Fairfield Betula Limited

Dunlin Alpha
Decommissioning Programme
FBL-DUN-DUNA-HSE-01-PLN-00001

Consultation Draft

Preface

This Dunlin Alpha Decommissioning Programme is supported by a Comparative Assessment Report, Environmental Appraisal Report and Stakeholder Engagement Report. In accordance with regulatory requirements, statutory and public consultation is triggered by submission of the Draft Decommissioning Programme to the Department for Business, Energy and Industrial Strategy (BEIS) for their consideration. Regulatory consultation is conducted simultaneously by BEIS.

Stakeholders are invited to respond to the draft proposals during the six-week consultation which runs from 3rd August 2018. The closing date for responses is 14th September 2018. Comments should be sent by post or email to:

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The Draft Decommissioning Programme and principal supporting documents can be found online at www.fairfield-energy.com. Other documentation referred to within the consultation documents can also be made available for inspection by arrangement. Supporting documents are referenced in Section 7 of this Decommissioning Programme.

After collation of consultation responses and further discussions with BEIS, the Draft Decommissioning Programme and supporting documents will be updated and refined as required. Additional discussion with stakeholders may be needed depending on the comments submitted.

The Final Decommissioning Programme will incorporate details of comments from statutory and public consultees indicating how these have been addressed. Following approval from the Secretary of State, the final version of the programme will be made available online and stakeholders notified, as per those listed in Appendix 2 together with any further stakeholders who express interest.

Document Control

Approvals

	Name	Signature	Date
Prepared by	Jonathan Bird		1 AUG 18
Reviewed by	Carol Barbone	CB	1 August '18
Approved by	Peter Lee	PL	1 AUG 18

Revision Control

Revision No.	Reference	Changes/Comments	Issue Date
R1	Issued for Comment	1st draft	22 Sep 2016
A1	Pre-Consultation Draft	Comments incorporated	30 Sep 2016
A2	Pre-Consultation Draft	Comments incorporated	14 May 2018
A3	Pre-Consultation Draft	Comments incorporated	6 June 2018
A4	Pre-Consultation Draft	Comments incorporated	4 July 2018
A5	Pre-Consultation Draft	Comments incorporated	20 July 2018
A6	Consultation Draft	Comments incorporated	1 Aug 2018

Distribution List

Name	Company / Organisation
Internal Distribution	Fairfield
Offshore Decommissioning Unit	Department for Business, Energy and Industrial Strategy
MCX Liaison Officer	MCX Dunlin (UK) Limited
Chairman	Independent Review Group
Statutory Consultee	Scottish Fishermen's Federation
Statutory Consultee	National Federation of Fishermen's Organisations
Statutory Consultee	Northern Ireland Fishermen’s Federation
Statutory Consultee	Global Marine Systems

Contents

Contents

Note: The contents of this Decommissioning Programme follow the BEIS streamlined template. Some sections are not applicable but have been retained to preserve the template format.

Terms and Abbreviations

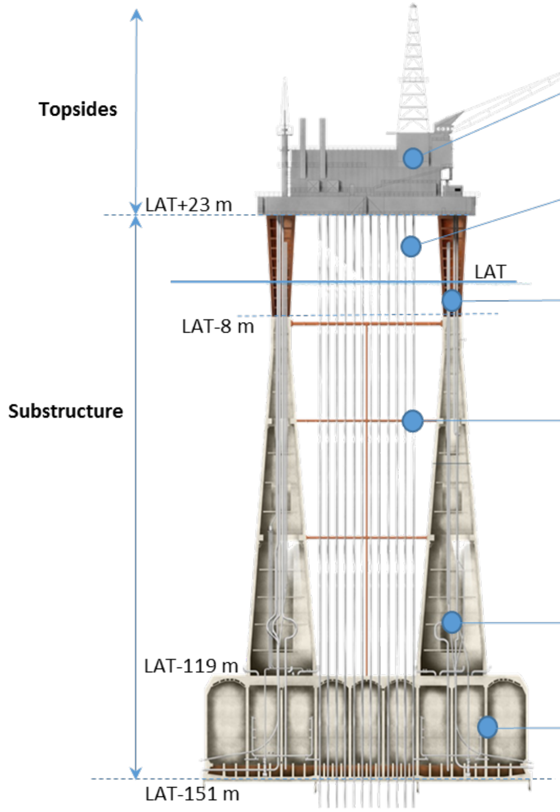
Abbreviation	Explanation
AIS	Automatic Identification System
ANDOC	Anglo Dutch Offshore Concrete
AORP	Attic Oil Recovery Project
BEIS	Department for Business, Energy and Industrial Strategy (formerly DECC)
CA	Comparative Assessment
CGB	Concrete Gravity Base
CGBS	Concrete Gravity Base Substructure
COP	Cessation of Production
DCC	Document Control Centre
DECC	Department of Energy and Climate Change (now called BEIS)
DFGI	Dunlin Fuel Gas Import
DP	Decommissioning Programme(s)
DPI	Dunlin Power Import
DSV	Diving Support Vessel
EA	Environmental Appraisal
EIA	Environmental Impact Assessment
ES	Environmental Statement
FBL	Fairfield Betula Limited
HLV	Heavy Lift Vessel
HSE	Health and Safety Executive
IMO	International Maritime Organisation
INST	Installation
LAT	Lowest Astronomical Tide
LSA	Low Specific Activity (related to NORM)
MCDA	Multi Criteria Decision Analysis
MER	Maximising Economic Recovery
ML	Mud Line
MoM	Minute of Meeting
MS&H	Make-Safe & Handover
MSF	Module Support Frame
N/A	Not Applicable
Navaid	Navigational Aid (sometimes referred as Aid to Navigation (AtoN))
NGO	Non-Governmental Organisation
NORM	Naturally Occurring Radioactive Material (related to LSA)
OGA	Oil and Gas Authority
OGUK	Oil and Gas UK
OSPAR	Oslo Paris Convention

Abbreviation	Explanation
P&A	Plug & Abandonment
PETS	Portal Environmental Tracking System
P/L	Pipeline
PMT	Project Management Team
PON	Petroleum Operations Notice
PWA	Pipeline Works Authorisation
S29	Section 29 Notices
SFF	Scottish Fishermen's Federation
SLV	Single Lift Vessel
SSIV	Subsea Isolation Valve
TBC	To Be Confirmed
TFSW	Trans-Frontier Shipment of Waste
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
WMC	Waste Management Contractor
WONS	Well Operations and Notification System

Units of Measure

Unit	Explanation
ft	Foot (0.3048 m)
"	Inch (0.0254 m)
m (dimension)	Metre
m (currency)	Million
mm	Millimetre
km	Kilometre (one thousand metres)
m^2	Square metre
m^3	Cubic metre
%	Percentage
t	Metric tonne
Te	Tonne – mass equal to 1,000 kilograms (SI unit is t)

Definitions



Topsides - Those parts of the installation which are not part of the substructure and includes the modular support frame and the three module decks.

Conductors – The outer conduits for conveying the wells from the topsides to subsurface. These are part of the well Plug & Abandonment programme.

LAT – Sea level (Lowest Astronomical Tide).

Transitions - Steel columns which rise from LAT-8 m to LAT+23 m upon which the topsides sit. The transitions are classified as part of the substructure.

Conductor Guide Frames – Three supporting frames to prevent lateral movement of the conductors from wave/current action.

CGBS – Concrete Gravity Base Substructure (the substructure) consisting of the Base Caisson, Legs and Transitions.

Legs - The concrete shafts rising from the top of the base caisson from LAT -119 m to LAT-8 m.

Base Caisson - Lower section of the structure containing the 81 cells. The caisson footprint is 104 m x 104 m and reaches up 32 m from the seabed.

Installation – All the components listed above as a complete assembly.

Figures

Tables

Appendices

1 EXECUTIVE SUMMARY

1.1 Decommissioning Programme

This document outlines the Decommissioning Programme (DP) for the Dunlin Alpha installation as required by the relevant Section 29 (S29) Notice, issued August 2008. Note that this DP is for the Dunlin Alpha installation only. The Dunlin subsea facilities are the subject of separate, approved Decommissioning Programmes[1].

1.2 Requirement for a Decommissioning Programme

MCX Dunlin (UK) Limited holds a 100% interest in the Dunlin licence and is therefore the Owner of all Dunlin infrastructure. Fairfield Betula Limited is the appointed Licence Operator under a joint operating agreement in relation to the Dunlin licence with Fairfield Betula Limited as the "Lead Operator" under the same joint operating agreement in relation to all Dunlin, Osprey and Merlin facilities.

This programme, once approved, will form part of the overall Greater Dunlin Area decommissioning activity. The schedule outlined in this document spans from Cessation of Production (COP) to completion of the Close-Out Report. In conjunction with statutory, public and regulatory consultation, this Decommissioning Programme is submitted in compliance with national and international regulations and guidance notes.

1.2.1 Installation

In accordance with the Petroleum Act 1998, the S29 notice holders (see Table 1.2) for the Dunlin Alpha installation are applying to the Department of Business, Energy and Industrial Strategy (BEIS) to obtain approval for decommissioning of the installation as detailed in Section 2.1 of this programme. This programme also has the full support of the Joint Venture partners.

1.2.2 Pipelines

Not Applicable. There are no pipelines included in this Decommissioning Programme. These are covered in the Dunlin Fuel Gas Import and Dunlin Power Import Decommissioning Programmes. The Greater Dunlin Area subsea infrastructure of Merlin and Osprey, including risers, will be decommissioned under separately approved Decommissioning Programmes.

1.3 Introduction

The Dunlin Alpha installation served as the production facility for the Greater Dunlin Area and is located in UK Block 211/23a, approximately 137 km north east of Shetland and 11 km from the UK/Norwegian median line. The installation was installed in 1977 and two subsea tiebacks, Osprey and Merlin, were developed in 1991 and 1997 respectively. During its lifetime, over 522 million barrels of oil were produced from the Greater Dunlin Area.

[1] See www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines

Termination of Production from the Greater Dunlin Area was announced in May 2015, following achievement of Maximising Economic Recovery (MER) from these oilfields. Termination of Production was agreed with the Oil and Gas Authority (OGA) on 9th July 2015, with Cessation of Production (COP) confirmed by letter dated 15th January 2016, to have occurred on 15th June 2015.

The Dunlin Alpha installation consists of a four leg Concrete Gravity Base Substructure (CGBS), herein referred to as the substructure; a steel box girder Modular Support Frame (MSF) deck; and two further levels of modules. The installation stands in 151 m of water and is over 200 m high from the seabed to the top of the drilling derrick. The concrete legs extend to 8 m below LAT (+143 m from the seabed), with steel transitions spanning the splash zone to support the topsides.

The Dunlin Alpha topsides was originally designed as a drilling and production facility. The topsides is constructed over three levels and weighs approximately 19,640 tonnes (dry). Following a decision on the preferred removal option, the topsides will be fully removed for onshore recovery and disposal, in accordance with the Oslo and Paris Convention (OSPAR) Decision 98/3.

Substructure

The substructure was originally designed to provide oil and water separation prior to oil export and consists of 81 individual cells, arranged in a 9 x 9 matrix. It weighs approximately 342,000 tonnes including internal equipment in the legs and solid ballast in the base and was not designed to be refloated.

Over 50 individual studies were undertaken by independent consultants to inform the Comparative Assessment (CA) of Dunlin Alpha decommissioning options. The recommendation for the Dunlin Alpha substructure (after removal of topsides) is to leave in place all four concrete legs and the steel transitions which extend above the waterline, with a navaid fitted to one of the legs. This was identified as the ‘preferred’ decommissioning option for four of the five primary criteria - namely Safety, Environment, Technical and Economic.

Cell Contents

All use of the oil storage cells ceased in 2004, and an oil recovery project was undertaken in 2007 to remove mobile oil from the cells and roof spaces. As a result, the storage cells currently contain approximately 99% water, with the balance being residual trapped oil, wax and sediment. Technical issues associated with access and recovery of the cell contents makes further recovery significantly challenging. The recommendation from the CA process is to leave in place the contents of the storage cells.

Derogation

The recommendations from the CA process indicate that derogations from the OSPAR Decision 98/3 are appropriate. This Decommissioning Programme outlines the proposed removal activities and is supported by a CA Report and Environmental Appraisal (EA). An application for derogation will also be prepared.

1.4 Overview of Installation Being Decommissioned

1.4.1 Installation

Table 1-1: Installation Being Decommissioned			
Field	Dunlin	**Production Type (Oil/Gas/Condensate)**	Oil
Water Depth (m)	151	**UKCS block**	211/23a
Surface Installation			
Number	**Type**	**Topsides Weight (Te)**	**Substructure Weight (Te)**
1	Concrete Gravity Base	19,640	342,000
Subsea Installations		**Number of Wells**	
Number	**Type**	**Platform**	**Subsea**
N/A	N/A	45	N/A
Drill Cuttings Pile		**Distance to Median**	**Distance from UK coastline**
Number of Piles	**Total Estimated volume (m^3)**		
1	19,555	11 km	137 km

Table 1-2: Installation Section 29 Notice Holders Details		
Section 29 Notice Holders	**Registration Number**	**Equity Interest (%)**
Esso Exploration and Production UK Limited	00207426	0
Fairfield Betula Limited	04465204	0
Fairfield Energy Limited	05562373	0
MCX Dunlin (UK) Limited	06451712	100
Mitsubishi Corporation	BR005199	0
Shell U.K. Limited	00140141	0
Siccar Point Energy E&P Limited[2]	01504603	0
Equinor UK Limited[3]	01285743	0

[2] Siccar Point Energy E&P Limited have acquired OMV (U.K.) Limited
[3] Equinor UK Limited were formerly Statoil (UK) Limited

1.4.2 Pipelines

Not Applicable

Table 1-3: Pipelines Being Decommissioned	
Number of Pipelines	None

Table 1-4: Pipelines Section 29 Notice Holders Details		
Section 29 Notice Holders	**Registration Number**	**Equity Interest (%)**
N/A	N/A	N/A

1.5 Summary of Proposed Decommissioning Programme

Table 1-5: Summary of Decommissioning Programme		
Selected Option	**Reason for Selection**	**Proposed Decommissioning Solution**
1. Topsides		
Complete removal of topsides for recycling	Meets BEIS regulatory requirements.	Cleaned equipment refurbished for re-use where possible. Equipment which cannot be re-used will be recycled or other disposal routes considered as appropriate.
2. Substructures		
Decommission substructure *in situ*	CA indicates that disposal *in situ* provides the best option on technical, safety, economic & environmental grounds.	Concrete substructure to be left *in situ* with the transitions cut circa LAT +23 m. Addition of cathodic protection and installation of a single navaid.
Decommission residual cell contents *in situ*	CA indicates that disposal *in situ* provides the best option on technical, safety, economic & environmental grounds.	Cell contents to remain undisturbed to degrade naturally over time.
3. Subsea Installations		
N/A	N/A	N/A
4. Pipelines, Flowlines & Umbilicals		
N/A	N/A	N/A
5. Wells		
Abandoned in accordance with Oil and Gas UK Guidelines for the Abandonment of Wells, issue 5, July 2015.	Meets OGA and HSE regulatory requirements.	Well Plug & Abandonment (P&A) will be permitted as required under approved Chemical Permit, Oil Discharge Permit, Marine Licence (via PETS) and PON5 (via WONS) applications.
6. Drill Cuttings		
Decommission drill cuttings *in situ*	Cuttings fall below both OSPAR 2006/5 thresholds for persistence and oil loss.	Drill cuttings pile to remain undisturbed to degrade naturally over time.
Area (m^2)	9,184	
Volume (m^3)	19,555	
Avg. depth of cover (m)	2.48	
Max depth of cover (m)	12.9	
7. Interdependencies		
None		

