14.3mm thickness at 7850 kg/m3) (24" line) 700 Te (17.5mm thickness at 7850 kg/m3) (12" line)
Anodes	0.8 Te (Assumed to be 40 * 20 kg)

Overall Technical Complexity

Low	Medium	High
	X	

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover and deburial of pipeline considered transferrable from typical offshore operations, however overall success of this technique on gross scale as proposed here is not certain

Greenhouse Gas Emissions
Total CO2 Emissions: 7,897.91 tonnes

Risk to offshore personnel during works
PLL Value: 0.032597

Comments/Notes:
•Method statement is a combination of the Ramboll Method Statements Option 2a (24" KA to KB Pipeline - full removal) and Option 3a (12" KA to KB Pipeline - full removal).
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

KINSALE ENERGY

Client :	**Kinsale Energy**
Project :	**Kinsale (Rest of Field) NEBA Option Assessment**
Segment:	**24" KA to KB Pipeline & 12" KA to KB Pipeline**
Option No :	**2Y**
Option Title :	**Leave in situ and rock placement on pipeline where 50% or more exposed**

Method Statement

•Pipelines assumed to be filled with seawater and water bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
•Remove matress protection at pipeline platform ends where pipeline will be removed (only required on 12" line))
•Cut pipeline ends into 24m sections using mechanical shears (including spools to platform, assume cut into 4 pieces each end)
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Rockplacement over sections of line 50% or more exposed (6,886m)
•Rockplacement exposed pipeline ends (33.75 Te of rock per end assumed, over a length of 10m, 5m wide, 0.5m deep)
•Rock volumes taken directly from rock placement calculation sheet 270218

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☑	☐	☐	☐	☑
Remove 40 mats from pipeline ends and spools & grout bags (only required for 12" line) - 20@KA, 20@KB	3	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (2 x 4 pieces for each tie-in)	4	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	2	☑	☐	☑	☐	☐	☐	☐
Rock placement 7458.78 of 24" pipeline & 12" pipeline	7	☐	☐	☐	☐	☐	☐	☑
Interim Remob	3	☐	☐	☐	☐	☐	☐	☑
Rock placement 3,699m of pipeline & 4,755m of 12" pipeline (2nd pass) [not included in EIAR calcs]	0	☐	☐	☐	☐	☐	☐	☑
Rock placement pipeline ends & matresses remaining insitu [included in above]	0	☐	☐	☐	☐	☐	☐	☑
Demob	3	☑	☐	☑	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	27	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	17	272	1.36	1870	
DSV	0	0	0	0	
PSV	10	100	0.1	280	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	18	360	1.8	414	
Total	**45**	**732**	**3.26**	**2564**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Rock placement over exposed sections	6,886	34,761
Freespans	393	1,767
Rockplacement pipeline end	40	141
Mattresses	140	812
Total		**37,481**

Rock placement quantity required 11,079.44 Cubic Metres (29914.488 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	40 Mats @ approx 10 Te each (12 " line); 48 Te of concrete from pipeline coating (44mm thickness, 2400 kg/m3 density) (24 " line); 0 Te of concrete from pipeline coating) (12 " line)
Steel	47 Te (14.3mm thickness at 7850 kg/m3) (24" line); 30 Te (14.3mm th
Anodes	negligible/none

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market.
Rock FPV techniques for rock cover considered routine and transferrable from typical offshore operations.

Greenhouse Gas Emissions

Total CO2 Emissions: 2,525.38 tonnes

Risk to offshore personnel during works

PLL Value: 0.008

Comments/Notes:

•Method statement is a combination of the Ramboll Method Statements Option 2c (24" KA to KB Pipeline - leave insitu and rock placement where 50% exposed) and Option 3c (12" KA to KB Pipeline - leave insitu and rock placement where 50% exposed), except for matresses to be removed is reduced to only remove matresses where required to remove pipelines.
•Length of pipe to removed at platform ends = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statement Options where pipe ends are being removed)
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

KINSALE ENERGY

Client :	**Kinsale Energy**
Project :	**Kinsale Head Comparative Assessment**
Segment:	**24" KA to KB Pipeline & 12" KA to KB Pipeline**
Option No :	**2Z**
Option Title :	**Leave in situ and rock placement exposed ends, mattresses and any freespans**

Method Statement

- •Pipeline assumed to be filled with seawater and water bullheaded into Kinsale Alpha platform wells (provisional assumption - feasibility TBC)
- •Remove matress protection at pipeline platform ends where pipeline will be removed
- •Cut pipeline ends into 24m sections using mechanical shears (including spools to platform, assume cut into 4 pieces each end)
- •Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- •Rock placement along exposed pipeline ends, remaining insitu mattresses and freespans
- •Rock volumes taken directly from rock placement calculation sheet 270218

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☐	☐	☐	☐	☑
Remove 40 mats from pipeline ends (12" pipeline - 20@KA and 20@KB)	3	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (2 x 4 pieces for pipeline tieins at each platform)	4	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	2	☑	☐	☐	☐	☐	☐	☐
Rock placement along exposed pipeline ends, mattresses and freespans	1	☐	☐	☐	☐	☐	☐	☑
Rock placement along freespans [included in above]	0	☐	☐	☐	☐	☐	☐	☑
Demob	3	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	18	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	14	224	1.12	1540	
DSV	0	0	0	0	
PSV	0	0	0	0	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	9	180	0.9	207	
Total	**23**	**404**	**2.02**	**1747**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Freespans	393	1,767
Rockplacement pipeline end	40	141
Mattresses	140	812
Total		**2,720**

Rock placement quantity required 910 Cubic Metres

(2457 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	40 Mats @ approx 10 Te each (12 " line); 48 Te of concrete from pipeline coating (44mm thickness, 2400 kg/m3 density) (24 " line); 0 Te of concrete from pipeline coating) (12 " line)
Steel	47 Te (14.3mm thickness at 7850 kg/m3) (24" line); 30 Te (14.3mm thickness at 7850 kg/m3) (24" line);
Anodes	negligible/none

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations

Med = Uncommon but using technology that exists

High = Untried or highly unusual concept

Rationale:

Rock FPV techniques for rock cover considered routine and transferrable from typical offshore operations.

Greenhouse Gas Emissions

Total CO2 Emissions: 1,367.01 tonnes

Risk to offshore personnel during works

PLL Value: 0.005451

Comments/Notes:

•Method statement is a combination of the Ramboll Method Statements Option 2d (24" KA to KB Pipeline - leave insitu and rock placement at ends) and Option 3d (12" KA to KB Pipeline - leave insitu and rock placement at ends), except now with pipeline ends removed for consistency with Ramboll Method Statements for Seven Heads do minimium leave Insitu options (taken from Ramboll Method Statement Option 2d/3d) and rock placement along freespans.