1.6 Field Location Including Field Layout and Adjacent Facilities

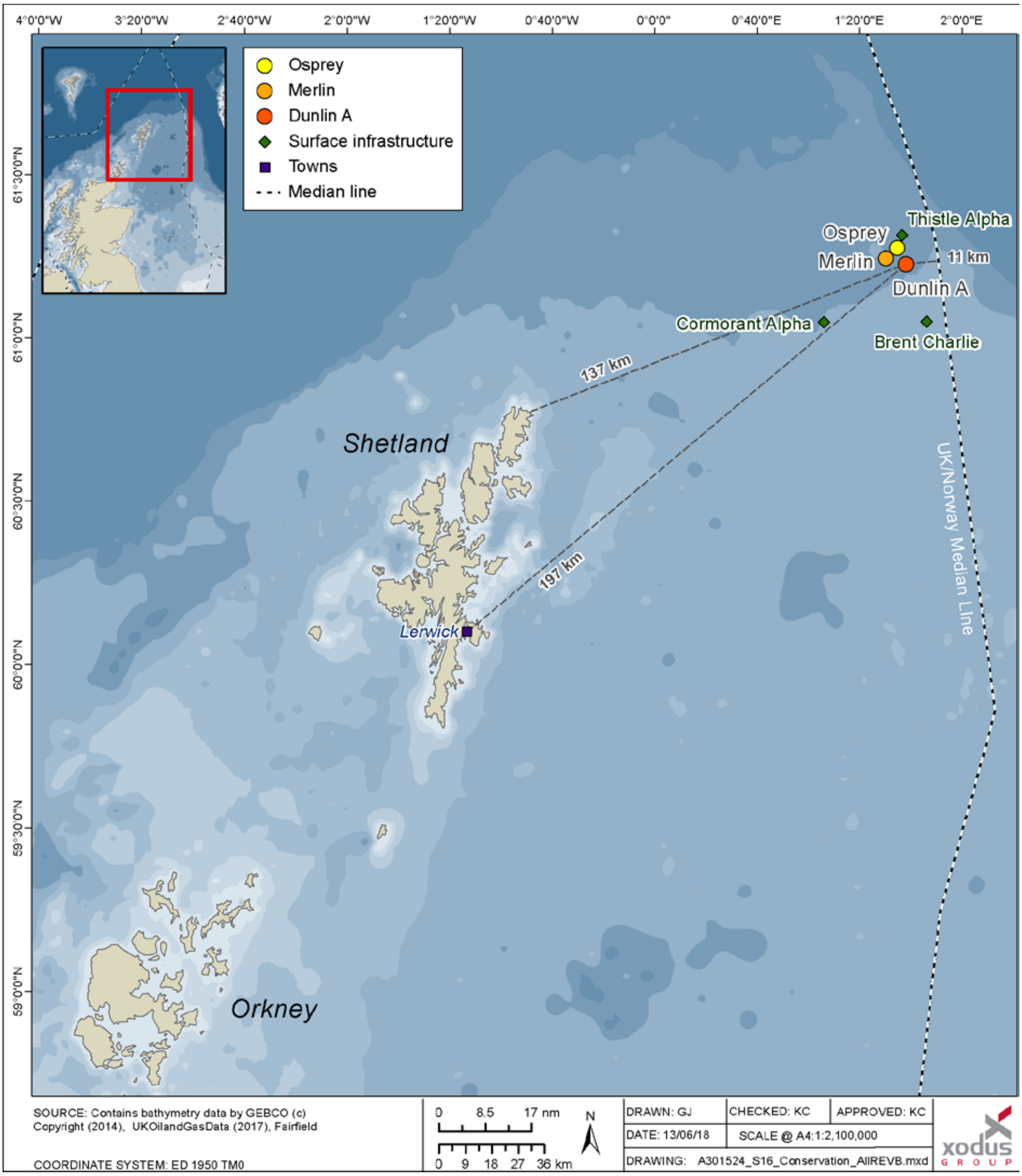


Figure 1-1: Field Location in UKCS

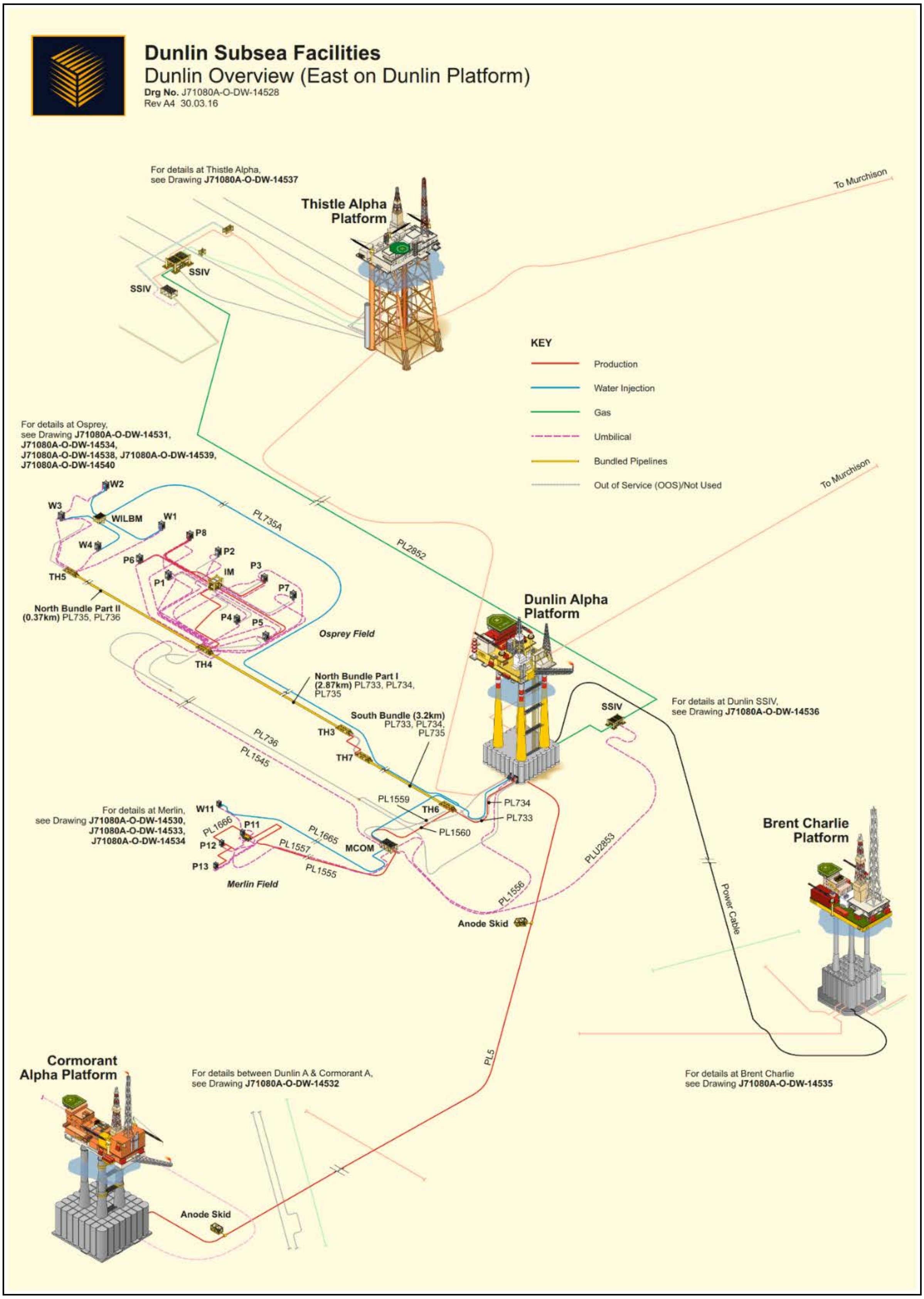


Figure 1-2: Greater Dunlin Area Field Layout

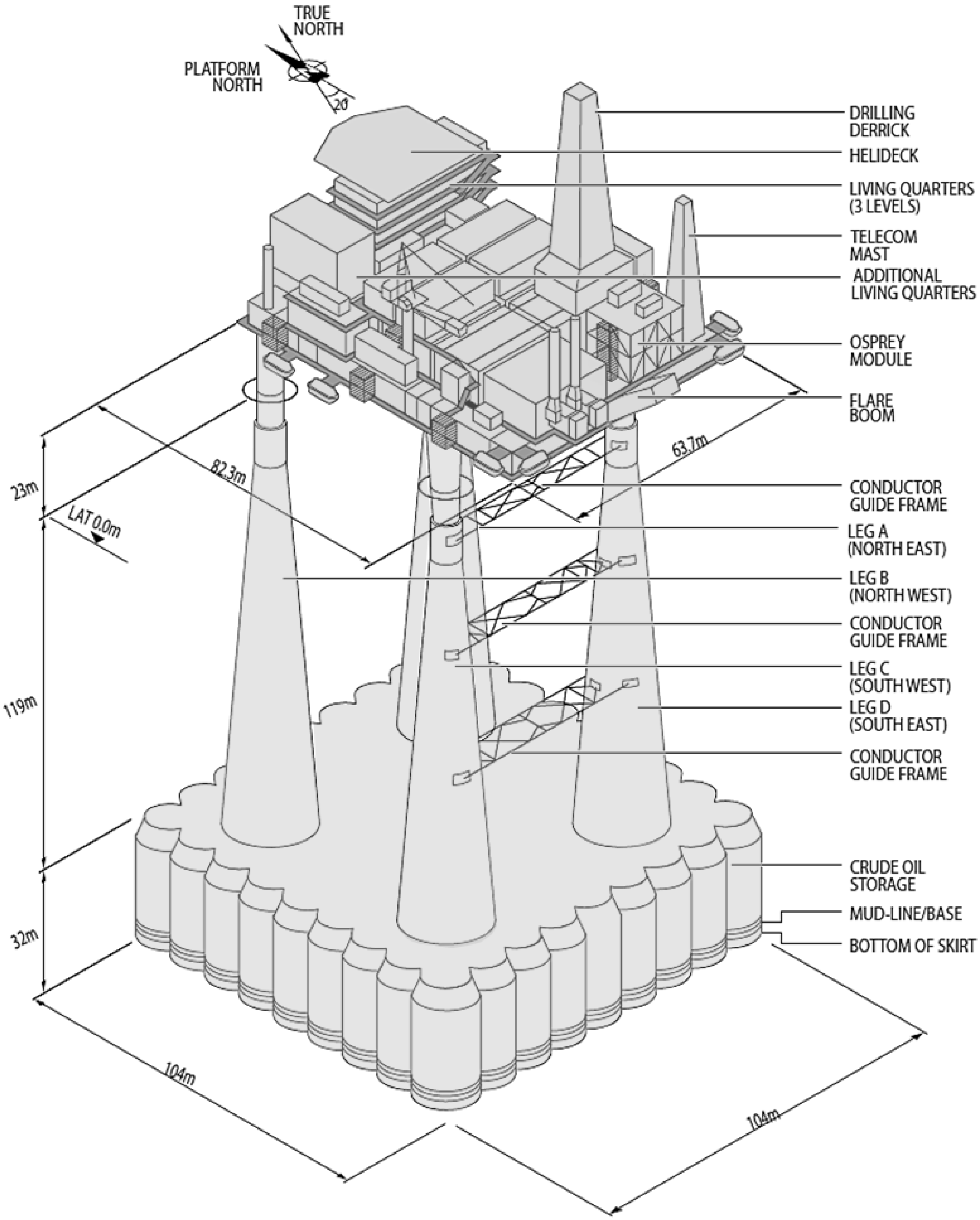


Figure 1-3: Dunlin Alpha Installation

Note: Installation elevations and weights can be found in Appendix 3.

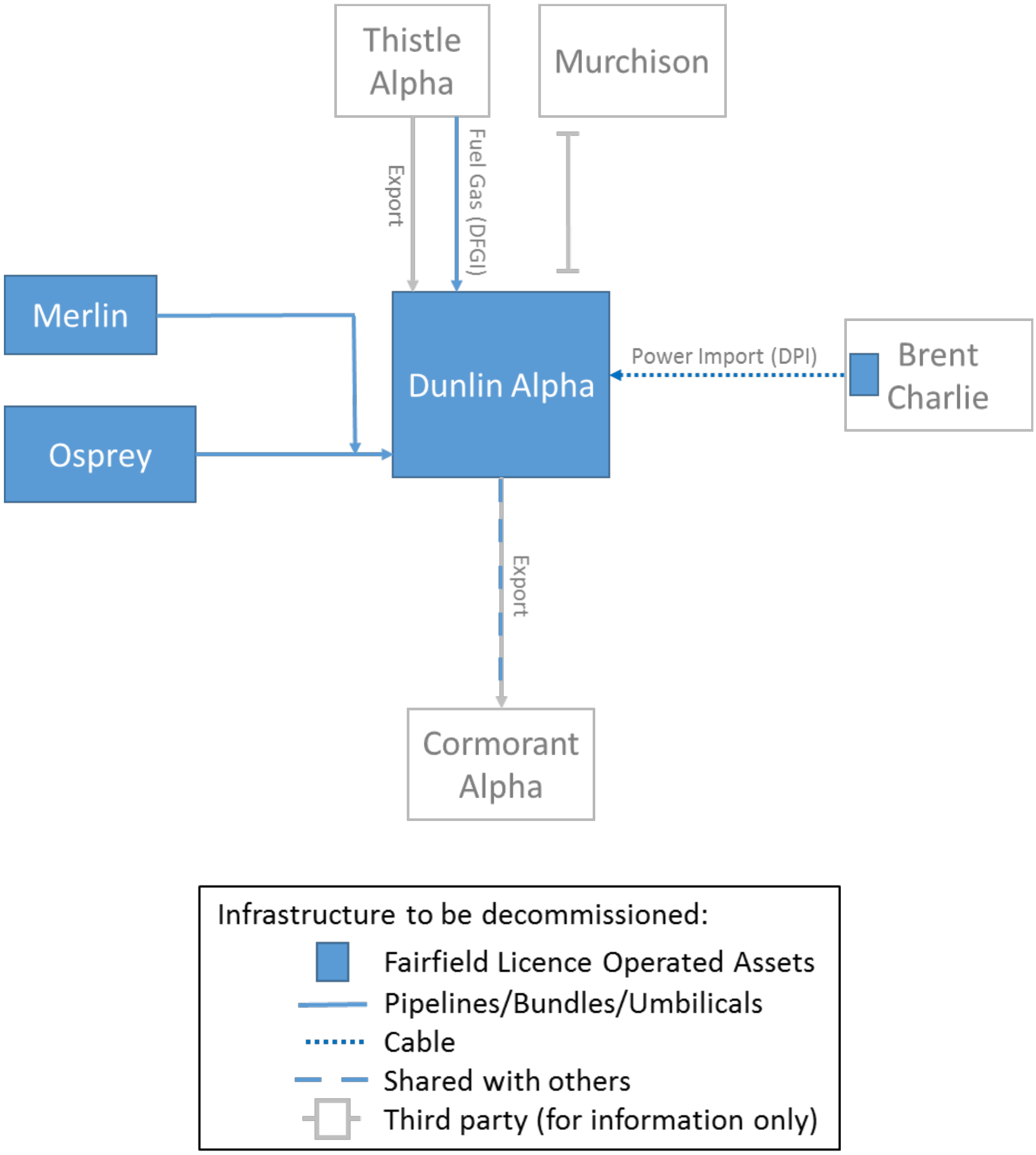


Figure 1-4: Greater Dunlin Area Adjacent Facilities

Table 1-6: Adjacent Facilities					
Owner	**Name**	**Type**	**Distance/Direction**	**Information**	**Status**
MCX Osprey (UK)	Osprey	Subsea tie-back	Dunlin Alpha – Osprey 6.11 km (3.8 miles) North West	Osprey ties into Dunlin Alpha and will be decommissioned	Decommissioning Programme Approved
MCX Osprey (UK)	Merlin	Subsea tie-back	Dunlin Alpha – Merlin 6.98 km (4.36 miles) North West	Merlin ties into the Osprey system and will be decommissioned	Decommissioning Programme Approved
EnQuest	Thistle Alpha	Installation	Dunlin Alpha – Thistle Alpha 9.87 km (6.17 miles) North North West	Thistle Alpha exports production fluids to Dunlin Alpha for onward export to Cormorant Alpha	Operational
TAQA	Cormorant Alpha	Installation	Dunlin Alpha – Cormorant Alpha 34.12 km (21.33 miles) South West	Dunlin Alpha exports Thistle Alpha production fluids to Cormorant Alpha	Operational
Shell	Brent Charlie	Installation	Dunlin Alpha – Brent Charlie 20.99 km (13.12 miles) South East	Provided electrical power and communications to Dunlin Alpha	Operational. Power Cable Decommissioning Programme Approved
CNR	Murchison	Installation	Dunlin Alpha – Murchison 15.89 km (9.93 miles) North East	Disconnected from Dunlin Alpha.	Decommissioned
Impacts of Decommissioning Proposals					
The Dunlin field will be decommissioned along with Osprey, Merlin and associated Dunlin subsea infrastructure including PL5 export pipeline to Cormorant Alpha. Dunlin Alpha currently provides the export route for Thistle Alpha production fluids. This service will terminate in 2019 and alternate arragements are expected to be announced in due course.					

1.7 Industrial Implications

The Dunlin Alpha Decommissioning Programme will be managed by Fairfield in Aberdeen. There will be a number of specialist contract services required for the execution of the programme including, but not limited to; Engineering Studies; Topsides Preparation for Removal; Topsides Removal; and Topsides Recycling/Disposal.

In planning, preparing and executing the programme, Fairfield will ensure that all contracts are raised and administered in a consistent and effective manner and that these:

- Adhere to the ethical and safety standards of the company
- Meet the requirements of legislation and all other relevant external organisations
- Are processed and awarded with tight and proper controls
- Are focussed on safe, efficient and cost effective decommissioning service delivery

Fairfield will continue to work with the OGA Decommissioning & Supply Chain teams, and will also engage with the industry supply chain to identify effective technological solutions that are environmentally acceptable and safe.

2 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

2.1 Installation: Surface Facilities - Topsides and Substructure

Table 2-1: Surface Facilities Information

Name	Facility Type	Location		Topsides/Facilities		Substructure		
				Weight (Te)	Number of Modules	Weight (Te)	Number of Legs	Number of Piles
Dunlin Alpha Installation	Concrete Gravity Base Substructure (CGBS)	WGS84 Decimal	61.275 01.598	19,640	24 (see Section 2.2)	342,000	4	N/A
		WGS84 Decimal minute	61° 16.487' N 01° 35.856' E					

2.1.1 Topsides

Figure 2-1: Dunlin Alpha Installation (Operational March 2012)

Figure 2-2: Dunlin Alpha Installation (Operational March 2012)

The Dunlin Alpha topsides was originally designed as a drilling and production installation, with accommodation facilities for over 140 personnel. The topsides is constructed over three levels and weighs approximately 19,640 tonnes.

Figure 2-3 shows the topsides construction/layout of modules, comprising:

- The Lower Deck (known as the MSF) with six sections creating 45 void spaces.

  This deck consists of compartmentalised steel box girders, and is approximately 85 m x 67 m. The flare boom is cantilevered from the back of the lower deck on the southern side.

- The Module Deck with 10 main modules with additional utility modules for various services.

  The module deck is located above the MSF and consists of ten main production and utilities modules, including the well bay, process vessels, and power generation equipment.

- The Drilling Deck with 14 modules including the accommodation.

  The drilling deck is located above the module deck and consists of the drilling package, platform cranes and living quarters. The helideck is located above the accommodation modules.