•Length of pipe to removed at platform ends = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statement Options where pipe ends are being removed)

• Number of materesses to be removed modified from Ramboll Method Statements to only remove matresses required to remove pipelines and umbilical end sections rather than removing all materesses as previously assumed to be required (Xodus report and KEL as-built data used for matress quantities and sizes). (40 no matress now removed, reduced from 60no)

•Rock placement along freespansbased on 343m length span x 5m breadth x 1.5m depth

•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Kinsale Head Comparative Assessment**
Segment:	**12" SW Kinsale Pipeline & 12" western drill centre & 10" Greensand & 10" Ballycotton & All Associated Umbilicals**
Option No :	**3X**
Option Title :	**Full Removal**

Method Statement

•Pipelines assumed to be filled with seawater and water bullheaded into Kinsale Bravo platform wells (or SWK Well 48/25-3 via SWK Valve Skid) (provisional assumptions - feasibility TBC)
•Remove matress protection at pipeline/umbilical platform ends and valve skid/manifold ends
•Remove rock covering from 10509m of pipeline and 22m umbilical by mass flow excavation techniques
•De-bury 16222m of pipeline and 12436m umbilical where buried to allow cutting operations
•Cut pipeline into 24m sections using mechanical shears (including spools to platform and valve skid/manifolds, assume cut into 4 peices each platform end and 2 pieces each other subsea structure end)
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Perform cuts at umbilical ends and removal of umbilical by reverse reeling
•Rock placement in excavated trench where pipelines and umbilicals was exposed and removed

Schedule

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (CSV and DSV and Rock FPV)	5	☑	☐	☑	☐	☐	☐	☑
Remove 370 mats from pipeline/umbilical ends and spools = 38 mats (12" sw Kinsale) 22 mats (12" west drill) 45 mats (10" Greensand) 161 mats (10" Ballycotton) 15 mats (Ballycotton Umbilical) 28 mats (SWK umbilical) 38 mats (WDC umbilical) 23 mats (Greensands umbilical)	21.5	☑	☐	☐	☐	☐	☐	☐
Excavate rock cover - 10509m for pipelines & 22m for umbilicals	18	☑	☐	☐	☐	☐	☐	☐
Excavate seabed cover - 16222m for pipelines & 12436m for umbilicals	36	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (1138 pieces)	94	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	94	☑	☐	☑	☐	☐	☐	☐
Perform cuts at umbilical ends	5	☑	☐	☐	☐	☐	☐	☐
Removal of umbilical by reverse reeling including final cut at tree/well end etc	17	☑	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
Trench remediation by rock placement (incl 24 days for remobilisations)	74	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
	367.5	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	293.5	4696	23.48	32285	
DSV	0	0	0	0	
PSV	102	1020	1.02	2856	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	82	1640	8.2	1886	
Total	**477.5**	**7356**	**32.7**	**37027**	**0**

Affected Seabed Areas

Detail	Length (m)	Breadth (m)	Rock Height (m) if appropriate	Area Affected (m2)
Dispersed Rock from deburial	10531	10		105310
Deburied sections of pipeline	12942	30		388260
Rock Backfill of open trench due to deburial	962	3	0.5	2886
Rock Backfill of open trench due to deburial	27696	6	1	166176
				0

Rock placement quantity required 83809 Cubic Metres
(226284.3 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	370 Mats @ approx 10 Te each; 0 Te of concrete from pipeline coating (0mm thickness, 2400 kg/m3 density)
Steel	2620 Te of steel from all pipelines
Anodes	2.8 Te (assumed 36*20kg, 4*20kg, 54*20kg, 50*20kg)
Umbilical	Assuming the 259.1 tonne umbilical is composed of 15% copper, 30% polypropylene and 55% steel

Overall Technical Complexity

Low	Medium	High
	X	

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered transferrable from typical offshore operations, however overall success of this technique on gross scale as proposed here is not certain

Greenhouse Gas Emissions
Total CO2 Emissions: 27024.19 tonnes

Risk to offshore personnel during works
PLL Value: 0.115524

Comments/Notes:
•Method statement is a combination of Ramboll Method Statements Option 4a, Option 5a, Option 6a, Option 7a, Option 8a, Option 9a, Option 10a, Option 16a, Option 17a (all KH infield pipelines and umbilicals - full removal).
•Length of seabed and rock excavation from SWK and WDC umbilicals assumed to be covered under quantities of SWK and WDC pipeline options.
•Area of seabed affected and quantity for rock placement for Ballycotton Umbilical from Ramboll Method Statement revised to match quantities of seabed and rock excavation.
•15hours per km of seabed excavation and 20hours per km of rock covering assumed as per Ramboll Method Statements.
•12 pipeline cuts per day and 12 pipeline section removals per day assumed as per Ramboll Method Statements for infield pipelines.
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Kinsale Head Comparative Assessment**
Segment:	**12" SW Kinsale Pipeline & 12" western drill centre & 10" Greensand & 10" Ballycotton & All Associated Umbilicals**
Option No :	**3Z**
Option Title :	**Leave in situ and rock placement exposed ends, mattresses and freespans**

Method Statement

•Pipeline assumed to be filled with seawater and water bullheaded into Kinsale Bravo platform wells (or SWK Well 48/25-3 via SWK Valve Skid) (provisional assumptions - feasibility TBC)
•Remove matress protection at pipeline and umbilical platform ends, well ends, manifold and valve skid ends where removing pipe (264 matresses)
•Cut pipeline ends into recoverable sections using mechanical shears (including spools to platform, well heads, manifold and valve skid ends, assume cut into 4 pieces at platforms and 2 pieces at all other ends
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Cut and recover umbilical ends
•Rock placement exposed pipeline ends (allow 33.75Te per end), remaining matresses and freespans (Ballycotton Pipeline 1 freespan identified)
•Rock volumes taken directly from rock placement calculation sheet 270218

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☐	☐	☐	☐	☑
Remove 264 matresses (not removing 98 at Ballycotton tree and 8 at SWK PLEM (others all assumed to be removed due to close proximity of subsea structures at SWK/Greensands/WDC wells))	15	☑	☐	☐	☐	☐	☐	☐
Cut pipe into recoverable sections (27 sections)	2.5	☑	☐	☐	☐	☐	☐	☐
Recover pipe sections using clamp tool	2.5	☑	☐	☐	☐	☐	☐	☐
cut and recover umbilical ends at platform/tree	5	☑	☐	☐	☐	☐	☐	☐
Rockplacement exposed pipeline/umbilical ends & matresses & freespan	1	☐	☐	☐	☐	☐	☐	☑
Demob	3	☑	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	34	☐	☐	☐	☐	☐	☐	☐

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	33	528	2.64	3630	
DSV	0	0	0	0	
PSV	0	0	0	0	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	9	180	0.9	207	
Total	**42**	**708**	**3.54**	**3837**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Freespans	17	75
Rockplacement pipeline end	80	279
Mattresses	530	2,191
Total		**2,545**

Rock placement quantity required 714 Cubic Metres
(1927.8 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	264Mats @ approx 10 Te each; 0 Te of concrete from pipeline coating (0mm thickness, 2400 kg/m3 density)
Steel	70 Te assumed (14.3mm thickness at 7850 kg/m3)
Anodes	Negligible
	Negligible weight of umbilical recovered.

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Rock FPV techniques for rock cover considered routine and transferrable from typical offshore operations.

Greenhouse Gas Emissions
Total CO2 Emissions: 2330.45 tonnes

Risk to offshore personnel during works
PLL Value: 0.011971

Comments/Notes:
•Method statement is a combination of Ramboll Method Statements Option 4d, Option 5d, Option 6d, Option 7d, Option 8b, Option 9b, Option 10b, Option 16b, Option 17b (all KH infield pipelines and umbilicals - leave insitu and rock placement at exposed ends) with pipe and umbilical ends to be removed and rock to be placed on identified freespans also.
•Length of pipe to removed at platform ends = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statement Options where pipe ends were being removed)
•Length of pipe to be removed at manifold and well head ends = 2 x 24m sections (assuming length of approximately 50m will be removed at all manifold and well head ends for all lines to provide clearzone for all subsea structures - as per Ramboll SH Method Statement Options where pipe ends were being removed)
•Number of matresses to be removed modified from Ramboll Method Statements to remove pipelines and umbilical end sections only, and provide rock placement on all remaining matresses - time taken pro-rata from Ramboll full removal method statements. (matress decresed from 366no to 260no).
•12 pipeline cuts per day and 12 pipeline section removals per day assumed as per Ramboll Method Statements for infield pipelines.
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Kinsale (Rest of Field) Comparative Assessment**

Background Data

	Fuel Consumption m3/day	Dayrate £ / day	Personnel No.	Diving Personnel
HLV		500000		
CSV	16	80000	110	
DSV	20	120000	130	12
PSV	10	10000	28	
AHT	30	35000	15	
Tug & Barge	10	10000	10	
Rock FPV	20	100000	23	
PLV	30	500000	200	

Days

1
2
3
4
5
6
7
8
9
10

Functional hearing group	Estimated auditory bandwidth	
Low-frequency Cetaceans (LFC)	7 Hz	22 kHz
Mid-frequency Cetaceans (MFC)	150 Hz	160 kHz
High-frequency Cetaceans (HFC)	200 Hz	180 kHz
Pinnipeds (PINN)	75 Hz	75 kHz

Greenhouse Gas Emissions (CO2)	CO2 consumed for material processed (t CO2 / tonne)			
Raw steel processing	1.889	Institute of Petroleum (2000)		
Recycled steel	0.96	Institute of Petroleum (2000)		
Raw concrete production	0.88	Institute of Petroleum (2000)	0.076	Sustainable Concrete Org (2014)
Recycled concrete	-	Institute of Petroleum (2000)	0.004	Sustainable Conrete Org (2014)
Raw aluminum processing	3.589	Institute of Petroleum (2000)		
Recycled aluminum	1.08	Institute of Petroleum (2000)		
Raw copper processing	7.175	Institute of Petroleum (2000)		
recycled copper	0.3	Institute of Petroleum (2000)		
Recycled polypropylene	-	Institute of Petroleum (2000)	0.6	WRAP (2011)

Density of rock (granite rock placement) (kg/m3)
2700 Kaufman (1992)

1a: 18" Export Pipeline Full Removal	424	5088
1b: 18" Export Pipeline Full Removal apart from rockplacement sections	293	3516
1c: 18" Export Pipeline Full removal apart from buried and rockplacemented sections	79	948
1d: 18" Export Pipeline removal of pipeline ends only at manifold and platform	14	168
2a: Main control umbilical Full removal by reverse reeling	17	204
2b: Main control umblical De-bury and expose umbilical for reeling	87	1044
2c: Main control umbilical remove umblical ends only at manifold and platform	12	144
3a: Sevenheads manifold Full removal	16	192
3b: Sevenheads manifold rockplacement and leave in situ	9	108

Client :	**Kinsale Energy**
Project :	**Seven Heads Option Assessment**
Segment:	**18" Export Pipeline and Main Control Umbilical**
Option No :	**1X**
Option Title :	**Full Removal**

Method Statement

- •Pipeline assumed to be filled with seawater and water bullheaded into production wells via manifold and isolate wells.
- •Umbilical assumed to be displaced with seawater. Hydraulic cores to be left with HW540 control fluid.
- •Remove matress protection at pipeline and umbilical ends and at xing supports
- •Remove rock covering from 9,448m of pipeline by mass flow excavation techniques
- •De-bury 7,245m (assumed pipeline can be cut when 50% exposed) plus 10,380m of pipeline where fully buried to allow cutting operations
- •Cut pipeline into 24m sections using mechanical shears (including spools to manifold/platform)
- •Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- •Recover Umbilical end to vessel and recover to carousel
- •Rock placement in excavated trench where pipeline was exposed and removed (7,245m partial burial plus 10,380m full burial sections)

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (CSV and DSV and Rock FPV)	5	☑	☐	☑	☐	☐	☐	☑
Remove 100 mats from line ends (76 @ ends, 18 @ umbilical end at platform & 6 at xings)	3.75	☑	☐	☐	☐	☐	☐	☐
Excavate 9,448m of rock cover	16	☑	☐	☐	☐	☐	☐	☐
Excavate 7,245m + 10,380m of seabed cover	11	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (1,462pieces)	130	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	130	☑	☐	☑	☐	☐	☐	☐
Perfrom umbilical cuts for Hibernia crossing and platform end	1	☑	☐	☐	☐	☐	☐	☐
Removal of umbilical by reverse reeling including final cut at manifold	8	☑	☐	☐	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
Trench remediation by rockdump (incl 9 days reload trips)	30	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	337.75	☐	☐	☐	☐	☐	☐	☐

Noise Generating equipment

Type	
Dredging	http://www.jfsubseaexcavation.com/files/5114/4956/5240/SP12000_Specsheet_V3.pdf
Cutting	http://www.underwatercuttingsolutions.com/wp-content/u

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	307.75	4924	24.62	33852.5	
DSV	0	0	0	0	
PSV	138	1380	1.38	3864	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	38	760	3.8	874	
Total	**483.75**	**7064**	**29.8**	**38590.5**	

Affected Seabed Areas

Detail	Length (m)	Breadth (m)	Rock Height (m) if appropriate	Area Affected (m2)
Dispersed Rock from deburial	9448	10		94480
Deburied sections of pipeline	17625	30		528750
Rock Backfill of open trench due to deburial	7245	3	0.5	21735
Rock Backfill of open trench due to deburial	10380	6	1	62280
				0

Rock Placement quantity required 36573 Cubic Metres (98747.1 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	100 Mats @ approx 10 Te each; 10255 Te of concrete from pipeline coating (assuming 85 mm thickness, 2400 kg/m3 density)
Steel	7892 Te (assumes 20 mm thickness at 7850 kg/m3)
Anodes	4.42 Te (Assumed to be 221 * 20 kg)
Umbilical	35 km of 123.5mm OD umbilical containing polyprop outer wrap, steel armour wire, rope filler and hoses. 22.3 kg/m. Assuming the 780.5 tonne umbilical is composed of 15% copper, 30% polypropylene and 55% steel

Overall Technical Complexity

Low	Medium	High
	X	

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:
Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered transferrable from typical offshore operations, however overall success of this technique on gross scale as proposed here is not certain

Greenhouse Gas Emissions
Total CO2 Emissions: 31033.29 tonnes

Risk to offshore personnel during works
PLL Value: 0.12040236

Comments/Notes:
•Combination of Ramboll Method Statements Option 1a (SH main pipeline full removal) and 2a (SH main umbilical full removal).
•Number of materesses to be removed modified from Ramboll Method Statements based on review of Xodus report and Kinsale Energy as-built drawings (80no. Increased to 100no.).