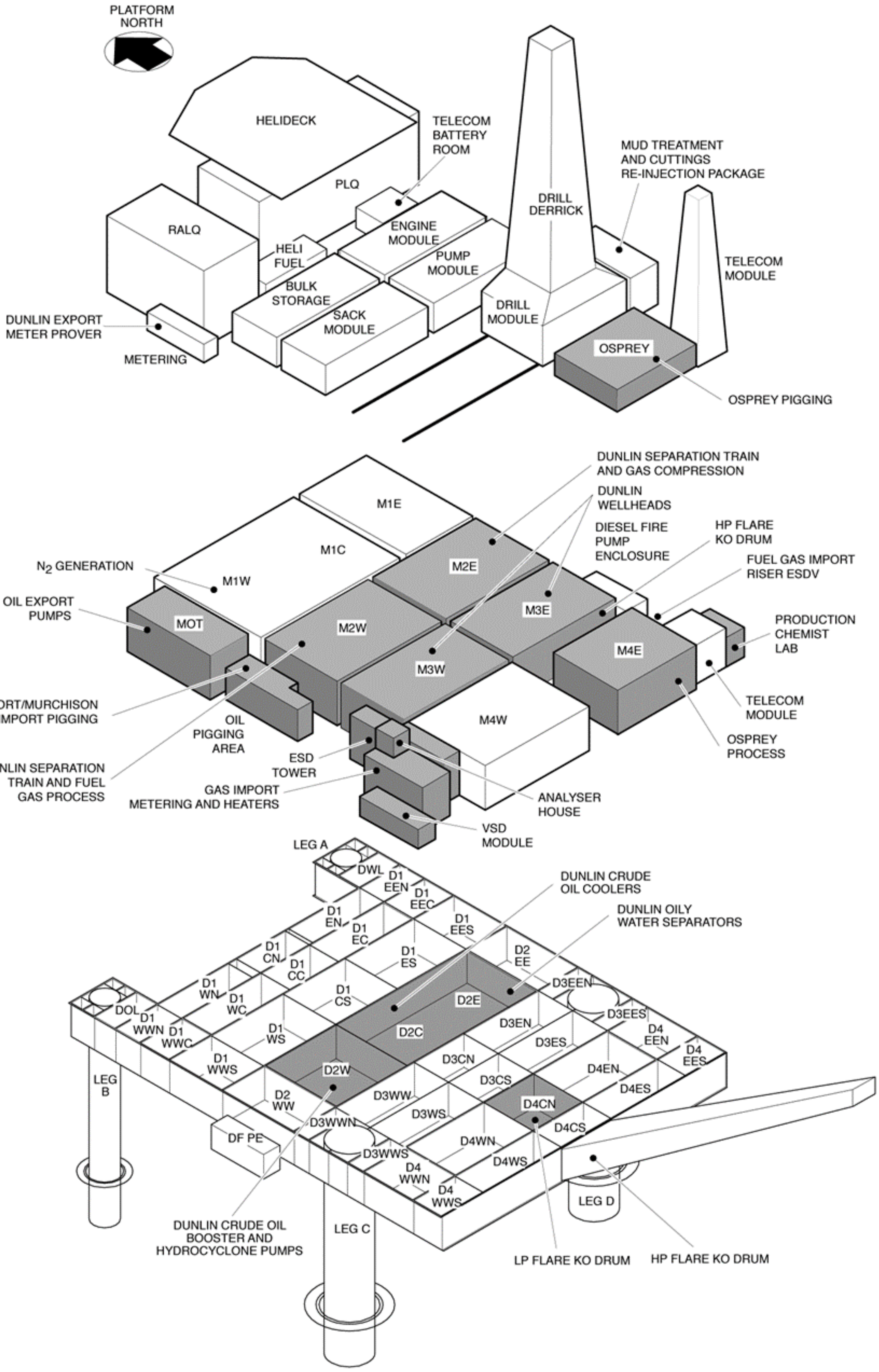


Figure 2-3: Dunlin Alpha Module Layout

2.1.2 Substructure

The Dunlin Alpha substructure weighs approximately 342,000 tonnes, comprising some 236,500 tonnes of steel-reinforced concrete with the remainder of the weight being attributable to internal equipment in the legs and solid granular iron ore ballast in the bottom of the base caisson. The substructure is a unique 1970s design by ANDOC, and was not designed to be re-floated.

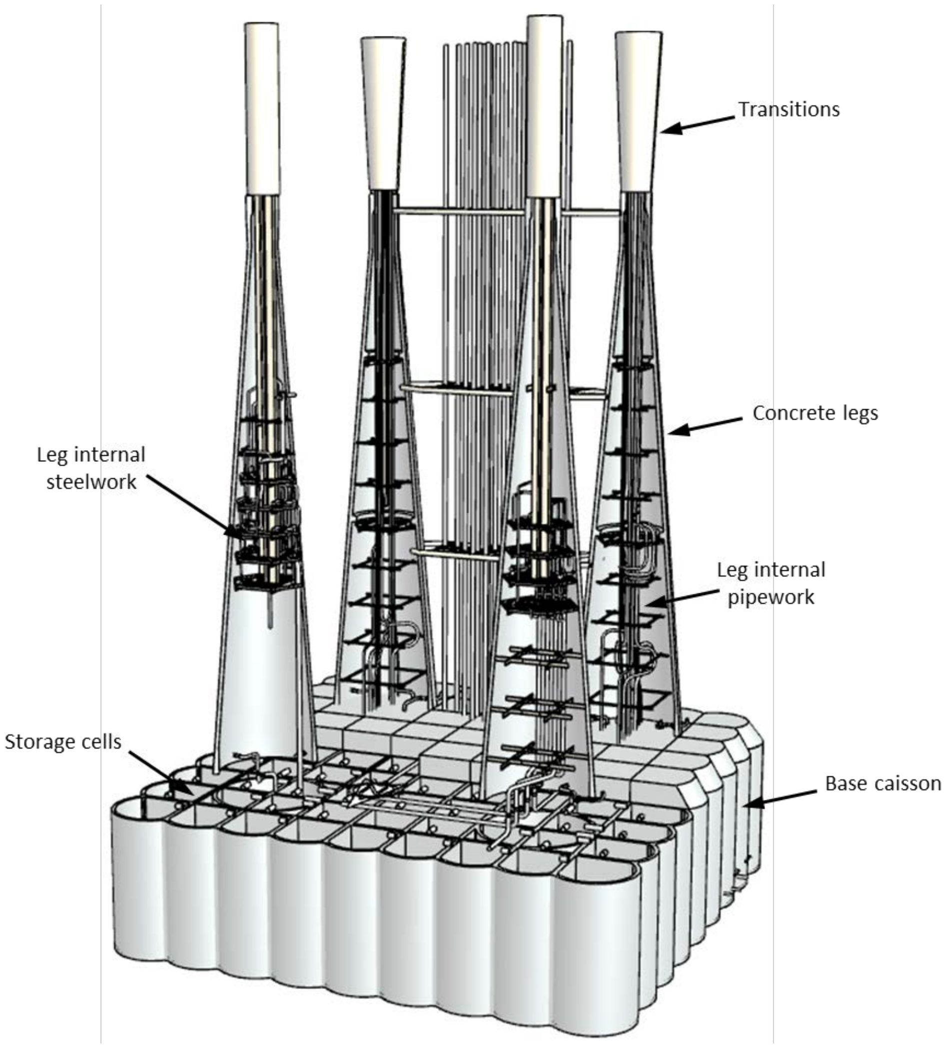


Figure 2-4: Dunlin Alpha Substructure Overview

The substructure base caisson footprint is 104 m x 104 m and consists of 81 cells extending 32 m from the seabed. Rising up from the roof of the base caisson are four concrete legs, each 111 m high and each weighing approximately 8,625 tonnes. These reduce in outside diameter from 22.6 m at the bottom to 6.6 m at the top, where they mate with the transitions at 8 m below sea level. The legs are designed as hollow shafts, with the concrete walls generally being 700 mm thick but increasing to 1,200 mm at the top and the bottom.

Figure 2-5: Dunlin Alpha Concrete Legs (Construction 1976)

Four steel transitions, each weighing between 300-500 tonnes, extend 31 m from the top of the concrete legs, through the splash zone, and are attached to the underside of the topsides at the MSF. Equipment and pipework within the legs and transitions include import and export risers, process pipework and pumps, access stairways, lift shafts, platforms and service openings.

Dunlin Alpha has 48 well slots, of which 45 were utilised. These extended from the MSF to the seabed and were supported against lateral forces by three conductor guide frames located between legs C and D at depths of LAT-10 m, LAT-40 m and LAT-76 m respectively. For each well the external casing is the 30” conductor. As part of the well P&A campaign the conductor internals (well completions) will be removed.

The original purpose of the storage cells was to provide oil and water separation and storage prior to oil export, and to allow seawater to be circulated for well conductor cooling. The arrangement of the storage cells is such that water was free to move throughout the base caisson via lower pipes and ports, while the oil, floating over the water layer, could only move *within* single cell groups via the upper port connections. A layout of the cell group is shown in Figure 2-6.

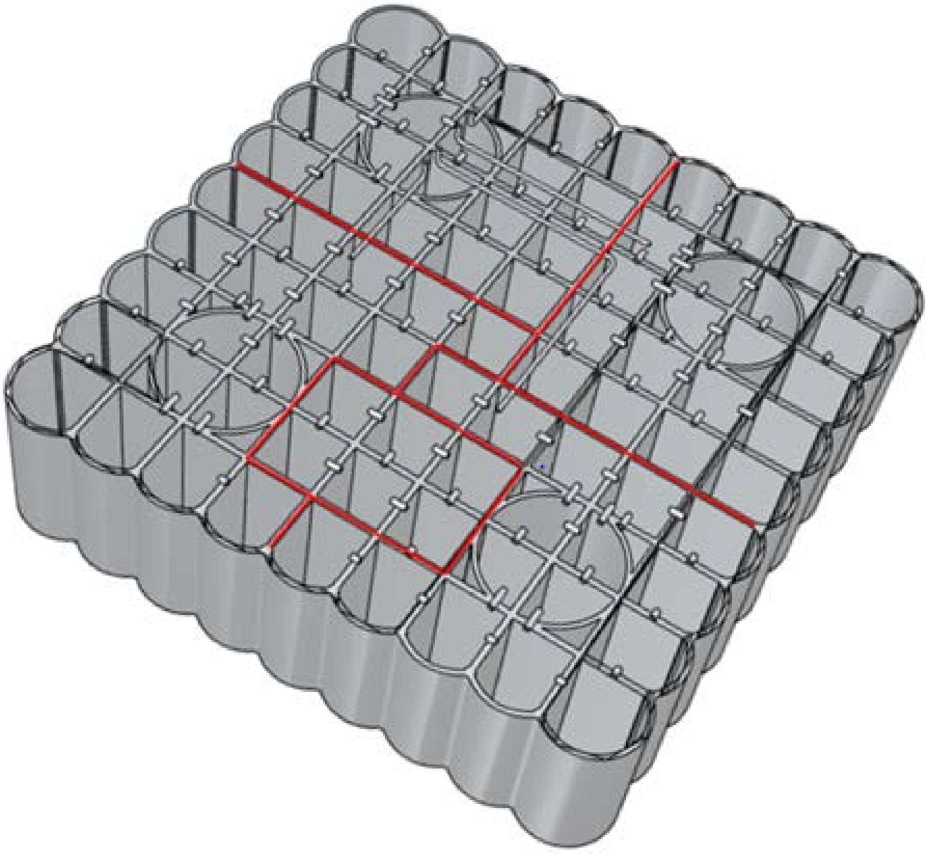


Figure 2-6: Dunlin Alpha Cell Group Layout

The cells underneath the four concrete legs have flat roofs (16 cells) and all others have domed tops (65 cells). The domed tops were created using a 6 x 6 support lattice formwork. This geometry creates 36 sub-compartments in each domed cell.

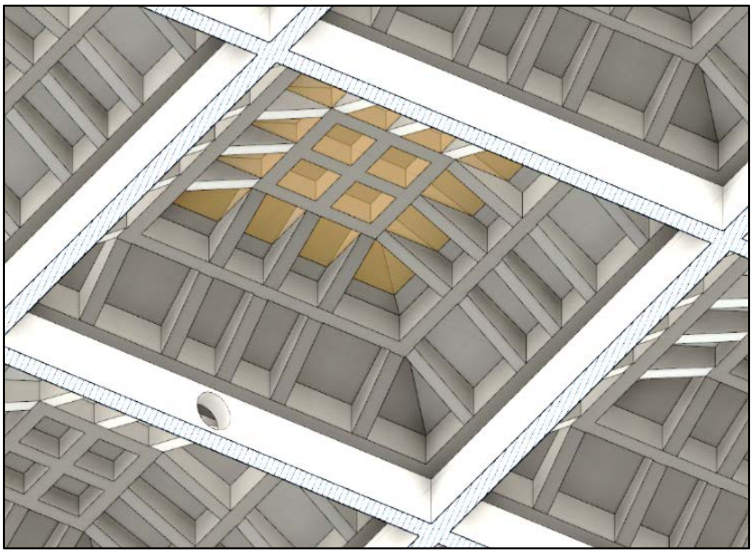


Figure 2-7: Domed Roof Formwork

Cell Contents

The substructure storage cells are split into five distinct groups, four (75 cells) of which were used for separation and storage of production fluids and the fifth group (6 cells) which was used to cool the conductors (which pass through the substructure) with seawater.

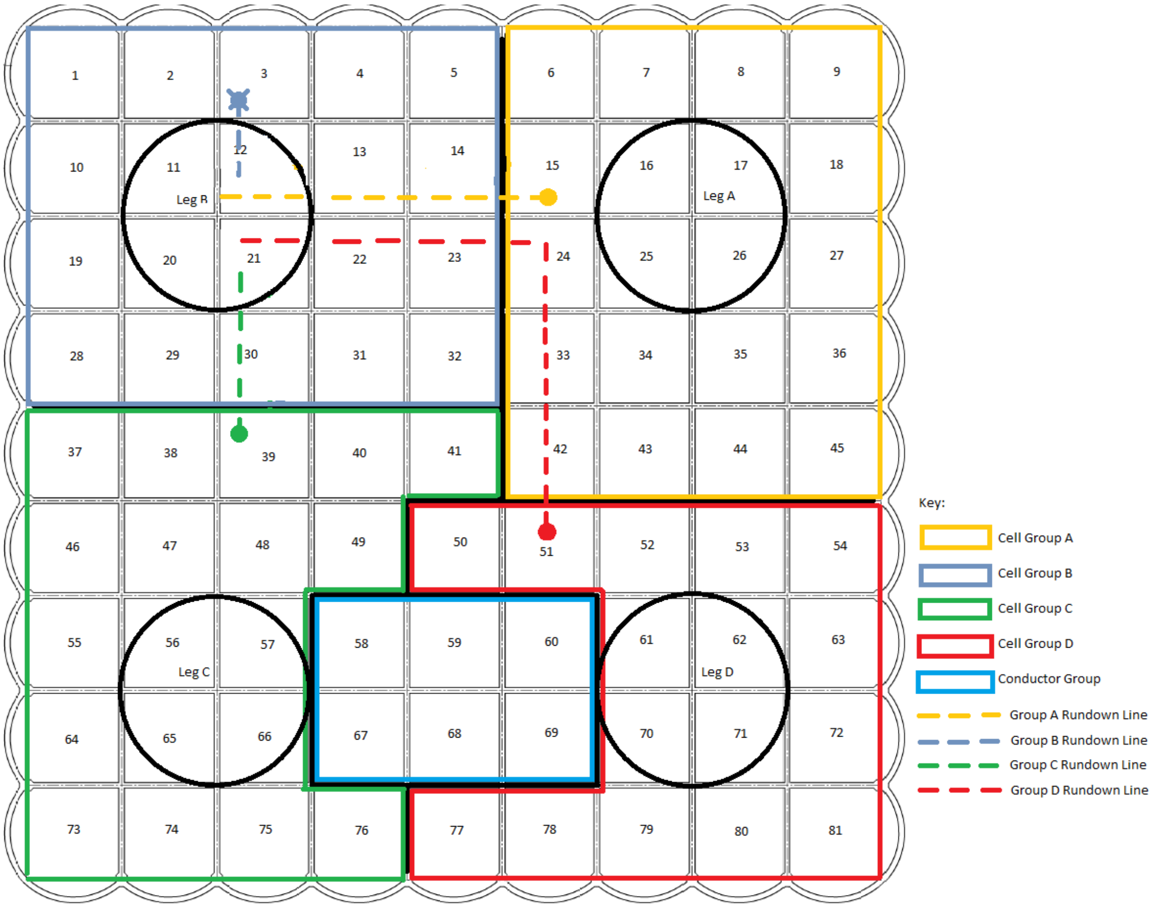


Figure 2-8: Schematic of Cell Layout and Groupings

The majority of material present in the storage cells would have originated from the reservoir, brought in as components of the produced fluids. These components include hydrocarbons (oil and wax), inert particulate material (sand and clay) and scale. The particulate material (sand and clay) settled at the base of the cells, while the scale and hydrocarbons were introduced via the fluid phases and subsequently precipitated on the cell walls, roof and floors through physical and chemical processes.

In 2004 the decision was made to take the storage cells out of service permanently and, in 2007, a project was executed to recover the remaining oil inventory. An inaccessible volume of oil was located in the top of each cell, above the pipework, that could not be extracted due to the export pipework orientation. The previous owner's project team were able to use carbon dioxide (CO_2) gas to displace this 'attic' oil and make it accessible via the existing pipework. Overall the oil recovery project took nearly one year to complete and required significant resources. The stored oil and almost all the trapped attic oil were successfully recovered.