•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

KINSALE ENERGY

Client :	**Kinsale Energy**
Project :	**Seven Heads Option Assessment**
Segment:	**18" Export Pipeline and Main Control Umbilical**
Option No :	**1Y**
Option Title :	**Leave in situ and rock placement on pipeline where 50% or more exposed**

Method Statement

- •Pipeline assumed to be filled with seawater and water bullheaded into production wells via manifold and isolate wells.
- •Umbilical assumed to be displaced with seawater. Hydraulic cores to be left with HW540 control fluid.
- •Remove matress protection at pipeline ends
- •Cut pipeline ends into 24m sections using mechanical shears (including spools to manifold/platform, assume cut into 2 pieces at manifold end and 4 pieces at platform)
- •Recover pipe sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- •Cut and recover umbilical end at platform
- •Cut and recover umbilical end at manifold
- •Rock placement over sections of line 50% or more exposed (984m) and pipeline ends/mattresses (350m)

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☑	☐	☐	☐	☑
Remove 34 mats from pipeline ends (8 @ manifold, 16 @ KA for pipe, 10 @KA for umbil)	2	☑	☐	☐	☐	☐	☐	☐
Cut pipe into sections (2 pieces at manifold and 4 pcs at platform)	2	☑	☐	☐	☐	☐	☐	☐
Recover sections using clamp tool	2	☑	☐	☑	☐	☐	☐	☐
Cut and recover umbilical end at platform	1	☑	☐	☐	☐	☐	☐	☐
Cut and recover umbilical end at manifold	1	☑	☐	☐	☐	☐	☐	☐
Rockdump over >50% exposed sections of line (1,334m) (including exposed ends and matresses)	2	☐ ☑	☐ ☐	☐ ☑	☐ ☐	☐ ☐	☐ ☐	☑ ☑
Demob	3							
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	18	☐	☐	☐	☐	☐	☐	☐

Noise Generating equipment

Type	
Cutting	http://www.underwatercuttingsolutions.com/wp-

27240 0.0070824

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	16	256	1.28	1760	
DSV	0	0	0	0	
PSV	10	100	0.1	280	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	10	200	1	230	
Total	**36**	**556**	**2.38**	**2270**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Rock placement over exposed sections	13,480	4,219
Freespans	0	0
Rockplacement pipeline end	20	86
Mattresses	330	1,662
Total		**5,966**

Rock Dump quantity required 2174 Cubic Metres

(5869.8 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	34 Mats @ approx 10 Te each; 42.19 Te of concrete from pipeline coating (assuming 85 mm thickness, 2400 kg/m3 density)
Steel	32.5 Te (assumes 20 mm thickness at 7850 kg/m3)
Anodes	negligible/none
Umbilical	neglgible length of 123.5mm OD umbilical containing polyprop outer wrap, steel armour wire, rope filler and hoses. 22.3 kg/m.

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market. Techniques for removal of mattress protection considered transferrable from typical offshore operations.

Greenhouse Gas Emissions
Total CO2 Emissions: 1820.61 tonnes

Risk to offshore personnel during works
PLL Value: 0.0070824

Comments/Notes:
- •Method statement is a combination of Ramboll Method Statements 'Option 1c' (SH main pipeline leave insitu, remove ends and rock placement where more than 50% exposed) and 'Option 2b' (SH main umbilical leave insitu and remove ends only) with some slight modifications as noted below.
- •Length of pipe to removed at platform end = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines to provide clearzone to platforms as per Ramboll Method Statements)
- •Length of pipe to be removed at manifold end = 2 x 24m sections (assuming length of approximately 50m will be removed at all manifold and well head ends for all lines to provide clearzone for all subsea structures - reduction from Ramboll SH Method Statements to provide consistency with KH Method Statements)
- •Number of materesses to be removed modified from Ramboll Method Statements to only remove matresses required to remove pipelines and umbilical end sections, rather than removing all materesses as previously assumed to be required (Xodus report and KEL As-built data used for matress quantities and sizes) (23no increased to 34no).
- •Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

KINSALE ENERGY

Client :	**Kinsale Energy**
Project :	**Seven Heads NEBA Option Assessment**
Segment:	**18" Export Pipeline**
Option No :	**1Z**
Option Title :	**Leave in situ and rock placement exposed ends, matresses and freespans**

Method Statement

•Pipeline assumed to be filled with seawater and water bullheaded into production wells via manifold and isolate wells.
•Umbilical assumed to be displaced with seawater. Hydraulic cores to be left with HW540 control fluid.
•Remove matress protection at pipeline ends
•Cut pipeline ends into 24m sections using mechanical shears (including spools to manifold/platform, assume cut into 2 pieces at manifold end and 4 pieces at platform)
•Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
•Cut and recover umbilical at platform End
•Cut and recover umbilical at manifold End
•Rock placement for span remediation (allow 0 Te)/no spans
•Rock placement at exposed ends (allow 33.75 Te each end) and over remaining matresses (66No.)

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field	5	☑	☐	☑	☐	☐	☐	☑
Remove 34 mats from pipeline ends (8 @ manifold, 16 @ KA for pipe, 10 @KA for umbil)	2	☑	☐	☐	☐	☐	☐	☐
Cut pipe into sections (2 pieces at manifold and 4 pcs at platform)	2	☑	☐	☐	☐	☐	☐	☐
Recover sections using clamp tool	2	☑	☐	☑	☐	☐	☐	☐
Rock placement for exposed ends & matresses	1	☐	☐	☐	☐	☐	☐	☑
Rock placement for Span remediation	0	☐	☐	☐	☐	☐	☐	☐
Cut and recover umbilical end at platform - 96m	1	☑	☐	☐	☐	☐	☐	☐
cut and recover umbilical end at manifold - 48m	1	☑	☐	☐	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	17	☐	☐	☐	☐	☐	☐	☐

Noise Generating equipment

Type	
Cutting	http://www.underwatercuttingsolutions.com/wp-

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	16	256	1.28	1760	
DSV	0	0	0	0	
PSV	10	100	0.1	280	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	9	180	0.9	207	
Total	**35**	**536**	**2.28**	**2247**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Freespans	0	0
Rockplacement pipeline end	20	86
Mattresses	330	1,662
Total		**1,748**

Rock Dump quantity required 626 Cubic Metres
(1690.2 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	34 Mats @ approx 10 Te each; 42.19 Te of concrete from pipeline coating (assuming 85 mm thickness, 2400 kg/m3 density)
Steel	32.47 Te (assumes 20 mm thickness at 7850 kg/m3)
Anodes	negligible/none
Umbilical	neglgible length of 123.5mm OD umbilical containing polyprop outer wrap, steel armour wire, rope filler and hoses. 22.3 kg/m.