The residual materials within the storage cells can be described in terms of four distinct groups or phases:

- Mobile oil within the "attic" roof space of the cells
- Bottom sediment layer, including sand, clay and scale, located above the inert ballast in the floor of the cells
- Residue adhering to the cell walls and roofs
- Water phase

Other materials associated with these main groups, particularly with the hydrocarbons and scale, include organic and inorganic compounds, heavy metals and naturally occurring radioactive materials (NORM). There is also a layer of granular iron ore ballast in the bottom 4 m of each cell which was installed during construction. See appendix 4 for further details.

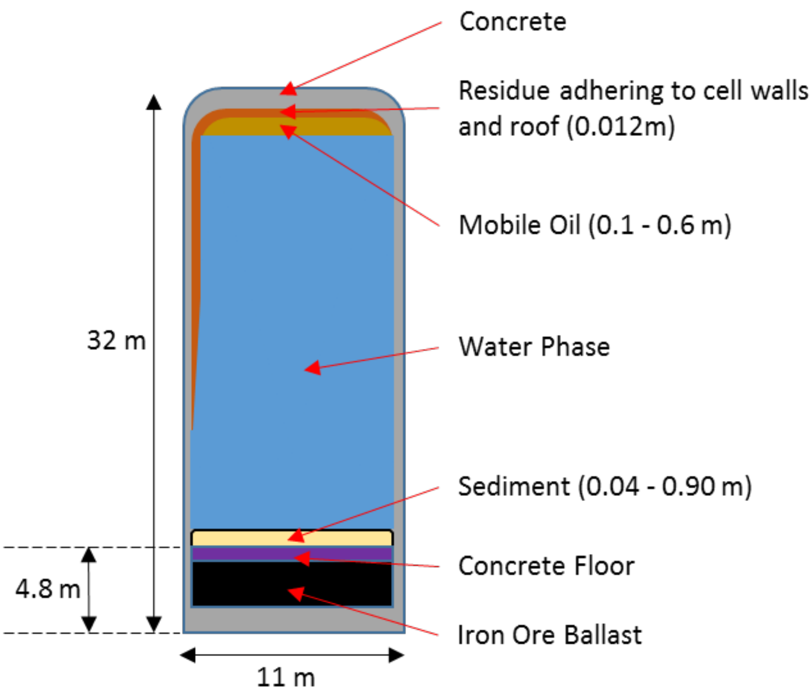


Figure 2-9: Schematic Showing Typical Cell Contents[4] (not to scale)

Fairfield has undertaken an extensive review of the cell contents in order to quantify and characterise the residual materials present in the CGBS storage cells. The information used is considered to be evidence based, using either operational records, analysis of historical samples, analogous data and/or the application of proven scientific principles. Uncertainties associated with the base data have been assessed and, where appropriate, conservative (worst-case) assessments have been applied.[5]

[4] Variation in oil layer thickness is due to differences in individual cell geometry.
[5] For detailed information refer to the Dunlin Alpha Cell Contents Technical Report FBL-DUN-DUNA-FAC-24-RPT-00001

2.2 Installation: Subsea including Stabilisation Features

Not Applicable

Table 2-2: Subsea Installations and Stabilisation Features					
Subsea installation including Stabilisation Features	**Number**	**Size/Weight (Te)**	**Location**		**Comments/Status**
Wellhead(s)	N/A	N/A	N/A	N/A	N/A
Manifold(s)	N/A	N/A	N/A	N/A	N/A
Template(s)	N/A	N/A	N/A	N/A	N/A
Protection Frame(s)	N/A	N/A	N/A	N/A	N/A
Concrete mattresses	N/A	N/A	N/A	N/A	N/A
Grout bags	N/A	N/A	N/A	N/A	N/A
Formwork	N/A	N/A	N/A	N/A	N/A
Frond Mats	N/A	N/A	N/A	N/A	N/A
Rock Cover	N/A	N/A	N/A	N/A	N/A
Other	N/A	N/A	N/A	N/A	N/A

2.3 Pipelines Including Stabilisation Features

Table 2-3: Pipeline / Flowline / Umbilical Information									
Description	**Pipeline No. (as per PWA)**	**Diameter (inches)**	**Length (km)**	**Description of Component Parts**	**Product Conveyed**	**From-To End Points**	**Burial Status**	**Pipeline Status**	**Current Content**
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2-4: Subsea Pipeline Stabilisation Features				
Stabilisation Feature	**Total Number**	**Weight (Te)**	**Location**	**Exposed / Buried / Condition**
Concrete mattresses	N/A	N/A	N/A	N/A
Grout bags	N/A	N/A	N/A	N/A
Sand Bags	N/A	N/A	N/A	N/A
Formwork	N/A	N/A	N/A	N/A
Frond Mats	N/A	N/A	N/A	N/A
Rock Cover	N/A	N/A	N/A	N/A
Other	N/A	N/A	N/A	N/A

2.4 Wells

Table 2-5: Platform Well Information				
Common Name	**Well Name**	**Designation**	**Status**	**Category of Well**
DA-01	211/23-A48	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-02	N/A	N/A	Slot utilised for fire pump	N/A
DA-03	211/23-A19	Water Injector	Phase 2 Abandoned	PL-0-0-3
DA-04	211/23-A18	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-05	211/23-A8	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-06S2	211/23-A17	Water Injector	Plugged	PL-3-4-3
DA-07S3	211/23-A7	Water Injector	Phase 2 Abandoned	PL-0-0-3
DA-08	211/23-A34	Oil Producer	Phase 1 abandoned	PL-0-4-3
DA-09	N/A	N/A	Slot utilised for water discharge	N/A
DA-10	211/23-A24	Oil Producer	Plugged	PL-3-4-3
DA-11S1	211/23-A5	Oil Producer	Phase 3 Abandoned	PL-0-0-0
DA-12	211/23-A30	Water Injector	Phase 1 abandoned	PL-0-4-3
DA-13S1	211/23-A56	Water Injector	Plugged	PL-3-4-3
DA-14S2	211/23-A49Z	Oil Producer	Plugged	PL-3-4-3
DA-15S2	211/23-A61	Oil Producer	Plugged	PL-3-4-3
DA-16S1	211/23-A9	Water Injector	Plugged	PL-3-4-3
DA-17	211/23-A6	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-18	211/23-A10	Water Injector	Phase 2 Abandoned	PL-0-0-3
DA-19	211/23-A43	Oil Producer	Plugged	PL-3-4-3
DA-20S1	211/23-A63	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-21	211/23-A44	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-22	211/23-A1	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-23S1	211/23-A54	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-24S1	211/23-A58	Oil Producer	Phase 3 Abandoned	PL-0-0-0
DA-25S4	211/23-A62	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-26S6	211/23-A52Y	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-27S1	211/23-A46	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-28	211/23-A23	Oil Producer	Phase 2 Abandoned	PL-0-0-3

Table 2-5: Platform Well Information				
Common Name	**Well Name**	**Designation**	**Status**	**Category of Well**
DA-29	211/23-A26	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-30S6	211/23-A57W	Oil Producer	Plugged	PL-3-4-3
DA-31	211/23-A38	Oil Producer	Plugged	PL-3-4-3
A-32S2	211/23-A42	Oil Producer	Plugged	PL-3-4-3
DA-33S1	211/23-A59	Oil Producer	Plugged	PL-3-4-3
DA-34S1	211/23-A53	Oil Producer	Plugged	PL-3-4-3
DA-35	211/23-A41	Oil Producer	Plugged	PL-3-4-3
DA-36S2	211/23-A55	Oil Producer	Active (Disposal)	PL-3-4-3
DA-37S1	211/23-A50	Oil Producer	Plugged	PL-3-4-3
DA-38	211/23-A27	Water Injector	Plugged	PL-0-0-3
DA-39	211/23-A39	Oil Producer	Plugged	PL-3-4-3
DA-40S1	211/23-A37	Oil Producer	Active (Disposal)	PL-3-4-3
DA-41	N/A	N/A	Slot utilised for cuttings discharge	N/A
DA-42S2	211/23-A47Z	Oil Producer	Plugged	PL-3-4-3
DA-43S3	211/23-A65	Oil Producer	Phase 1 Abandoned	PL-0-4-3
DA-44S4	211/23-A20Z	Water Injector	Phase 2 Abandoned	PL-0-0-3
DA-45S3	211/23-A28Z	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-46S1	211/23-A60	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-47S2	211/23-A64Z	Oil Producer	Phase 2 Abandoned	PL-0-0-3
DA-48S1	211/23-A2	Water Injector	Phase 2 Abandoned	PL-0-0-3
Subsea Wells				
N/A		N/A	N/A	N/A

For details of well categorisation, see Oil and Gas UK Guidelines for the Suspension or Abandonment of Wells (July 2015). Well plug and abandonment operations are in progress and well status will change. The above well status is correct as of July 2018.

2.5 Drill Cuttings

The Dunlin Alpha cuttings pile is in a cone shaped deposit on the south-east portion of the CGBS roof, with additional material located in a semi-circular pattern within 60 m of the south edge of the CGBS. The average depth of cover within the entire Dunlin Alpha drill cuttings deposition area is 2.48 m, whilst the maximum thicknesses of the CGBS and seabed cuttings piles are 12.9 m and 12.8 m, respectively. From the 75,949 tonnes of mud and cuttings discharged at Dunlin, the mass of the combined base caisson roof and seabed cutting locations is 48,888 tonnes. During the drilling phase, Water Based, Oil Emulsion and Low Toxicity Oil Based Muds were used and discharged. Further details can be found within the Drill Cuttings Technical Report.

Table 2-6: Drill Cuttings Pile Information		
Location of Pile Centre (Latitude / Longitude)	**Seabed Area (m^2)**	**Estimated Volume of Cuttings (m^3)**
61° 16.487' N 01° 35.856' E	9,184	19,555

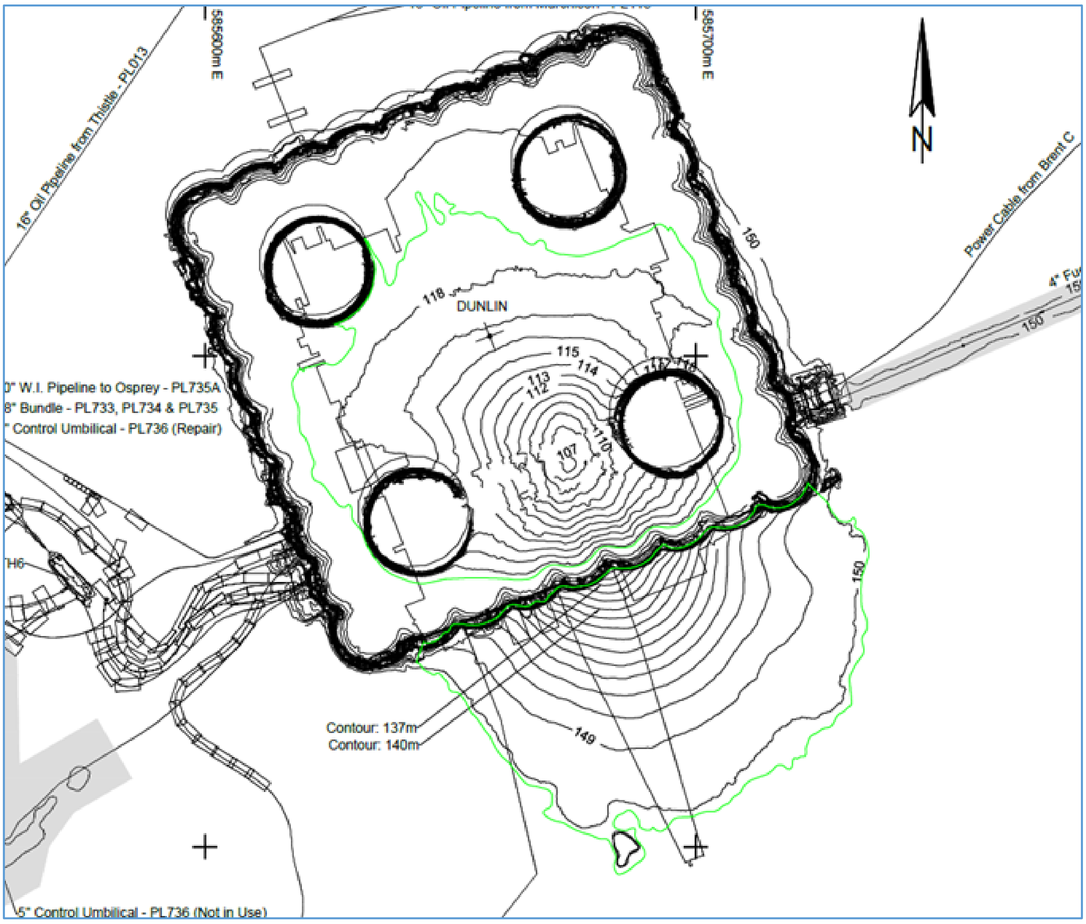


Figure 2-10: Dunlin Alpha Drill Cuttings Pile

2.6 Inventory Estimates

2.6.1 Topsides

Table 2-7 provides an overview of the estimated weight of materials associated with the Dunlin Alpha topsides, as described in Section 2.1. A further breakdown of the relative inventory types is provided in Figure 2-11.

Table 2-7: Estimated Material Inventory Associated with Dunlin Alpha Topsides

Material	Description	Mass (t)
Steel	Ferrous	17,790
	Non-Ferrous (copper, aluminium, alloys)	750
Concrete	Aggregates (concrete; cement)	110
Plastics	Polymers (PVC/uPVC; nylon)	340
Hazardous	Asbestos (asbestos containing material)	170
	Residual fluids (hydrocarbons; chemicals; control fluid)	30
	Heavy metals (batteries; paint coatings)	150
	NORM scale	30
	Other hazardous	10
Other	Fibreglass; manolite; insulation; wood; glass; ceramics	260
	Total (tonnes)	**≈ 19,640**

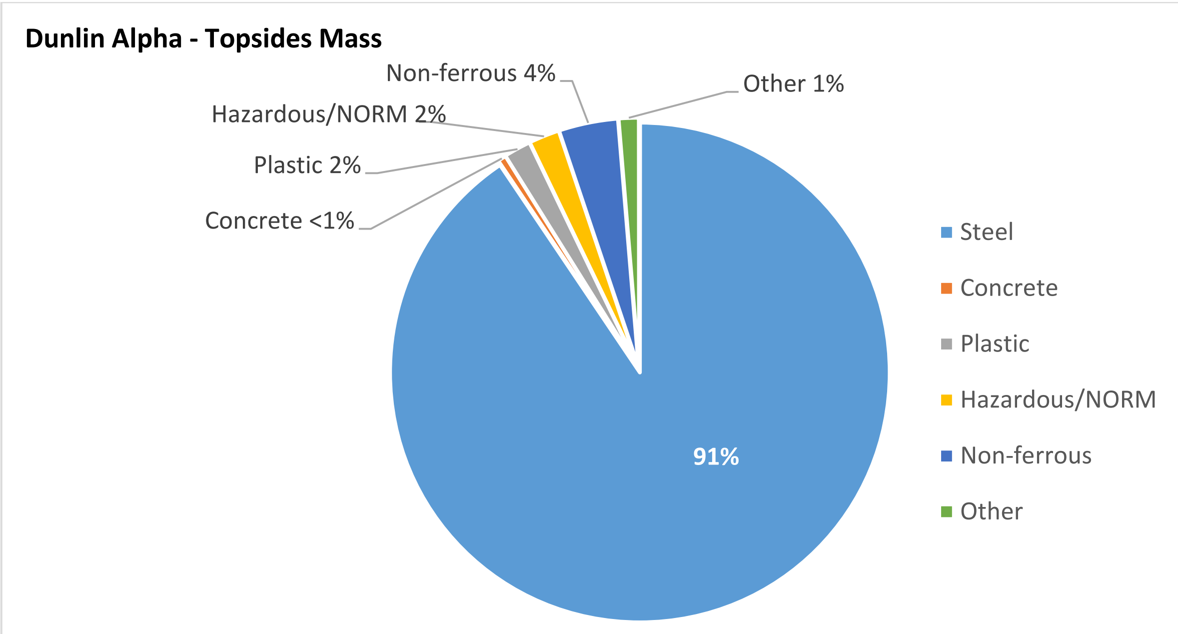


Figure 2-11: Pie Chart of Estimated Inventories (Topsides)

2.6.2 Substructure

Table 2-8 provides an overview of the estimated weight of materials associated with the Dunlin Alpha substructure, as described in Section 2.1. A further breakdown of the relative inventory types is provided in Figure 2-12.

Table 2-8: Estimated Material Inventory Associated with Dunlin Alpha Substructure (not including Cell Contents - see Table 2-9)

Material	Description	Mass (t)
Steel	Ferrous	8,066
	Non-Ferrous (copper, aluminium, alloys)	13
Concrete	Aggregates (concrete; cement)	236,509
Plastics	Polymers (PVC/uPVC; nylon)	19
Hazardous	Asbestos (asbestos containing material)	< 1
	Residual fluids (hydrocarbons; chemicals; control fluid)	< 1
	Heavy metals (batteries; paint coatings)	16
	NORM scale	4
	Other hazardous	4
Ballast	Iron ore ballast	96,800
Other	Other construction material	< 1
	Total (tonnes)	**≈ 341,431**

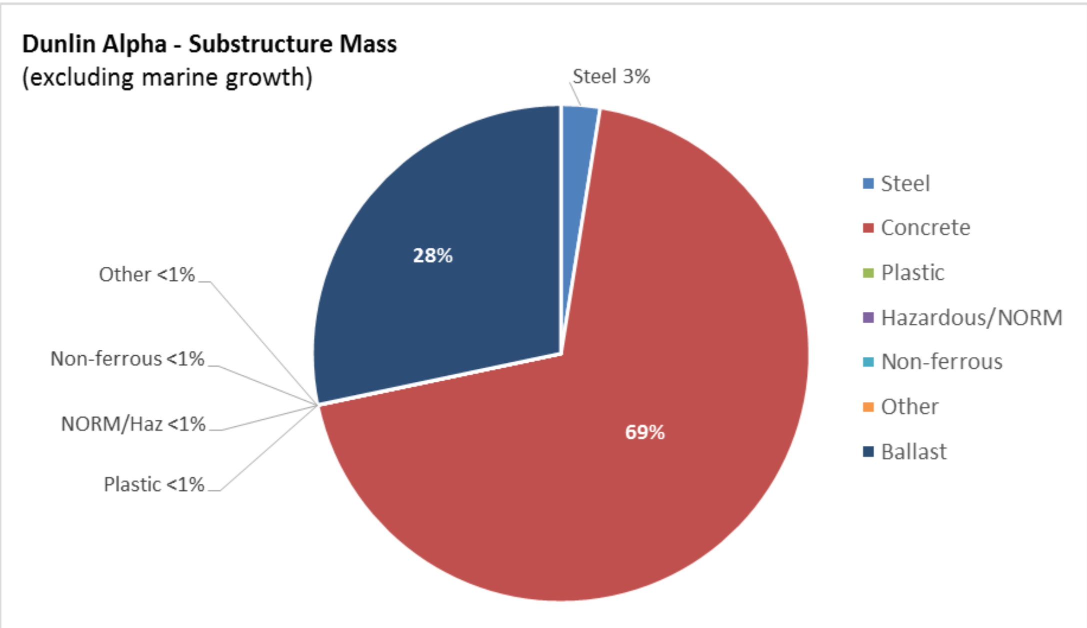


Figure 2-12: Pie Chart of Estimated Inventory (Substructure)

2.6.3 Cell Contents

Table 2-9 provides an overview of the estimated volume of materials associated with the Dunlin Alpha cell contents, as described in Section 2.1. A further breakdown of the relative inventory types is provided in Figure 2-13.

Table 2-9: Estimated Material Inventory Associated with Cell Contents

Material	Description	Volume (m^3)
Water	Seawater; water in sediment layer	233,994
Hydrocarbons	Mobile oil; oil in sediment layer; wax	1,928
Sediment	Sand; clay; scale (including heavy metals and NORM)	522
Wax	Wall residues	462
	Total (m^3)	**≈ 236,906**

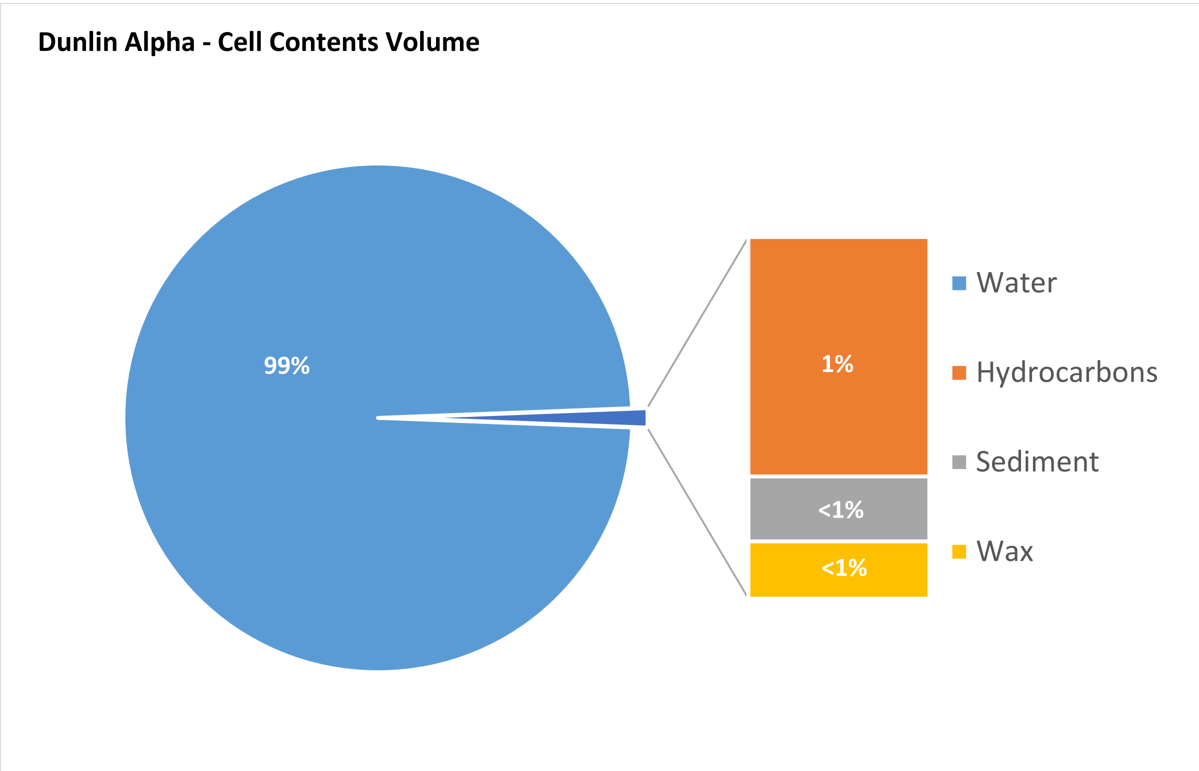


Figure 2-13: Pie Chart of Estimated Inventory (Cell contents)

3 REMOVAL AND DISPOSAL METHODS

As operator of the Dunlin Alpha installation, Fairfield recognises its Duty of Care for all waste materials generated from the proposed decommissioning activities. Fairfield has therefore developed a Waste Management Strategy for the project in order to outline the processes and procedures necessary to ensure that waste is managed in a manner that complies with legislative requirements and prevents harm to people and the environment.

Fairfield's strategy is underpinned by the waste hierarchy, shown in Figure 3-1. The hierarchy is based on the principle of waste disposal only where reuse, recycling and waste recovery cannot be undertaken. In line with the waste hierarchy principles, reuse of an installation (or parts thereof) is first in the order of preferred decommissioning options for assessment.

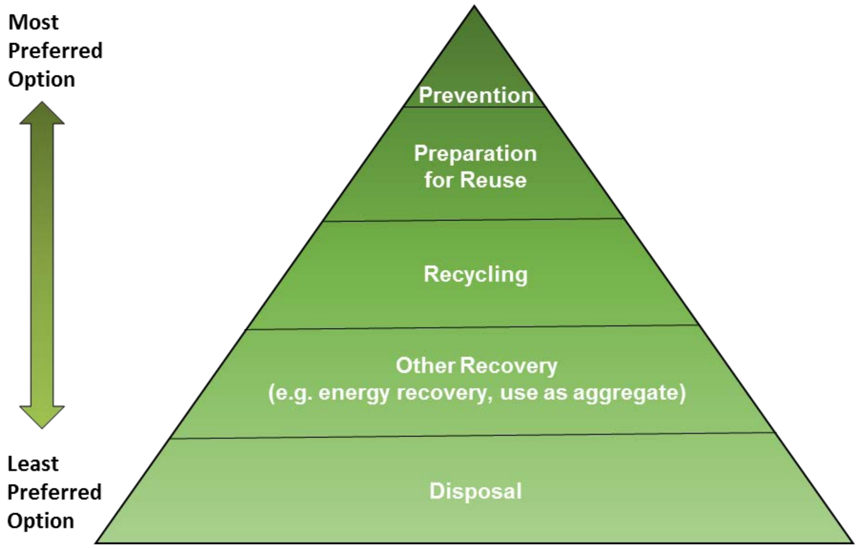


Figure 3-1: Waste Hierarchy

Fairfield will continue to engage with other companies and wider industries to discuss reuse opportunities for topsides equipment. However, Fairfield believe that any further reuse or resale opportunities will be best achieved through the tendering and selection of a waste management contractor with the required knowledge and experience in this area. Final disposal routes and historical performance will be a key consideration within the tendering process to ensure the aims of the waste hierarchy are best achieved.

Recovered infrastructure will be returned to shore and transferred to a suitably licensed decommissioning facility. Steel and other recyclable metal are estimated to account for the greatest proportion of the materials to be removed to shore. It is expected that steelwork would be cleaned before being largely recycled.

Detailed inventory assessments have been undertaken in order to characterise and quantify both hazardous and non-hazardous materials to be decommissioned. Where required, this has involved specific sampling and analysis by competent specialists in order to ensure materials are classified correctly. Any hazardous wastes remaining in recovered infrastructure will be disposed of under an appropriate licence or permit.

3.1 Topsides

3.1.1 Topsides Decommissioning Overview

Following Cessation of Production, options to re-use the Dunlin Alpha installation for further hydrocarbon developments have been assessed but, to date, none have yielded a viable commercial opportunity. As a result, the Dunlin Alpha topsides will be fully removed for onshore recovery and disposal, in accordance with OSPAR Decision 98/3 and BEIS guidance notes on decommissioning.

3.1.2 Preparation/Cleaning

Prior to removal, Fairfield will undertake offshore operations required to depressurise, flush and isolate systems in order to make the topsides safe for removal activities. Where possible, pipework and vessels will be visually inspected and may be further treated should any sources of potential spills of oils or other fluids be identified. Activities will also be undertaken to remove hazardous materials and substances from the legs.

Table 3-1: Preparation of Topsides for Removal

Waste Type	Composition of Waste	Disposal Route
Residual hydrocarbons	Process fluids, fuels and lubricants	Process vessels and pipework will be drained and flushed, with fluids reinjected into the reservoir under an approved oil discharge permit. Residual hydrocarbons will be shipped to an appropriately licensed facility for recovery or disposal.
Residual sand	Residual hydrocarbons and NORM	Residual process sand will removed from process vessels, washed and disposed of offshore under an approved oil discharge permit.
Other hazardous materials	NORM, LSA scale, instruments containing heavy metals, batteries	Hazardous materials will be recovered and transported onshore for recovery or disposal at an appropriately licenced facility.
Original paint coating	Lead-based paint	It is not proposed to remove lead-based paint coatings prior to shipment of materials onshore for disposal. All hazardous materials will be treated and disposed of at an appropriately licensed facility.
Asbestos	Asbestos and ceramic fibre	Asbestos will be managed in accordance with appropriate controls and transported onshore for disposal at an appropriately licenced facility.

3.1.3 Topsides Removal Options

Fairfield are currently assessing the different methods available for the removal of the Dunlin Alpha topsides, including use of a single lift vessel (SLV) or use of a heavy lift vessel (HLV) for reverse installation (piece large), offshore deconstruction (piece small), or a combination of these methods. These are outlined in Table 3-2 and shown graphically in Figure 3-2.

Table 3-2: Topsides Removal Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) Monohull crane vessel ☑ 3) SLV ☑ 4) Piece small ☑ 5) Other (see Figure 3-2) ☑	
Method	**Description**
Single lift removal by SLV	Removal of topsides as a complete unit using a SLV, and transportation to onshore facility for deconstruction. Selected equipment to be re-used, and deconstructed material to be recovered for recycling and/or disposal.
Reverse installation (piece large) by SLV/HLV	Removal of separated topsides modules by HLV for transportation to onshore facility for deconstruction. Selected equipment to be re-used, and deconstructed material to be recovered for recycling and/or disposal.
Offshore deconstruction (piece small)	Removal of topsides by breaking up offshore and transporting to shore using monohull crane vessel and work barge. Recovered materials will be sorted for re-use, recycling or disposal at an onshore facility.
Combination of removal methods	A combination of piece small and reverse installation methods, with potential single or multi lift of the MSF (one to six sections) using a HLV. All materials will be transported to onshore facility for reuse, recycling and/or disposal.
Proposed removal method and disposal route	**Topsides removed and recycled onshore.** **A competitive tender process is ongoing. Tender responses will raise any potential issues of trans-frontier shipment of wastes. A final decision on the decommissioning method will be made following this tendering process.**

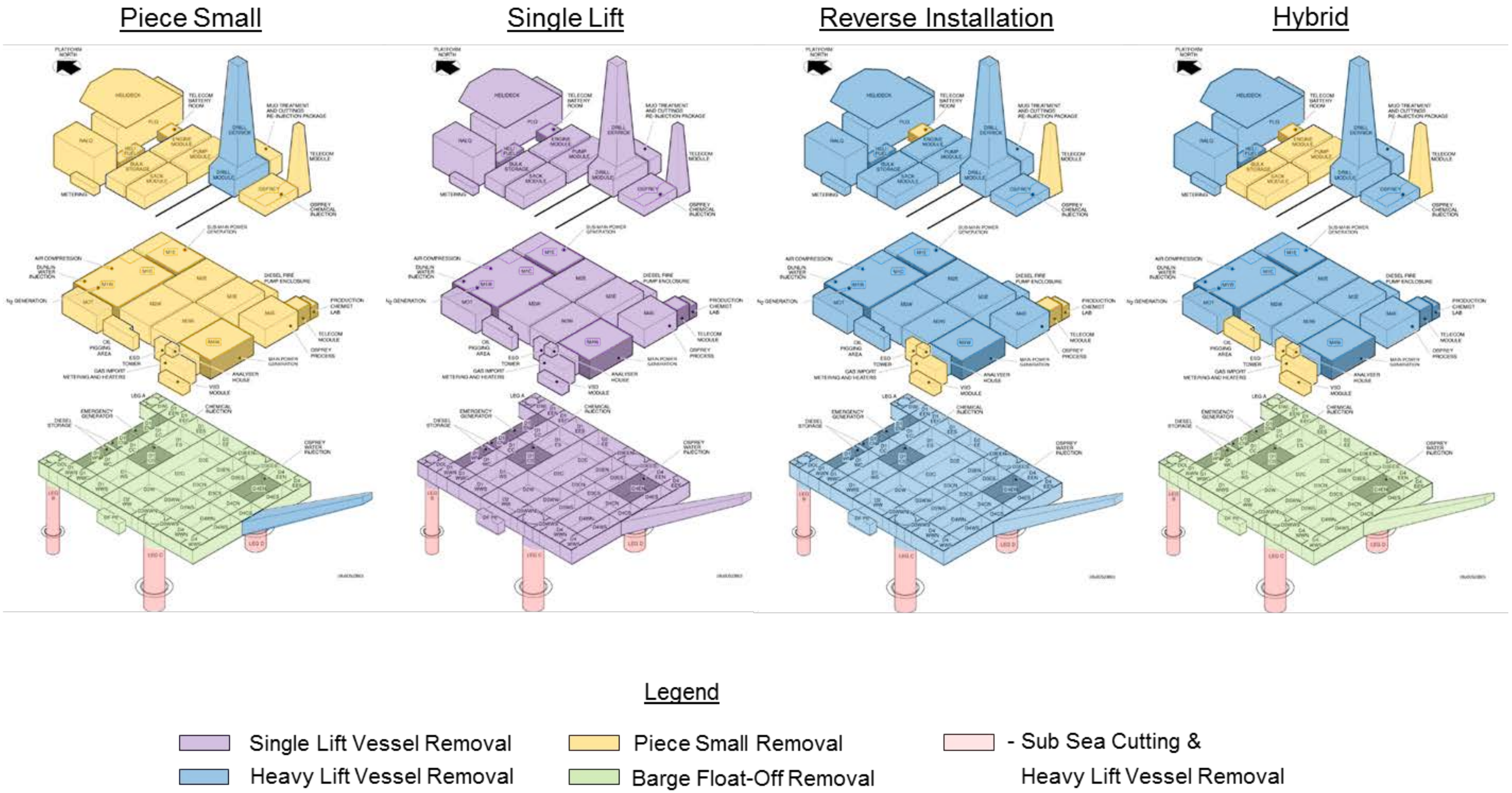


Figure 3-2: Dunlin Alpha Topsides Removal Methods

3.2 Substructure

3.2.1 Substructure Decommissioning Overview

OSPAR Decision 98/3 prohibits disused offshore installations from being left wholly or partly in place. However, a derogation from these general requirements may be granted for concrete installations where there are significant reasons why an alternative disposal method is preferable to re-use or recycling or final disposal on land. As such, Fairfield have undertaken a Comparative Assessment (CA) of decommissioning options in order to identify the preferred decommissioning method.

Table 3-3: Substructure Overview

Name of Substructure	Substructure weight (Te)	Date Installed	Seeking Derogation from OSPAR Decision 98/3 (Yes/No)
Dunlin Alpha Concrete Gravity Base Substructure	342,000	1977	Yes

3.2.2 Comparative Assessment Methodology

Comparative Assessment (CA) is a core part of the overall decommissioning planning and approval process being undertaken by Fairfield. Fairfield's strategy for the CA process is aligned with the Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes (October 2015) and DECC's Guidance Notes (March 2011). Figure 3-3 outlines the CA process applied to the Dunlin Alpha Decommissioning Programme(s).