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market. Techniques for removal of mattress protection considered transferrable from typical offshore operations.

Greenhouse Gas Emissions

Total CO2 Emissions: 1739.12 tonnes

Risk to offshore personnel during works

PLL Value: 0.007011

Comments/Notes:

•Method statement is a combination of Ramboll Method Statements 'Option 1d' (SH main pipeline leave insitu and remove ends only) and 'Option 2b' (SH main umbilical leave insitu and remove ends only) with some slight modifications as noted below.
•Length of pipe to removed at platform end = 4 x 24m sections (assuming length of approximately 100m will be removed at platform ends for all lines as per Ramboll Method Statements)
•Length of pipe to be removed at manifold end = 2 x 24m sections (assuming length of approximately 50m will be removed at all manifold and well head ends for all lines - modification from Ramboll Method Statements to provide consistency across all method statements)
•Number of materesses to be removed modified from Ramboll Method Statements to only remove matresses required to remove pipelines and umbilical end sections rather than removing all materesses as previously assumed to be required (Xodus report and KEL as-built data used for matress quantities and sizes). (23no increased to 34no).
•Rock placement along trench transitions removed from Ramboll Method Statements and allowance calculated and inserted for rock placement where matresses are not being removed and for exposed ends.
•No freespans identified on these lines so no additional rock placement inserted.

KINSALE ENERGY

Client : **Kinsale Energy**
Project : **Seven Heads Option Assessment**
Segment: **8" Flowlines & umbilicals to wells**
Option No : **2X**
Option Title : **Full Removal**

0

Method Statement

- •Flowlines assumed to be filled with seawater and water bullheaded into production wells via manifold and isolate wells. Total Length = 25,675m.
- •Umbilical assumed to be displaced with seawater. Hydraulic cores to be left with HW540 Control Fluid
- •Remove matress protection at flowline ends (272 mats)
- •Remove rock covering from 10,984m of pipeline by mass flow excavation techniques
- •De-bury 13,504m of pipeline to allow cutting operations
- •Cut pipeline into 24m sections using mechanical shears (including spools to manifold and wells, assume total of 22 pieces for spools)
- •Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- •Recover Umbilical end to vessel and recover all to carousel (25,675m)
- •Rock placement in excavated trench where pipeline/umbilical was exposed and removed (13,504m)

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (CSV and DSV and Rock FPV)	5	☑	☐	☑	☐	☐	☐	☑
Remove 317 mats from pipeline ends	9	☑	☐	☐	☐	☐	☐	☐
Excavate 10,984m of rock cover	20	☑	☐	☐	☐	☐	☐	☐
Excavate 13,504m of seabed cover	9	☑	☐	☐	☐	☐	☐	☐
Cut pipe into 24m section (1,082pieces)	90	☑	☐	☐	☐	☐	☐	☐
Recover 24m sections using clamp tool	90	☑	☐	☑	☐	☐	☐	☐
Removal of Umbilical by reverse reeling including final cut at manifold	11	☑	☐	☐	☐	☐	☐	☐
Demob	3	☑	☐	☑	☐	☐	☐	☑
Trench remediation by rockdump (including 3 day reload)	9	☐	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	246	☐	☐	☐	☐	☐	☐	☐

Noise Generating equipment

Type	
Dredging	http://www.jfsubseaexcavation.com/files/5114/4956/5240/SP12000_Specsheet_V3.pdf
Cutting	http://www.underwatercuttingsolutions.com/wp-content/up

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	237	3792	18.96	26070	
DSV	0	0	0	0	
PSV	98	980	0.98	2744	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	17	340	1.7	391	
Total	**352**	**5112**	**21.64**	**29205**	**0**

Affected Seabed Areas

Detail	Length (m)	Breadth (m)	Rock Height (m) if appropriate	Area Affected (m2)
Dispersed Rock from deburial	10984	10		109840
Deburied sections of pipeline	13504	30		405120
Rock Backfill of open trench due to deburial	13504	3	0.5	40512
				0
				0

Rock Dump quantity required 10128 Cubic Metres
(27345.6 Tonnes)

Recovered Materials to Waste Management Chain

Concrete
317 Mats @ approx 10 Te each;
Steel 2580 Te (assumes 20 mm thickness at 7850 kg/m3)
Anodes 164 @ 20 kg each
Umbilical 26 km of 93mm OD umbilical containing polyprop outer wrap, steel armour wire, rope filler and hoses. 16.3 kg/m.
Assuming the 423.8 tonne umbilical is composed of 15% copper, 30% polypropylene and 55% steel

Overall Technical Complexity

Low	Medium	High
	X	

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:
Mechanical shear and clamp tools considered to be readily available to market. Techniques for displacement of rock cover, removal of mattress protection and deburial of pipeline considered transferrable from typical offshore operations, however overall success of this technique on gross scale as proposed here is not certain.

Greenhouse Gas Emissions
Total CO2 Emissions: 19135.33 tonnes

Risk to offshore personnel during works
PLL Value: 0.0911196

Comments/Notes:
•Combination of Ramboll Method Statements Option 4a (SH flow lines full removal) and 5a (SH well umbilicals full removal).

•Number of materesses to be removed modified from Ramboll Method Statements based on review of Xodus report and Kinsale Energy as-built event listing survey. (198no increased to 272no)
•Re-mobilisation for rock placement assumed to be required where greater than 25,000 tonnes of rock required (no. of days increased from Ramboll Method Statement for consistency; approx 4500te placed per day and 3 days for a remob)

Client :	**Kinsale Energy**
Project :	**Seven Heads Option Assessment**
Segment:	**8" Flowlines & umbilicals to wells**
Option No :	**2Z**
Option Title :	**Leave in situ and rock placement exposed ends, matresses and freespans**

Method Statement

- Flowlines assumed to be filled with seawater and water bullheaded into production wells via manifold and isolate wells.
- Umbilical chemical cores assumed to be displaced with seawater. Hydraulic cores to be left with HW540 control fluid
- Remove matress protection at flowline ends (107No. matresses)
- Cut flowline ends/spools into approx 24m sections using mechanical shears (2x24m section at each line end = 11 sections)
- Recover sections to deck of vessel and tranship to Belfast for disposal by pipehandler
- Cut and recover umbilical at well ends
- Cut and recover umbilical at manifold ends
- No rock required to fill freespans as all lines buried with no spans
- Rock placement at exposed ends (allow 35 Te each end) and where matresses remain