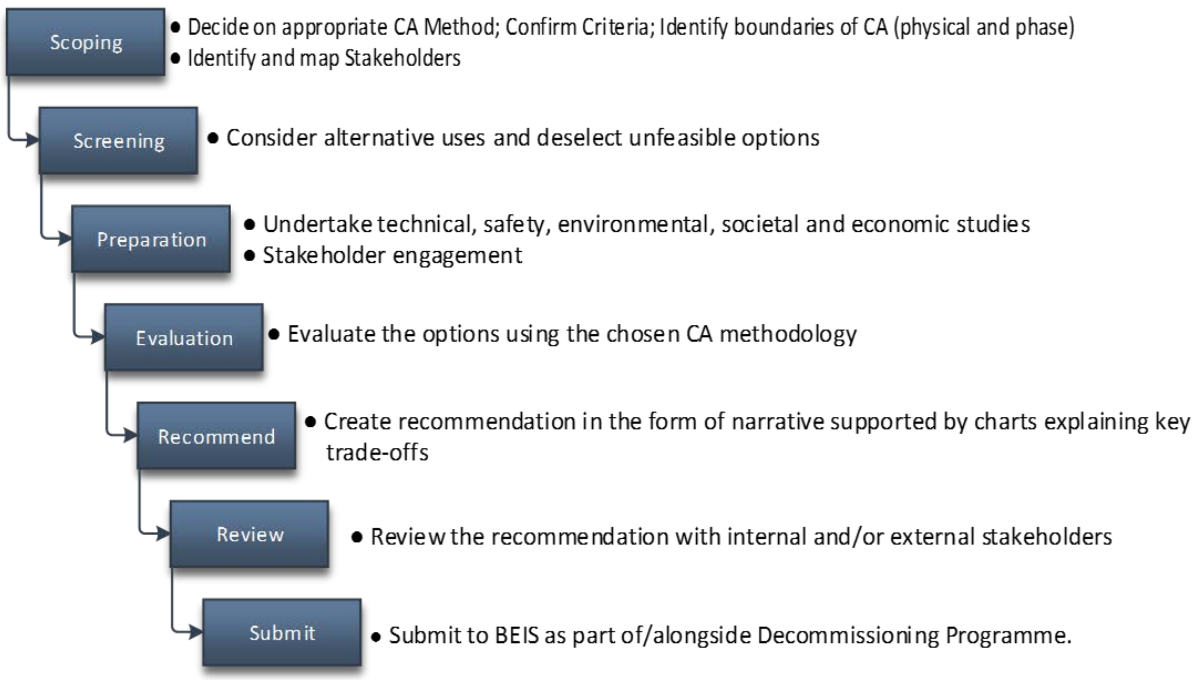


Figure 3-3: Comparative Assessment Process

The overall CA process followed a nested decision logic, where assessment of the substructure was undertaken in the first instance, in order to determine the scope of the cell contents management assessment. Together, these decisions influenced the management strategy for the Dunlin Alpha drill cuttings pile.

The CA evaluation process uses the five assessment criteria of Safety, Environment, Technical, Societal and Economic to compare the relative merits of each option. The assessment criteria are equally weighted in order not to single out any criterion as more important as any other. The main criteria and associated sub-criteria are given in Table 3-4.

Table 3-4: CA Main Criteria and Sub Criteria

Main Criteria	Weighting	Sub Criteria
Safety	20%	Operations Personnel
		Other Users
		Legacy Risk
Environmental	20%	Operational Marine Impacts
		Energy & Emissions
		Legacy Marine Impacts
Technical	20%	Project Technical Risk
Societal	20%	Fishing Industry
		All Other Groups
Economic	20%	Operational & Legacy Costs

An independent consultancy was employed and used Multi Criteria Decision Analysis (MCDA) pairwise software to facilitate the CA process. The evaluation team consisted of Fairfield specialists, industry experts, and key stakeholders, notably other users of the sea. The evaluation session was attended by regulators and members of an Independent Review Group.

For each assessment criterion the participants analysed the relative merit of each option against the other options and looked for a differentiator, using terms such as 'stronger than' or 'weaker than'. This was inputted using the software to allow numerical weightings to be derived for the various competing criteria, a standard part of any MCDA activity. Once all options were assessed and compared, the MCDA approach allowed the evaluations to be portrayed in the form of stacked bar charts.

3.2.3 Substructure Decommissioning Method

In order to understand the possible decommissioning options for the substructure and determine their respective feasibility, Fairfield commenced detailed study work in 2011 after engaging with stakeholders to gather a range of perspectives. These studies were revisited following Cessation of Production and a Screening exercise conducted to determine the most viable options for the substructure which would then be subjected to Comparative Assessment. A description of the options considered and the results of the screening exercise are summarised below.

Option 1: Reuse of the Installation at the Current Location

The achievement of Maximum Economic Recovery from the Dunlin and Dunlin SW reservoirs was confirmed by the OGA in June 2015. In the absence of an economic oil and gas purpose for the installation, Fairfield considered other potential uses, such as carbon sequestration and storage schemes, but could not identify a technically feasible or economically viable alternate use. This option was therefore screened out of further consideration.

Option 2: Refloat the Installation for Reuse at another Location

Notwithstanding the lack of credible alternate locations, a key consideration for this option was the technical feasibility of re-floating the substructure. Significant study work concluded that this was not viable for a number of technical reasons, including the prior addition of some 96,800 tonnes of iron ore ballast at installation; the inability of the surrounding soil to withstand the pressure needed to free the 4 m skirts from the seabed; the poor integrity of numerous aged penetrations and piping systems which would likely fail in any refloat attempt; the hydrostatic instability of the substructure (with or without the topsides in place); and the impracticability of adding sufficient external buoyancy to the substructure. This option was therefore screened out of further consideration.

Option 3: Refloat the Substructure for Deconstruction at an Inshore Location

For the same technical reasons as above, refloat of the substructure for the purpose of near-shore demolition was screened out of further consideration.

Option 4: Total Deconstruction of the Substructure at the Current Location

This option would require the entire substructure to be deconstructed at its current location and the resulting materials transferred to barges for transportation to shore for their subsequent recycling and disposal. While early studies (2011) had concluded that the risks associated with cutting the concrete structures at depth would not be manageable and should not be attempted, Fairfield has continued to study this option to develop some understanding of the scale, complexity and risk of such a venture. As this was the only remaining ‘full removal’ case, this option was retained and developed for Comparative Assessment purposes and is hereafter referred to as ‘Full Removal’.

Option 5: Partial Removal of the Substructure to LAT-8 m & Installation of a Navaid tower

This option would require cutting of all four legs, likely in the range of LAT-8 m to LAT-20 m by diamond wire cutting. As the remaining substructure would present a shallow hazard above the IMO standard of LAT-55 m, a concrete tower would be retrofitted to one of the cut legs in order to support a navaid at an appropriate elevation. As this option was considered potentially feasible, it was retained and developed for Comparative Assessment purposes and is hereafter referred to as the ‘Shallow Cut & Navaid Tower’ option.

Option 6: Partial Removal of the Substructure to LAT-55 m

As an alternative derogation option, consideration has been given to cutting the legs at greater depth to achieve the IMO standard of 55 m of clear, freely navigable water above the remaining substructure. This option would require upscaling of cutting technology, and involve extremely challenging heavy lifts, but would obviate the need for installation and maintenance of any retrospective structure to carry a navaid. As this option was considered potentially feasible, it was retained and developed for Comparative Assessment purposes and is hereafter referred to as the 'IMO Compliant Cut' option.

Option 7: Collapsing Legs through Controlled Demolition

Consideration was given to collapsing the four legs at their base, through either diamond wire cutting techniques and/or explosive charges. The legs would be allowed to topple to the seabed and would remain *in situ* due to the technical and safety challenges associated with any attempted recovery programme. While potentially feasible, guidance was sought from BEIS on the likely regulatory view of such an option and confirmation received that this option would not be acceptable as it is considered 'dumping at sea' and thus not allowable. The option was therefore screened out of further consideration.

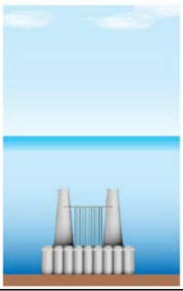
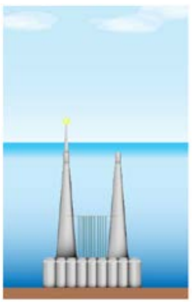
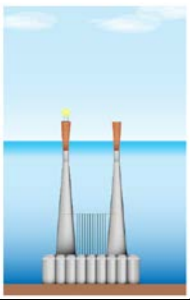
Option 8: Retain the Module Support Frame on the Substructure and install Navaid

This option considered retention of the MSF which sits atop the substructure at LAT+23 m. This option removes any requirement for concrete leg or transition cutting and would not require the installation of a new tower to carry a navaid. Study work on the longevity of both the MSF and substructure showed there was little structural benefit in retaining the MSF despite introducing a significant maintenance burden with the MSF. This option was therefore screened out of further consideration.

Option 9: Leave the Substructure *in situ* and install Navaid on one Transition

This option involves leaving the substructure in place up to its current elevation of LAT+23 m. The topsides would be removed and one of the transitions would accommodate a navaid with a combination of coatings and/or cathodic protection used to arrest corrosion. As this option was considered potentially feasible, it was retained and developed for Comparative Assessment purposes and is hereafter referred to as the 'Transitions Up' option.

Based on the results of the screening exercise, four options were taken forward for further consideration. The four selected options are further summarised in Table 3-5.

Table 3-5: Substructure Decommissioning Methods	
1) HLV (semi-submersible crane vessel) ☑ 2) Monohull crane vessel ☑ 3) SLV ☑ 4) Piece small ☑ 5) Other (leave *in situ*) ☑	
Method	**Description**
Full Removal 	Option 4 would involve complex *in situ* deconstruction of the substructure by a single Heavy Lift Vessel (HLV) utilising a Dive Support Vessel (DSV)/barge for cut, lift, transport and recycle/disposal. The drill cuttings, cell contents, conductors and Conductor Guide Frames (CGFs) would be removed. The base caisson would require piece small deconstruction by ROV on a cell by cell basis and is estimated to take in excess of 40 years to complete. A navaid would not be required as the concrete would be fully removed.
IMO Cut 	Option 6 would involve removing the steel transitions and upper concrete leg sections. Shallow and IMO Compliant cut zones would be cleared and leg internals above these removed. The subsea cuts would be completed by a single HLV utilising a DSV/barge for cut, lift, transport and recycle/disposal. A navaid would not be required.
Shallow Cut 	Option 5 would involve removing the steel transitions. Shallow cut zone would be cleared and leg internals above this removed. The subsea cut would be completed by a single HLV utilising a DSV/barge for cut, lift, transport and recycle/disposal. A prefabricated concrete support tower would be installed subsea on one of the cut concrete legs in order to carry a navaid. Navaid monitoring and maintenance would be required post-decommissioning.
Transitions Up 	Option 9 would involve topside removal only, leaving the four steel transitions in place. One of the steel transitions would be used to carry a navaid. This would have its internal walls coated and/or cathodic protection installed. Navaid monitoring and maintenance would be required post-decommissioning.
Proposed removal method and disposal route	**Substructure decommissioned *in situ* leaving the Transitions Up** **Install and maintain a navaid to warn other users of the sea of shipping hazard.** **OSPAR derogation required for Substructure.**

Outcome of CBGS Comparative Assessment

Over 50 individual studies were commissioned by Fairfield in order to provide the necessary inputs required for the CA process. For the evaluation of the substructure decommissioning options, it was determined that the three derogation options should be comparatively assessed in order to identify the preferred derogation option. Thereafter, the 'Full Removal' option and recommended derogation option would be comparatively assessed. The results of the derogation option evaluation are shown in Figure 3-4.

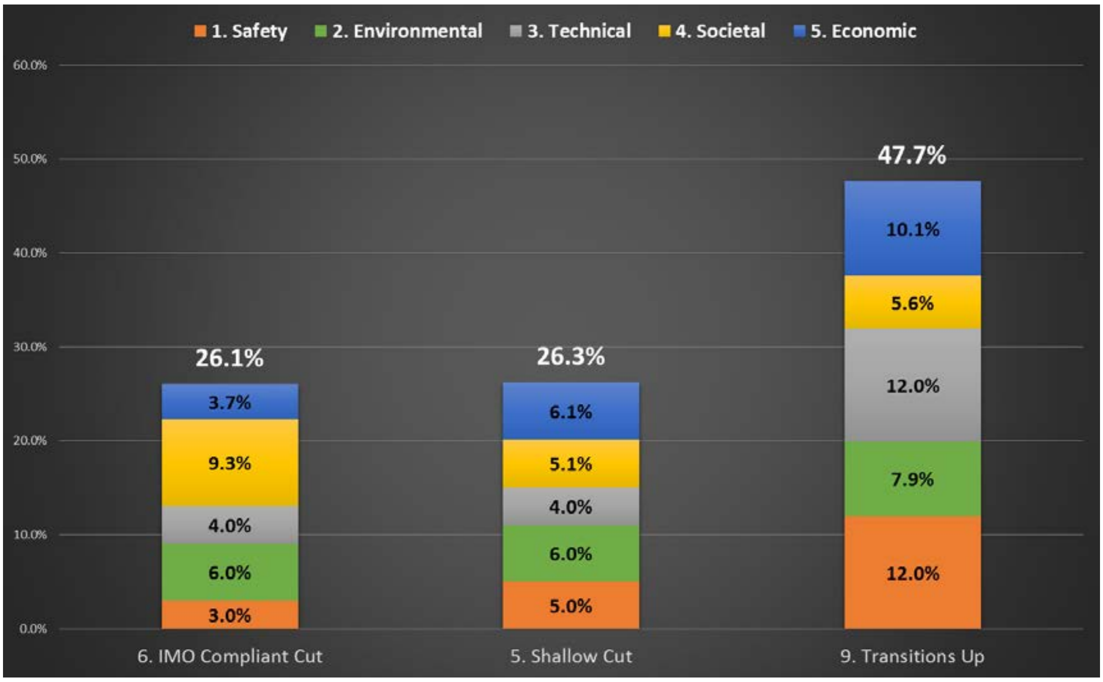


Figure 3-4: Substructure Derogation Option Evaluation

Figure 3-4 demonstrates that 'Transitions Up' was the preferred option in four of the five assessment criteria – namely Safety, Environment, Technical and Economic. Sensitivity analyses were conducted and the evaluation outcome was found to be robust. A full discussion of the evaluation against the CA criteria and sub-criteria, and the sensitivity analyses performed, can be found in the Comparative Assessment Report.

Having identified the strongest derogation option (Transitions Up), a second evaluation was performed to comparatively assess the 'Full Removal' and 'Transitions Up' options. The results of this evaluation are shown in Figure 3-5. The bar chart demonstrates that 'Transitions Up' was the strongly preferred option in four of the five assessment criteria – again for Safety, Environment, Technical and Economic aspects. The key sensitivity analysis of disregarding cost was conducted and the evaluation outcome was found to be robust.

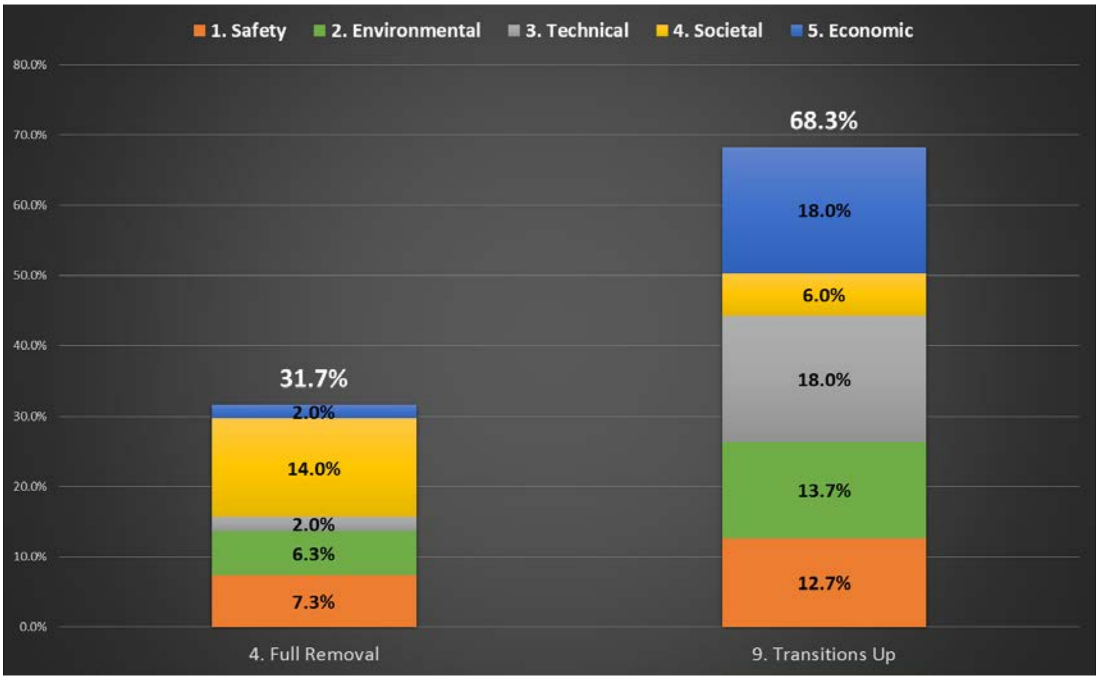


Figure 3-5: Substructure Option Evaluation

The Comparative Assessment concluded that decommissioning the substructure *in situ* with 'Transitions Up' and installation of a navaid was the most preferred of the derogation options against Safety, Technical, Economic and Environmental criteria. When evaluated against the 'Full Removal' option, 'Transitions Up' was also the most preferred option when assessed against Safety, Technical, Economic and Environmental criteria. A discussion of the outcome is provided below.

Safety

'Transitions Up' was the overall preferred option when assessed against all safety criteria. 'Full Removal' was the preferred option when assessing 'legacy safety risks' (i.e. snagging or collision risk), as there would be no legacy risk once the substructure has been removed. However, 'Full Removal' would require over 8 million man hours and over 40 years of offshore operations, resulting in significant potential for loss of life. The 'Transitions Up' option had by far the lowest number of operational man-hours and vessel transits, and was the preferred option when considering 'operational safety risks' and risks to 'other users of the sea'. In addition, installation of a navaid and retaining the 500 m safety zone will significantly reduce the potential for legacy risks.

Environmental

'Transitions Up' was also the overall preferred option when assessed against all environmental criteria. Although 'Full Removal' was the preferred option in regards to 'legacy marine environmental impacts', it is anticipated that 'Full Removal' would involve over 40 years of subsea cutting and concrete removal activities, with associated underwater noise, atmospheric emissions and unavoidable marine discharges. As a result, 'Transitions Up' was the preferred option when assessed against 'operational marine environmental impacts' and 'atmospheric emissions' sub-criteria. In addition, legacy environmental impacts associated with the long-term degradation of the substructure and potential early failure of the legs were assessed to inform the Comparative Assessment process. For both scenarios, environmental impacts were assessed to be not significant.

Technical
'Full Removal' and both leg cutting options were all deemed to have significant technical challenges, even after consideration of forthcoming technologies, associated with performing large scale, unproven subsea concrete cutting operations. As a result, the risk of project failure was considered to be high. There are limited technical challenges associated with the 'Transitions Up' option, as the operations required are considered largely routine activities. 'Transitions Up' was therefore assessed as the most preferred option under the technical criteria.

Societal
'Full Removal' of the substructure was the preferred option when considering societal impacts on the fishing industry. Recovering large volumes of materials to be processed onshore was also assessed as being a societal benefit with regard to employment. However, over 200,000 tonnes of potentially contaminated concrete would require processing and disposal onshore, and was considered to have a negative societal impact. Regardless of this impact, the assessment concluded that 'Full Removal' was the preferred option when assessed against societal criteria.

Economic
The 'Full Removal' cost estimate is two orders of magnitude greater than the 'Transitions Up' option and therefore 'Transitions Up' is the most preferred option under the economic criteria.

The recommendation from the CA evaluation is to decommission the substructure *in situ* with steel transitions in place, apply cathodic protection and coatings to reduce corrosion rates, and install a navaid on top of one of the steel transitions.

Table 3-6: Outcome of CGBS Comparative Assessment

Name of Substructure	Recommended Option	Justification
Dunlin Alpha Concrete Gravity Base Substructure	Disposal *in situ*.	Leaving the substructure in place is considered the best option. Refer to Comparative Assessment Report for details.

The topsides will be removed by cutting the top 2-3 m of the transitions and removing the MSF. The pipework remaining in the transitions will be held in place by dead weight supports. A navaid will be installed (at least at LAT +15 m) on one leg to warn other users of the sea of the hazard. Admiralty Charts and the FishSafe system will also be updated accordingly.

3.2.4 Cell Contents Decommissioning Method

Following the recommendation from the substructure CA to decommission the substructure *in situ*, a further evaluation was undertaken to assess options for the long term management of the cell contents. The evaluation followed the same CA methodology outlined above, assessing the options using safety, environmental, technical, societal and economic criteria.

At a high-level there are four distinct options for the management of the cell contents:

Removal
Accessing the cells with the aim of removing one or more of the inventory phases. Access would be achieved either via existing pipework or by external penetration of the cells.

Bioremediation
Using biological organisms to convert the hydrocarbon components of the cell inventory (present in mobile oil, sediment, water and wall residue phases) to carbon dioxide (CO_2). The required biological organisms, as well as any essential nutrients would need to be delivered via external penetration of the cell domes to ensure that each substance was present in the correct stoichiometric ratio balanced with the targeted hydrocarbon content.

Capping
Using solid material (e.g. cement, sand, clay, bentonite, grout or a mixture of these substances) to create an additional barrier between the cell contents and the environment. *In situ* capping refers to the sediment phase only and again would require external cell access (via cell domes) to deliver the capping material.

Leave in situ
Leaving the cell contents, in their entirety, within the substructure without any treatment or intervention.

Detailed investigations undertaken to inform the option identification and screening exercises have led to the following conclusions:

- Bioremediation as a management option to be screened out from the evaluation stage due to the unsuitable environmental conditions within the storage cells. As well as temperature and acidity requirements, nutrients, particularly phosphate and nitrate, would need to be repeatedly supplied over time. This would require individual access to each cell and involve numerous interventions to check progress and replenish chemicals.

  Fairfield acknowledges that further research into micro-organisms which can react in challenging environmental conditions is being carried out. However, the work is in its infancy and is some years (decades) away from achieving significant breakthroughs (if any).

- Capping as a management option to be screened out from the evaluation stage. This option would require individual access to each cell compartment in order to deliver the capping material to provide a suitable barrier between any contents left *in situ* and the environment. The concrete structure already provides a significant barrier and contents removal is viewed as a better option if access to each cell was required.

- Full removal of the residual cell contents is only technically feasible should the whole substructure be removed. The geometry of the cell tops would also mean that full recovery of the mobile oil would be difficult to achieve due to the formwork in the cell tops creating over 2,100 sub-compartments (see Figure 3-6); however, partial removal to be retained for evaluation.

- Recovery of sediment would result in significant fluidisation of the materials making it difficult to capture and fully remove; however, partial removal to be retained for evaluation.

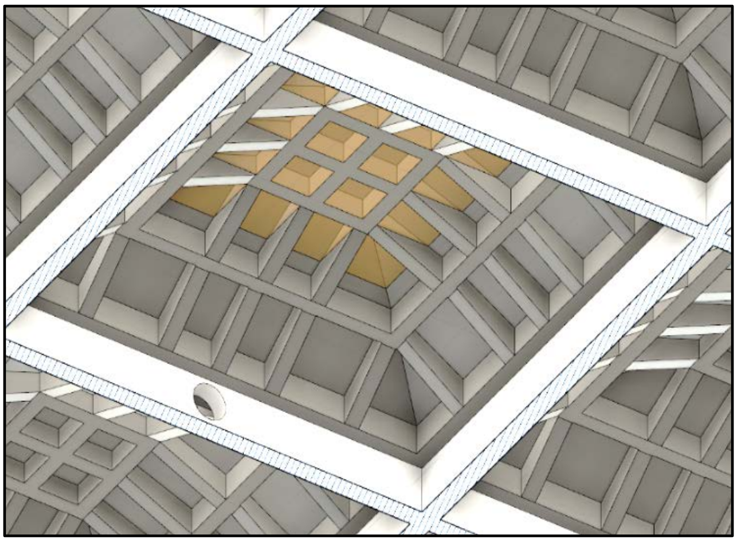
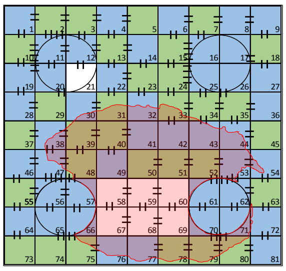
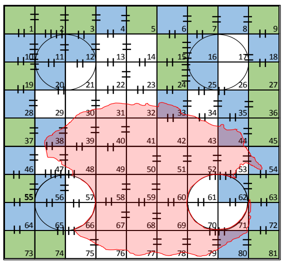
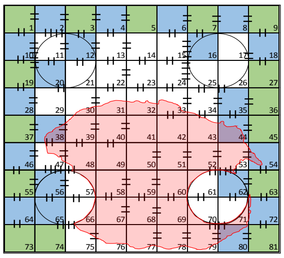
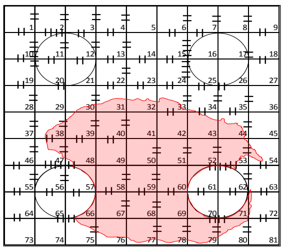
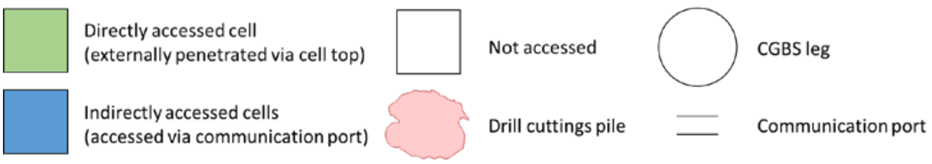


Figure 3-6: Domed Roof Formwork

As a result, 17 different cell access configurations ranging from a high degree of removal to more targeted removal were identified. There were a number of sub-options to these access options which resulted in over 70 cell contents management options being investigated. A number of key considerations were assessed during the screening process to frame and evaluate the options to be taken forward to the CA evaluation. These included:

- Presence of drill cuttings (full removal, minimal/moderate/substantial disturbance)
- Direct/indirect cell penetrations – technical feasibility of running hoses to access fluids (oil/water) in neighbouring, below leg and triangle cells
- Volume of waste created
- Duration of operations
- Degree of contamination and management option efficiency

The cell contents removal options that were selected for the evaluation step of the CA looked to deliver the most efficient solution possible by maximising return (i.e. volume of materials recovered) versus the level of effort (i.e. time and resources) to realise this improvement. This resulted in the four options below being carried through to the evaluation stage of the CA.

Table 3-7: Cell Contents Decommissioning Methods	
1) Removal ☑ 2) Bioremediation ☐ 3) Capping ☐ 4) Leave *in situ* ☑	
Method	**Description**
	**Option 1 – High-case – oil and sediment removal** This would require 31 cell penetrations. Mobile oil would be recovered from 74 cells (31 cells accessed directly and 43 cells accessed indirectly). Sediment would be recovered from 8 cells. This option would require removal of all cell top drill cuttings. Mobile oil recovery = 599 m^3 / Sediment recovery = 270 m^3.
	**Option 2 – Mid-case – oil and sediment removal** This would require 18 cell penetrations. Mobile oil would be recovered from 41 cells (18 cells accessed directly and 23 cells accessed indirectly). Sediment would be recovered from 4 cells. This option would require limited removal of cell top drill cuttings. Mobile oil recovery = 299 m^3 / Sediment recovery = 147 m^3.
	**Option 3 – Mid-case – oil removal** This would require 15 cell penetrations. Mobile oil would be recovered from 36 cells (15 cells accessed directly and 21 cells accessed indirectly). Sediment would not be recovered from any cells. This option would require limited removal of cell top drill cuttings. Mobile oil recovery = 274 m^3 / Sediment recovery = 0 m^3.
	**Option 4 – Leave *in situ*** All cell contents would be left *in situ* with no further removal or remediation.
	
Proposed removal method and disposal route	**Cell contents decommissioned *in situ*.** **No further removal or remediation.** **Contents to be left to degrade naturally.**

Outcome of Cell Contents Comparative Assessment

Similar to the substructure CA, the evaluation process for the cell contents was aligned with the Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes (Oct 2015) and DECC Guidance Notes (March 2011).

The MCDA pairwise software was employed to facilitate the CA process and the evaluation team consisted of Fairfield specialists, industry experts, and key stakeholders. The evaluation process was observed by regulators and members of an Independent Review Group.

Figure 3-7 demonstrates that 'Leave *in situ*' was the preferred option in four of the five assessment criteria – namely Safety, Environment, Technical and Economic. A number of sensitivity analyses were conducted and the evaluation outcome was found to be robust. A full discussion of the evaluation against the CA criteria and sub-criteria, and the sensitivity analyses performed, can be found in the Comparative Assessment Report.

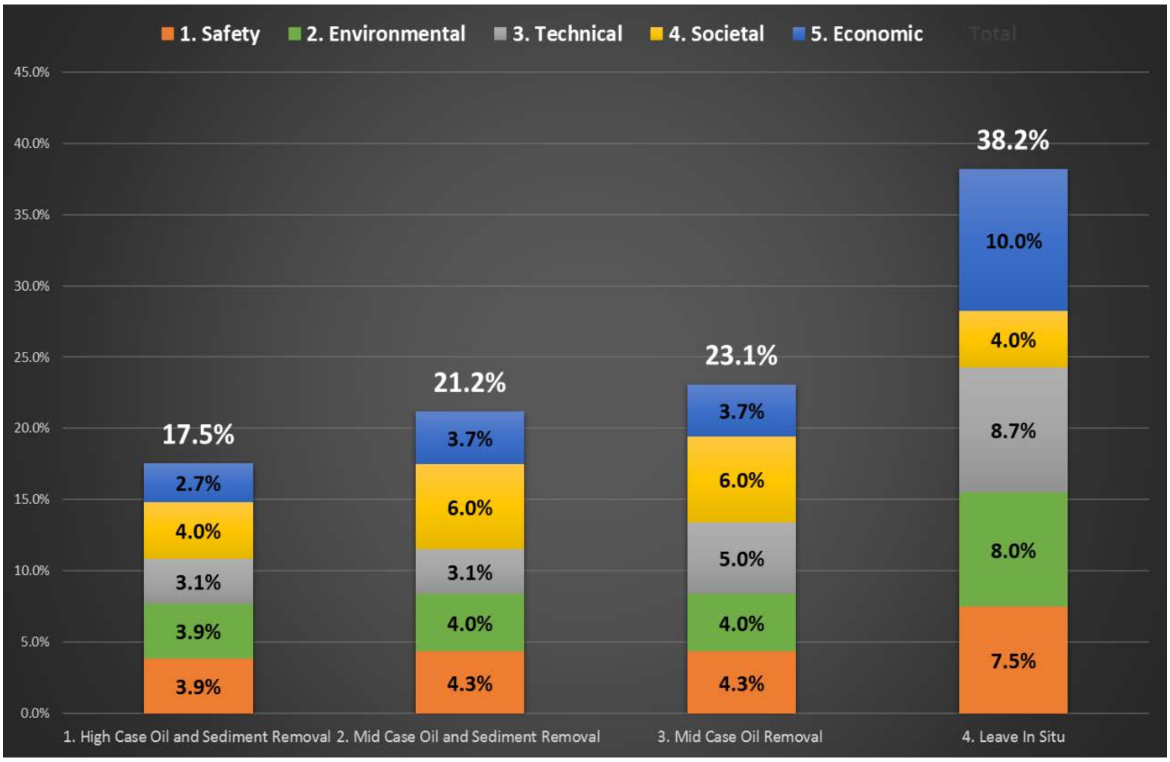


Figure 3-7: Cell Contents Option Evaluation

Safety

Each of the removal options would have inherent safety risks associated with the undertaking of marine operations. All options (both removal and Leave *in situ*) were assessed as equally preferred due to there being no legacy safety impact from any of the cell contents management options. Due to the risks associated with undertaking marine operations, the Leave *in situ* option was assessed as the most preferred option under the safety criteria.

Environmental

Environmental impacts associated with gradual releases (arising from long-term degradation of the substructure) and unplanned instantaneous releases (arising from a high energy impact) were assessed to inform the comparative assessment process. For all scenarios, the environmental impact was assessed to be not significant. In addition, operational marine impacts, atmospheric emissions and resource consumption associated with the Leave *in situ* option were all assessed as having less environmental impact than the other removal options. As a result, Leave *in situ* was the preferred option when assessed against the environmental criteria.

Technical

The assessment of the cell contents management options has identified that technical challenges associated with the three removal options would limit the quantity of cell contents material that could be recovered. This is due to the physical restrictions of the cell compartments, the ability to adapt and upscale technology to locate and extract the contents, and the physical properties of the materials to be recovered. In addition, while further recovery of cell contents may reduce the quantity of contents released to the marine environment, the overall reduction in environmental impact would likely be indiscernible. As a result, the Leave *in situ* was the most preferred option when assessed against the technical criteria.

Societal

The Leave *in situ* option was less preferred when compared to the other removal options under the societal criteria due to the loss of relatively small amount of employment opportunities if the cell contents and drill cuttings were not returned to shore. However, it was noted that there would also be negative societal impacts associated with transferring hazardous materials to be processed and disposed of onshore. The evaluation scored the High Oil and Sediment recovery option as less desirable for this reason as in this case the proposal was to remove the full drill cuttings pile from the cell tops.

Economic

The Leave *in situ* option has the lowest economic cost and therefore is the most preferred option under the economic criteria. The sensitivity of the recommended option was further analysed by removing the economic criteria. The outcome of the sensitivity analysis showed that removing the economic criteria would have no effect on the outcome of the preferred option.

Considering the discussion above, the recommendation from the cell contents CA is to leave the cell contents *in situ*, with no further removal or remediation.

Table 3-8: Outcome of Cell Contents Comparative Assessment

Material	Recommended Option	Justification
Cell Contents	Decommissioning *in situ*, with no remediation.	Leaving the cell contents in place is the preferred management option in regards to Safety, Environmental, Technical and Economic criteria. Refer to Dunlin Alpha CA Report for details.

3.3 Subsea Installations and Stabilisation Features

Note: The Greater Dunlin Area subsea infrastructure including risers will be decommissioned under separate Decommissioning Programmes.

Table 3-9: Subsea Installations and Stabilisation Features			
Subsea installations and stabilisation features	**Number**	**Option**	**Disposal Route (if applicable)**
Wellheads	N/A	N/A	N/A
Manifolds	N/A	N/A	N/A
Templates	N/A	N/A	N/A
Protection Frames	N/A	N/A	N/A
Concrete mattresses	N/A	N/A	N/A
Grout bags	N/A	N/A	N/A
Formwork	N/A	N/A	N/A
Frond Mats	N/A	N/A	N/A
Rock Dump	N/A	N/A	N/A
Other	N/A	N/A	N/A

3.4 Pipelines

Note: The Greater Dunlin Area subsea infrastructure will be decommissioned under separate Decommissioning Programmes.

Table 3-10: Pipeline or Pipeline Groups Decommissioning Options			
Pipeline or Group (as per PWA)	**Condition of line/group (Surface laid / Trenched/ Buried/ Spanning)**	**Whole or part of pipeline/group**	**Decommissioning Options considered**
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

3.4.1 Comparative Assessment Method

N/A

3.4.2 Outcome of Pipelines Comparative Assessment

N/A

Table 3-11: Outcomes of Pipelines Comparative Assessment		
Pipeline or Group	**Recommended Option**	**Justification**
N/A	N/A	N/A

3.5 Pipeline Stabilisation Features

Note: The Greater Dunlin Area subsea infrastructure including risers will be decommissioned under separate Decommissioning Programmes.