Schedule	Duration (Days)	CSV	DSV	PSV	Tug & Barge	AHT	HLV	Rock FPV
Mobilise to field (DSV only)	5	☑	☐	☐	☐	☐	☐	☑
Remove 107 mats from pipeline ends	5	☑	☐	☐	☐	☐	☐	☐
Cut flowline ends into sections (11 x 24m sections)	3	☑	☐	☐	☐	☐	☐	☐
Sling and recover sections	2	☑	☐	☐	☐	☐	☐	☐
cut and recover umbilical end at manifold	3	☑	☐	☐	☐	☐	☐	☐
cut and recover umbilical end at well ends	3	☑	☐	☐	☐	☐	☐	☐
Rock placement for exposed ends (12no.) & remaining matresses (210)	1	☐	☐	☐	☐	☐	☐	☑
Demob	3	☑	☐	☐	☐	☐	☐	☑
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
		☐	☐	☐	☐	☐	☐	☐
	25	☐	☐	☐	☐	☐	☐	☐

Noise Generating equipment

Type	
Cutting	http://www.underwatercuttingsolutions.com/wp

Outputs - Vessels and Manpower

Type	Qty (Days)	Fuel Burn (Tonnes)	Cost (£) millions	Man days	Diver Saturation days
CSV	24	384	1.92	2640	
DSV	0	0	0	0	
PSV	0	0	0	0	
Tug & Barge	0	0	0	0	
AHT	0	0	0	0	
HLV	0	0	0	0	
Rock FPV	9	180	0.9	207	
Total	**33**	**564**	**2.82**	**2847**	**0**

Affected Seabed Areas

Detail	Length (m)	Area Affected (m2)
Freespans	0	0
Rockplacement pipeline end	100	310
Mattresses	1,260	4,845
Total		**5,154**

Rock Dump quantity required 1247.32 Cubic Metres (3367.764 Tonnes)

Recovered Materials to Waste Management Chain

Concrete	
	107 Mats @ approx 10 Te each;
Steel	26.5 Te (assumes 20 mm thickness at 7850 kg/m3)
Anodes	6 @ 20 kg each
Umbilical	Negligible length of 93mm OD umbilical containing polyprop outer wrap, steel armour wire, rope filler and hoses. 16.3 kg/m.

Overall Technical Complexity

Low	Medium	High
X		

Low = Normal Offshore Operations
Med = Uncommon but using technology that exists
High = Untried or highly unusual concept

Rationale:

Mechanical shear and clamp tools considered to be readily available to market.

Greenhouse Gas Emissions
Total CO2 Emissions: 1832.28 tonnes

Risk to offshore personnel during works
PLL Value: 0.008883

Comments/Notes:

- Method statement is a combination of Ramboll Method Statements 'Option 4b' (SH flow lines leave insitu and remove ends only) and 'Option 5b' (SH well umbilicals leave insitu and remove ends only) with some slight modifications as noted below.
- Length of pipe to be removed at manifold and wellhead end = 2 x 24m sections (assuming length of approximately 50m will be removed at all manifold and well head ends for all lines - modification from Ramboll Method Statements)
- Number of materesses to be removed modified from Ramboll Method Statements to only remove matresses required to remove pipeline and umbilical end sections rather than removing all materesses as previously assumed to be required - 107No reduced from 198no. (each matress 6m in length) covers 264m pipe and 378m of umbilical in separate trench (taken from KEL as-built records).
- Rock placement increased to allow for rock placement where matresses are not being removed and for exposed ends.
- No freespans identified on these lines so no additional rock placement inserted.
- Rock placement along freespans assumed to be completed as per Ramboll Method Statement Option 4a&5a rock placement on a pro-rata basis.

Client : **Kinsale Energy**
Project : **Seven Heads Comparative Assessment**

Background Data

	Fuel Consumption m3/day	Dayrate £ / day	Personnel No.	Diving Personnel
HLV		500000		
CSV	16	80000	110	
DSV	20	120000	130	12
PSV	10	10000	28	
AHT	30	35000	15	
Tug & Barge	10	10000	10	
Rock FPV	20	100000	23	
PLV	30	500000	200	

Days

	1
	2
	3
	4
	5
	6
	7
	8
	9
	10

Functional hearing group	Estimated auditory bandwidth	
Low-frequency Cetaceans (LFC)	7 Hz	22 kHz
Mid-frequency Cetaceans (MFC)	150 Hz	160 kHz
High-frequency Cetaceans (HFC)	200 Hz	180 kHz
Pinnipeds (PINN)	75 Hz	75 kHz

Greenhouse Gas Emissions (CO2)		CO2 consumed for material processed (t CO2 / tonne)		
Raw steel processing	1.889	Institute of Petroleum (2000)		
Recycled steel	0.96	Institute of Petroleum (2000)		
Raw concrete production	0.88	Institute of Petroleum (2000)	0.076	Sustainable Concrete Org (2014)
Recycled concrete	-	Institute of Petroleum (2000)	0.004	Sustainable Conrete Org (2014)
Raw aluminum processing	3.589	Institute of Petroleum (2000)		
Recycled aluminum	1.08	Institute of Petroleum (2000)		
Raw copper processing	7.175	Institute of Petroleum (2000)		
recycled copper	0.3	Institute of Petroleum (2000)		
Recycled polypropylene	-	Institute of Petroleum (2000)	0.6	WRAP (2011)

Density of rock (granite rock dump) (kg/m3)
2700 Kaufman (1992)

Option	Est. total Duration (Days)	Est. total exposure hours assuming a 12 hour day	
1a: 18" Export Pipeline Full Removal	424	5088	0.0013229
1b: 18" Export Pipeline Full Removal apart from rockdump sections	293	3516	0.0009142
1c: 18" Export Pipeline Full removal apart from buried and rockdumped sections	79	948	0.0002465
1d: 18" Export Pipeline removal of pipeline ends only at manifold and platform	14	168	4.368E-05
2a: Main control umbilical Full removal by reverse reeling	17	204	5.304E-05
2b: Main control umblical De-bury and expose umbilical for reeling	87	1044	0.0002714
2c: Main control umbilical remove umblical ends only at manifold and platform	12	144	3.744E-05
3a: Sevenheads manifold Full removal	16	192	4.992E-05
3b: Sevenheads manifold rockdump and leave in situ	9	108	2.808E-05

Kinsale Area Decommissioning Project

Appendix F

List of Consultees

List of Consultees
Commission for Regulation of Utilities (CRU)
Marine Planning and Foreshore Unit - DHPLG
Cork County Council - Director of Services / County Manager
Cork County Council - Planning Department
TFS Office, Dublin City Council
National Parks and Wildlife Service (NPWS) - DAU - DAHRRG
National Monuments (NM) - DAU - DAHRRG
The Irish Coast Guard (IRCG)
Irish Maritime Operations Centre (NMOC) of the Irish Coast Guard - (Marine Rescue Co-Ordination Centre (MRCC) of the Irish Coast Guard)
Sea Fisheries Protection Authority
Sea Fisheries Policy Division
Marine Survey Office (MSO) of the Marine Safety Directorate
Marine Institute (Galway) - DCCAE Environmental Adviser
Commissioners of Irish Lights (CIL)
Ervia
Gas Networks Ireland
Naval Operations (Cork)
Cork Port Operations
Cork Chamber of Commerce
Cork Airport
Cork City Council
Irish South & West Fish Producer Organisation (IS&WFPO)
Irish South & East Fish Producer Organisation (IS&EFPO)
South West Regional Fisheries Forum / (Regional Inshore Fisheries Forum)
South East Regional Fisheries Forum / (Regional Inshore Fisheries Forum)
National Inshore Fisheries Forum (NIFF)
Irish Fish Producers Organisation (IFPO)
Killybegs Fishermen Organisation (KFO)
Bord Iascaigh Mhara
RNLI Ballycotton & Courtmacsherry
Met Eireann
Telecom Users of Mast at Inch
Eirgrid

List of Consultees
Ireland-France Subsea Cable: IFC-1
ESB
Sustainable Energy Authority of Ireland (SEAI)
Cork Energy Hub / Energy Cork
Irish Refining
BGE (Bord Gais Energy)
Providence Resources
Landsdowne Oil & Gas
San Leon Energy
Irish Offshore Operators Association
Sunningdale Oil & Gas
Landowner at Inch
Local Residents - Inch
General Public
Irish Whale and Dolphin Group
Birdwatch Ireland
Coastwatch
Local Councillors and TDs

KINSALE ENERGY

Kinsale Area Decommissioning Project

Appendix G

Consultation Material

Hartley Anderson

ARUP

Ladysbridge and District Flower and Garden Club

The next meeting of the Ladysbridge and District Flower and Garden Club will be held on Monday 16th April at 8pm in Garryvoe Hotel. Guest speaker Sonny Wieler, Stone Artist, will talk about the creative use of stone and mosaic in the garden. New members and guests always very welcome. Refreshments and raffle included.

KINSALE ENERGY

PUBLIC INFORMATION SESSION

PSE Kinsale Energy Limited is preparing to submit an initial Decommissioning Plan to the Department of Communications, Climate Action and Environment (DCCAE) to decommission the Kinsale area gas fields.

The Kinsale Head, Ballycotton, Seven Heads and South-West Kinsale gas fields lie approximately 50 kms off the south coast of County Cork and have been in production since 1978.

PSE Kinsale Energy Limited plans to host a public information session to provide details about the project, as follows:

Wednesday, April 18th, 2018
Clayton Hotel Cork City, Lapp's Quay, Cork
from 4pm to 8pm

Members of the public are invited to meet the PSE Kinsale Energy project team who will be available to provide details about the Decommissioning Project.

Kinsale Area Gas Fields Decommissioning Project

Information Leaflet

PSE Kinsale Energy Limited has been operating a number of gas fields in the Celtic Sea, off the County Cork coast, since 1978.

Kinsale Energy is a subsidiary of the Malaysian oil and gas company, PETRONAS, which acquired the company in April 2009, from its previous owners, Marathon Oil. Kinsale Energy employs 60 people at its onshore and offshore facilities and has a long history of safe and reliable operations. Kinsale Energy has been awarded a number of prestigious safety awards by NISO, the National Irish Safety Organisation.

History of Kinsale Area Gas Fields

The Kinsale Head, Ballycotton, Seven Heads and South-West Kinsale gas fields lie approximately 50 km off the south coast of County Cork. The gas fields were developed in the period 1978 to 2003. The fields supplied all of Ireland's natural gas from 1978 to 1995 and remained Ireland's only indigenous source of natural gas until 2015.

The offshore infrastructure consists of two steel platforms installed as part of the initial field development – Kinsale Alpha and Kinsale Bravo. These were commissioned in 1978. There are also a number of underwater (subsea) wells which were drilled to produce smaller gas discoveries. These wells are connected to the platforms by means of underwater pipelines and control cables. The facilities have only been used to process natural gas, as no oil has been produced in the area.

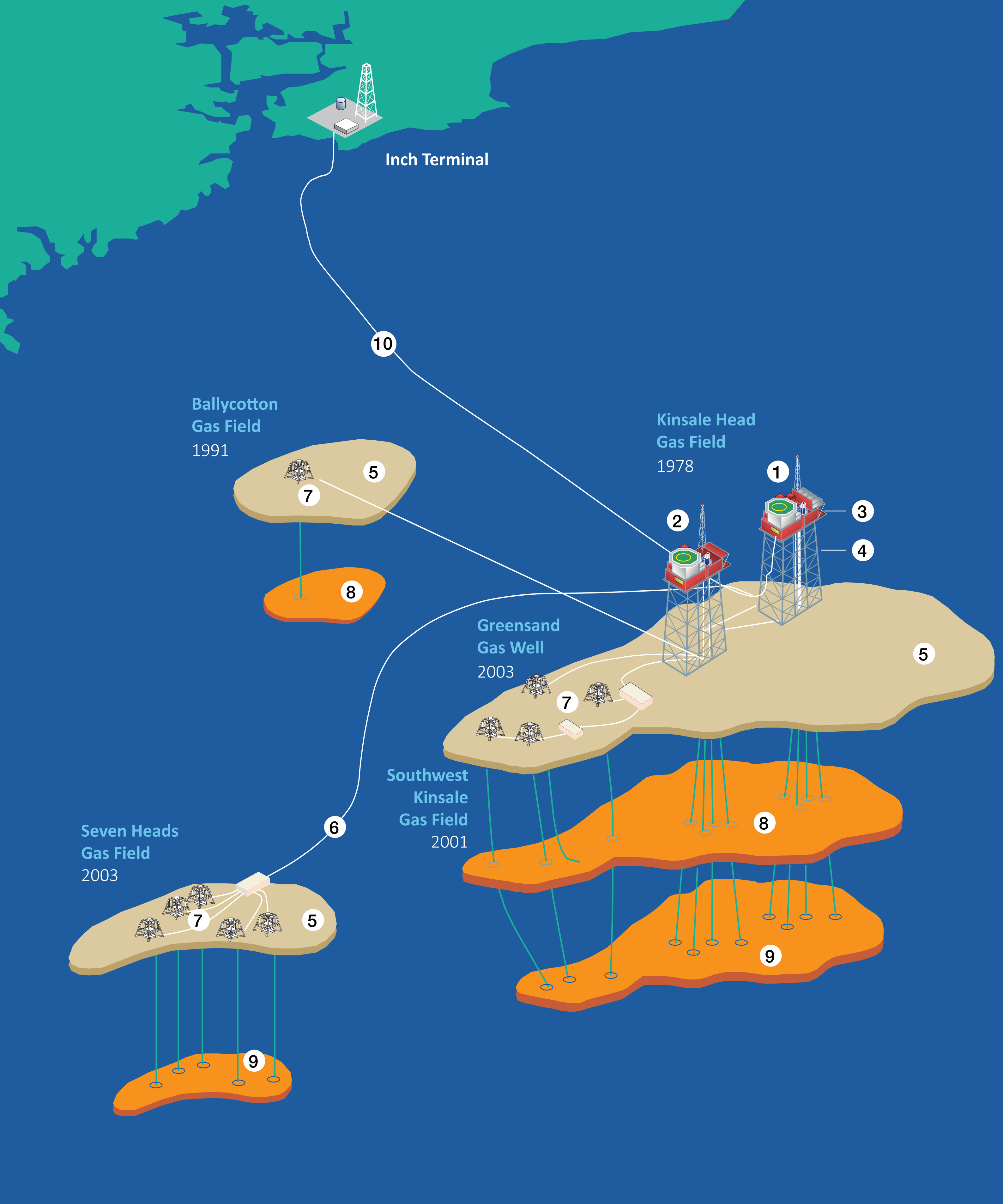
Gas from the offshore fields is transported by a 24" pipeline to a terminal at Inch in East Cork, where the gas is transferred to the Gas Networks Ireland (GNI) onshore gas grid.

Why Decommission?

It is anticipated that the gas wells will have come to the end of their productive life by 2020/2021, at which time the gas reserves will have been depleted. When this point is reached, the wells will be permanently plugged and the associated facilities (platforms, pipelines, cables, subsea structures and onshore terminal) will be decommissioned.

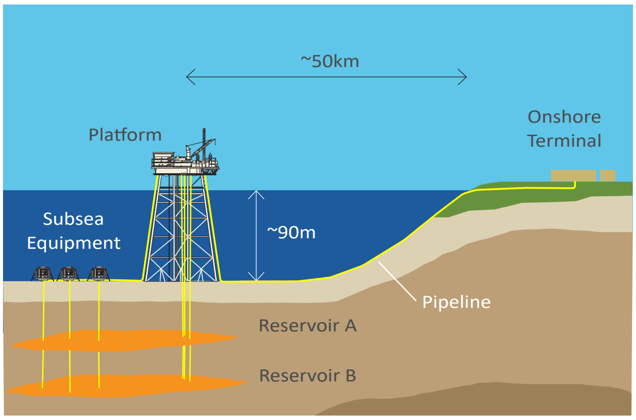
Although there has been a lot of exploration for additional gas reserves carried out in this area over the years, no other commercial gas discoveries have been made, either by Kinsale Energy or other companies.

Location Map



1. Alpha Platform
2. Bravo Platform
3. Topside above water
4. Jackets below water
5. Seabed
6. Pipelines and cables (on seabed)
7. Subsea equipment (on seabed)
8. Reservoir A deep below seabed
9. Reservoir B deep below seabed
10. Pipeline exporting gas to the onshore terminal at Inch

Note: This figure is for diagrammatic purposes only and not to scale.



Schematic cross-section, not to scale

Removal of topside by heavy lift vessel (Picture courtesy of Saipem)

Are there possibilities for re-use of the facilities?

There is a possibility that some of the facilities, for example, the platform support structures (jackets) or some of the pipelines could be used as part of a gas development project, a renewable energy project or to support carbon dioxide storage in the depleted gas field. Studies are being undertaken by third parties in this regard. In the meantime, however, Kinsale Energy has no plans for any future use and planning for decommissioning is ongoing.

What is the Decommissioning Project?

Kinsale Energy is currently working on a plan to decommission the Kinsale Area gas fields as summarised below. The offshore decommissioning activities are expected to occur intermittently over a number of years, commencing in 2020/2021 after field production ceases. The Inch Terminal works will occur over a much shorter period (less than 6 months). The actual scheduling of the works will depend on the availability of specialist marine construction and support vessels. Some facilities that will ultimately be removed, e.g. platform support structures (jackets), may be left for a longer period, subject to regulatory approval. This will also facilitate any third parties investigating possible re-use.

The facilities which have to be decommissioned are:-

Facilities to be Decommissioned	Proposed Decommissioning Method (subject to regulatory approval)
Platform topsides	Remove by heavy lift vessel in a single piece or number of pieces
Platform jackets	Remove by heavy lift vessel in a single piece or number of pieces
Pipelines & cables	Leave in-situ and install rock protection where required
Subsea equipment such as wellheads & manifolds	Remove with a construction support vessel
Wells	Permanently seal and plug with cement
The onshore terminal at Inch	Remove equipment and reinstate to agricultural use

Environmental Assessment

Marine life on Kinsale Alpha jacket

Marine life on subsea equipment

Environmental Studies

Kinsale Energy has engaged specialist consultants to prepare an Environmental Impact Assessment Report (EIAR) and an Appropriate Assessment Screening Report. These reports are being prepared in accordance with the relevant EU Directives and will identify any potential impacts likely to arise from the decommissioning process. Information has been collected relating to the natural environment and other users of the sea relevant to the Kinsale Area, using both desk-based and field-based techniques.

A number of decommissioning options were identified through a series of engineering and environmental studies and any potential impacts which could arise from activities associated with the decommissioning project were identified.

Based on the significant work done to date it is anticipated that in view of the predicted scale, intensity and duration of the activities, decommissioning of the Kinsale Area gas fields will not result in any significant effects on the environment.

Impact on the Marine Environment, Fishermen & Onshore Communities

Subject to regulatory approval it is planned to remove the offshore structures and to leave subsea pipelines and cables in-situ, with protective rock cover. This will be less disruptive than removal of the pipelines and cables which would have a larger impact on the seabed and associated marine life, especially as they have been in place for many years. The EIAR is considering both short-term impacts associated with the platform removal activities (for example, the presence of a large crane vessel) and longer-term impacts from leaving pipelines in-situ. The report will demonstrate that the long-term risk to the environment and to fishing activities is very low. An appropriate inspection programme will be put in place to monitor the status of the pipelines and cables.

The onshore terminal site will have all equipment removed and the land will be restored for agricultural use, in accordance with the planning permission for the site. A suitable plan will be developed to manage the short term impact of the activities associated with the removal of the equipment.

Onshore Inch Terminal

Subsea manifold

Consent Process

In accordance with the EU Environmental Impact Assessment Directive and the Habitats Directive, the project will be assessed for potential significant environmental impacts. The competent state authority is the Department of Communications, Climate Action and Environment (DCCAE- Petroleum Affairs Division (PAD)).
The EIAR and the Appropriate Assessment Screening Report will provide the necessary information to enable the PAD to undertake an Environmental Impact Assessment (EIA) of the project. Kinsale Energy intends carrying out a two stage consent application process to reflect project schedule requirements and to allow time for the completion of studies for the possible reuse of certain facilities. It is anticipated that the entire decommissioning consent process will be completed prior to cessation of gas production in 2020/2021.

Consultations with statutory bodies, together with public consultation, will be undertaken as part of the relevant application for consent. This will ensure that any questions are recorded, communicated to the project team and any concerns addressed.

In accordance with the Petroleum Safety Framework, which regulates the safety of offshore activities in Ireland, the well plugging programme will be subject to a separate approval by the Commission for Regulation of Utilities (CRU).

What will happen to the decommissioned equipment?

The equipment to be removed consists of industrial materials, primarily steel from the structures. All of the equipment will be transported to licensed dismantling yards where the material will be segregated and sorted. It is expected that a very high proportion of the material recovered will be recycled (~90%), with any non-recyclable items being disposed of in a controlled manner in approved waste facilities.

For any questions you may have about this project please contact
Email info@kinsale-energy.ie

For additional information on this project please visit our website
Website www.kinsaleenergy.ie

PSE Kinsale Energy Limited is a subsidiary of PETRONAS