Table 3-12: Pipeline Stabilisation Features			
Stabilisation features	**Number**	**Option**	**Disposal Route**
Concrete mattresses	N/A	N/A	N/A
Grout bags	N/A	N/A	N/A
Formwork	N/A	N/A	N/A
Frond Mats	N/A	N/A	N/A
Rock Dump	N/A	N/A	N/A

3.6 Wells

Table 3-13: Well Plug and Abandonment
The wells which remain to be abandoned, as listed in Section 2.4 (Table 2.5) will be plugged and abandoned in accordance with Oil and Gas UK Guidelines for the Abandonment of Wells (July 2015). A Well Operations and Notification System (WONS) / Portal Environmental Tracking System (PETS) / Marine Licence application will be submitted in support of any such work that is to be carried out.

3.7 Drill Cuttings

Table 3-14: Drill Cuttings Decommissioning Options				
How many drill cuttings piles are present?				One
Tick options examined: ☐ Remove and re-inject ☑ Leave in place ☐ Cover ☐ Relocate on seabed ☐ Remove and treat onshore ☐ Remove and treat offshore ☐ Other *(describe briefly)*				
Review of Pile characteristics	**Pile 1**	**Pile 2**	**Pile 3**	**Pile 4**
How has the cuttings pile been screened? (desktop exercise/actual samples taken)	Actual samples taken	N/A	N/A	N/A
Dates of sampling (if applicable)	4th & 5th April 2016	N/A	N/A	N/A
Sampling to be included in pre-decommissioning survey?	The sampling was undertaken as part of the pre-decommissioning survey, yes.	N/A	N/A	N/A
Does it fall below both OSPAR thresholds?	Yes	N/A	N/A	N/A
Will the drill cuttings pile have to be displaced in order to remove the jacket?	N/A	N/A	N/A	N/A
What quantity (m^3) would have to be displaced/removed?	N/A	N/A	N/A	N/A
Will the drill cuttings pile have to be displaced in order to remove any pipelines?	No	N/A	N/A	N/A
What quantity (m^3) would have to be displaced/removed?	N/A	N/A	N/A	N/A
Have you carried out a Comparative Assessment of options for the Cuttings Pile?	No[6]	N/A	N/A	N/A

[6] Refer to Dunlin Alpha Drill Cuttings Report A301524-S09-TECH-002

3.7.1 Drill Cuttings Appraisal

A Comparative Assessment of the drill cuttings was not required. Cuttings have been surveyed, sampled, characterised and assessed against thresholds and are below both OSPAR limits.

Table 3-15: Drill Cuttings Appraisal against OSPAR Thresholds		
	Persistence (km^2.year)	Yearly Oil Loss (tonnes)
OSPAR Threshold	500	10
Dunlin Alpha Cuttings Pile	47.4	0.49 to 1.75

The preferred management option is to leave cuttings to naturally degrade over time

3.8 Waste Streams

Waste stream information is provided below.

Table 3-16: Waste Stream Management Methods	
Waste Stream	**Removal and Disposal Method**
Bulk liquids	Topsides vessels will be drained and flushed as part of Make-Safe & Handover activities. The majority of residual hydrocarbons will be reinjected into the reservoir in compliance with an approved permit. Additional hydrocarbons may be transported to shore in accordance with maritime transportation guidelines, and disposed of at an appropriately licensed facility.
Marine growth	The majority of marine growth will be removed offshore. Onshore disposal will be undertaken at an appropriately licenced facility.
NORM/LSA Scale	The majority of NORM will be removed offshore and discharged under an appropriate consent. Onshore disposal of NORM/LSA scale will be undertaken at an appropriately licenced facility, under an appropriate consent.
Asbestos	Asbestos will be contained offshore and transported to shore for disposal at an appropriately licensed facility.
Other hazardous wastes	Hazardous materials will be recovered and transported onshore for disposal at an appropriately licenced facility.
Onshore Dismantling sites	An appropriately licensed disposal yard has not yet been selected. However, the selection process will ensure that the chosen facility is able to demonstrate a proven disposal track record and waste stream management throughout the deconstruction process, as well as the ability to deliver innovative reuse/recycling options. Locations of potential disposal yards may require the consideration of Trans-Frontier Shipment of Waste (TFSW), including hazardous materials. Early engagement with the regulatory authority will ensure any issues with TFSW are addressed.

Table 3-17: Inventory Disposition			
	Total Inventory Tonnage	**Planned Tonnage to Shore**	**Planned Left *In situ***
Installations (topsides)	19,640	19,640	Zero
Transitions	1,590	160*	1,430
Conductors	3,840	2,160**	1,680**
Guide Frames	540	360**	180**
Installations (concrete substructure)	336,000	Zero	336,000
Pipelines	N/A	N/A	N/A

**The amount of transition material removed will depend on the cut point selected to remove the topsides. The cut point is likely to be 2-3 m below the MSF equating to approximately 10% of the combined transition weight*

***The conductors will be cut to LAT-74 m and the upper two guide frames removed. Conductors removed will be 45 x 105 m (LAT-74 m to LAT+31 m) and conductors left in situ will be 45 x 80 m (LAT-74 m to 3 m below mudline / LAT-154 m, of which 32 m will be contained within the CGBS structure).*

Table 3-18: Anticipated Waste Management Target				
Waste stream	**Reuse**	**Recycle**	**Other recovery**	**Landfill**
Ferrous metal	0 - 15%	95 - 98%	0%	0 - 5%
Non-ferrous metal	0%	95 - 98%	0%	0 - 5%
Concrete (aggregates)*	0 - 50%	0%	50 - 100%	0 - 25%
Plastics	0%	50 - 75%	15 - 40%	0 - 10%
Residual hydrocarbons	0%	0%	85 - 100%	0 - 15%
NORM	0%	0%	0%	100%**
Marine growth	0%	0%	75 - 100%	0 - 25%

** Reuse and recovery opportunities will be dependent on availability of infrastructure projects*

*** NORM may be sent for incineration prior to landfill in order to reduce volume*

4 ENVIRONMENTAL APPRAISAL

An Environmental Appraisal (EA) of the proposed decommissioning operations has been undertaken in support of the Dunlin Alpha Decommissioning Programme. The EA process involved the identification of key environmental sensitivities in the Dunlin area in order to assess potential impacts arising from decommissioning operations, and identify management measures required to minimise impact on the environment. A summary of the EA is provided below.

4.1 Environmental Sensitivities (Summary)

Table 4-1: Environmental Sensitivities

Environmental Receptor	Main Features
Conservation interests	None of the survey work undertaken in the Dunlin area has identified any seabed habitats or species that are of specific conservation significance, apart from low numbers of juvenile ocean quahog, which is considered to be a threatened species. There are also no designated or proposed sites of conservation interest in the Dunlin area; the closest designated site, the European Site of Community Importance 'Pobie Bank Reef', lies approximately 98 km to the south west of Dunlin, off the east coast of Shetland.
Seabed	The habitat assessment undertaken has determined the sediments to be mainly muddy sand and mixed sediment. The visible animals found across the survey area included polychaete worms, crustaceans and molluscs. Species were generally considered to be intolerant of hydrocarbon contaminations. Surveys showed the seabed to host a relatively diverse range of species, with little variation across the area.
Fish	The fish populations in the Dunlin area are characterised by species typical of the northern North Sea, including long rough dab, hagfish and Norway pout. Basking shark, tope and porbeagle are all also likely to occur in small numbers. The Dunlin area is located within the spawning grounds of cod, haddock, Norway pout and saithe, meaning that these species use the area for breeding. Nursery grounds, where juvenile fish remain to feed and grow, for blue whiting, European hake, haddock, herring, ling, mackerel, Norway pout, spurdog and whiting are also found in the wider area.
Fisheries	Saithe and mackerel (often targeted by the larger pelagic vessels in January and February) are the key commercial species landed from the Dunlin area. However, they are of relatively low value when compared to total landings into Scotland; combined, landings of these species from the wider area within which Dunlin Alpha sits comprise only 0.06% of the value of landings into Scotland. Other species of commercial value include megrim, cod and monks/anglers.
Marine Mammals	Spatially and temporally, harbour porpoises, white-beaked dolphins, minke whales, killer whales and white-sided dolphins are the most regularly sighted cetacean species in the North Sea. Given the distance to shore, species such as the bottlenose dolphin and grey and harbour seals are unlikely to be sighted in the Dunlin area.

Table 4-1: Environmental Sensitivities	
Environmental Receptor	**Main Features**
Birds	The Dunlin area is important for fulmar, northern gannet, great black-backed gull, Atlantic puffin, black-legged kittiwake and common guillemot for the majority of the year. Manx shearwaters are present in the vicinity of the Dunlin area between the spring and autumn months. European storm petrels are present during September and November. Great skua, glaucous gull, Arctic skua and little auk may be present in low densities for the majority of the year. The months of March, July, October and November are those when seabird species in the Dunlin area are considered most vulnerable to surface pollution. Overall annual seabird vulnerability is reported to be low.
Onshore Communities	Whilst the decommissioning yard is yet to be selected, Fairfield expect the site to be in the UK or elsewhere in Europe. Fairfield procedures require suitably approved facilities, including site visits, review of permits and consideration of how facility and construction and design has been developed to minimise impact. In any case, all onshore yards at which decommissioned material will be handled will already deal with potential environmental issues and community relations as part of their existing site management plans.
Other Users of the Sea	There is very little shipping activity in the Dunlin area, and no site of renewable energy, cabling or archaeological interest. There is also limited infrastructure related to other oil and gas developments.
Atmosphere	Atmospheric emissions generated from vessels can contribute to local air quality issues; the absence of vulnerable receptors in the offshore area means this is not an issue for the Dunlin area. In addition, atmospheric emissions from the proposed decommissioning activities is occurring in the context of the cessation of production. As such, almost all future atmospheric emissions from Dunlin Alpha operations and vessels will cease. Emissions to air can also act cumulatively with those from other activities (such as onshore power generation and use of vehicles) to contribute to global climate change. These emissions may come from vessel use but also through linked activities such as the recycling of materials brought onshore.

4.2 Potential Environmental Impacts and their Management

4.2.1 Environmental Appraisal Summary

The Dunlin Alpha Decommissioning Programme Environmental Appraisal (EA) has been informed by a number of different processes, including scoping with the Regulators and their statutory advisors, workshops with specialists and the Comparative Assessment process. An Environmental Impact Identification (ENVID) was undertaken to identify the key potential environmental impacts of the project. These included:

- The gradual release of cell contents as the substructure degrades over time
- An accidental event resulting in an instantaneous release of the cell contents
- An accidental event resulting in disturbance of the drill cuttings pile
- Potential interactions with other users of the sea as a result of the permanent presence of the substructure
- The management of waste associated with Dunlin Alpha installation decommissioning activities

A review of each of these potentially significant environmental interactions was completed and, considering the extent of potential interaction with receptors and the mitigation measures that will be built into decommissioning activities, no significant impact on receptors is expected. As part of this review, cumulative and transboundary impacts have also been assessed and determined not to be significant. The information used to undertake the assessments is considered to be evidence based, using either operational records, analysis of historical samples or the application of proven scientific principles. Uncertainties associated with the base data have been assessed and where appropriate, conservative (worst-case) assessments have been applied to ensure environmental impact is not underestimated.

The EA has also considered the objectives and marine planning policies of the National Marine Plan across the range of policy topics including biodiversity, natural heritage, cumulative impacts and oil and gas. Fairfield considers that the proposed decommissioning activities are in broad alignment with such objectives and policies.

In summary, the proposed operations have been rigorously assessed through Environmental Appraisal and Comparative Assessment processes, resulting in a set of proposed decommissioning options which are thought to present the least risk of environmental impact whilst satisfying safety risk, technical feasibility, societal impacts and economic requirements.

4.2.2 Overview

Table 4-2: Environmental Impact Management

Activity	Main Impacts	Management
Topsides Removal	Atmospheric emissions	Planning of removal operations to reduce vessel numbers and durations. Onshore facilities will have appropriate management procedures in place to ensure that atmospheric emissions are below levels that could affect local air quality.

Table 4-2: Environmental Impact Management		
Activity	**Main Impacts**	**Management**
	Dropped objects	Dropped object procedures are well established industry practices. Compliance with all marine operations standards is a fundamental requirement of Fairfield's contract tendering and project assurance processes. Consideration of sensitive nearshore environments is a key element of these systems. On this basis, Fairfield are confident that all necessary preventative measures will be implemented.
	Onshore management of waste.	The selection of a competent decommissioning and waste management contractor will be key to managing potential onshore impacts. Fairfield has developed a waste management strategy for the project in order to outline the processes and procedures necessary to ensure that waste is managed in a manner that complies with legislative requirements and prevents harm to people and the environment.
Jacket / Floating Facility Removal	N/A	N/A
Substructure degradation	Legacy marine impact for gradual release of cell contents over time.	An oil recovery project has been completed to remove the vast majority of free oil from the cell groups. There is now expected to be only a very thin evenly distributed layer of oil that remaining in the attic space of each cell. In addition, each cell is sub-compartmentalised, limiting the extent of any potential release from the substructure.
	Potential early failure of a steel transition impacting the caisson roof could result in an instantaneous release of cell contents.	See above regarding oil recovery project completed. Periodic visual inspection of the substructure above the waterline will be undertaken to monitor degradation. The geometry of the cells also makes it difficult for falling debris to physically pierce the cells.
	Dropped objects from falling debris could result in disturbance and potential redistribution of the drill cuttings pile.	Periodic visual inspection of the substructure above the waterline will be undertaken to monitor degradation.

Table 4-2: Environmental Impact Management		
Activity	**Main Impacts**	**Management**
Substructure degradation (cont.)	The permanent physical presence of the substructure could result in potential interaction with other users of the sea.	A 500 m safety zone will remain around the installation. A navaid including radar beacon or AIS will be fitted to a transition to visibly show the location of the substructure to other sea users. Admiralty Charts and the FishSafe system will be updated to show the permanent location of the Dunlin Alpha substructure. Periodic inspection and replacement of the navaid and visual inspection of the substructure above the waterline will be undertaken to monitor degradation.
Decommissioning Pipelines	N/A	N/A
Decommissioning Stabilisation Features	N/A	N/A
Decommissioning Drill Cuttings	Redistribution of drill cuttings pile as a result of disturbance.	A 500 m safety zone will remain around the installation. Drill cuttings pile to remain undisturbed to degrade naturally over time.
	Legacy marine impact from drill cutting pile decommissioned *in situ*.	The Dunlin Alpha drill cuttings pile was assessed in accordance with regulatory guidelines and found to be below the OSPAR 2006/5 thresholds for leaching and persistence. It is the intention of Fairfield to leave the drill cuttings pile *in situ* with minimum disturbance.

5 INTERESTED PARTY CONSULTATIONS

5.1 Consultations Summary

This section will be updated when the UK and OSPAR consultation phases are completed.

Table 5-1: Summary of Stakeholder Comments (UK)		
Stakeholder	**Comment**	**Response**
Informal Consultations		
	Two principal engagement phases: 1) 2010-2012 to establish scope requirements, including: • Initiation and sharing of technical studies • Formation of Cell Contents Expert Discussion Group • Consultation with five OSPAR Contracting Parties • Bilateral stakeholder meetings • Regulatory liaison • Regularly updated website 2) 2016-2018 following Cessation of Production in 2015, with refreshed stakeholder base (c100 organisations) • Consultation on scope of Environmental Impact Assessment to inform further studies • Bilateral and multilateral meetings with stakeholders • Two major stakeholder engagement workshops (pre- and post-CA evaluation) with reports circulated to all stakeholders, not just attendees • Participation of key stakeholders in CA evaluation workshop • Sharing of key documents with stakeholders, notably Cell Contents Technical Report and Drill Cuttings Technical Report, plus other documentation as requested • Regulatory liaison • Regularly updated website • Conference and Parliamentary presentations on project progress • Supply chain engagement • Industry liaison on ‘lessons learnt’ • Other informal engagement	See Stakeholder Engagement Report for full details

Table 5-1: Summary of Stakeholder Comments (UK)		
Stakeholder	**Comment**	**Response**
Statutory Consultations		
National Federation of Fishermen's Organisations	*To be populated post consultation*	
Scottish Fishermen's Federation	*To be populated post consultation*	
Northern Ireland Fishermen's Federation	*To be populated post consultation*	
Global Marine Systems Limited	*To be populated post consultation*	
Public Consultations		
Public	*To be populated post consultation*	

Table 5-2: Summary of Stakeholder Comments (OSPAR)		
Contracting Party	**Comment**	**Response**
	To be completed post OSPAR consultation	

6 PROGRAMME MANAGEMENT

6.1 Project Management and Verification

A Project Management Team (PMT) has been appointed to manage suitable sub-contractors for the removal of the Dunlin Alpha topsides. Standard procedures for operational control and hazard identification and management will be used. Where possible the work will be coordinated with other decommissioning operations in the Northern North Sea. The PMT will monitor and track the progress of consents and the consultations required as part of this process. Any changes in detail to the offshore removal programme will be controlled by Fairfield via the Management of Change processes and discussed and agreed with BEIS.

6.2 Post-Decommissioning Debris Clearance and Verification

During site clearance activities, Fairfield Betula Limited will undertake best endeavours to recover any dropped objects subject to any outstanding Petroleum Operations Notices (PON). All recovered seabed debris related to offshore oil and gas activities will be returned for onshore disposal or recycling in line with existing disposal methods. A post decommissioning site survey will be carried out around 500 m radius of the installation site. This will be followed by independent verification and a statement of clearance to all relevant authorities.

6.3 Schedule

6.3.1 Dunlin Alpha Project Schedule

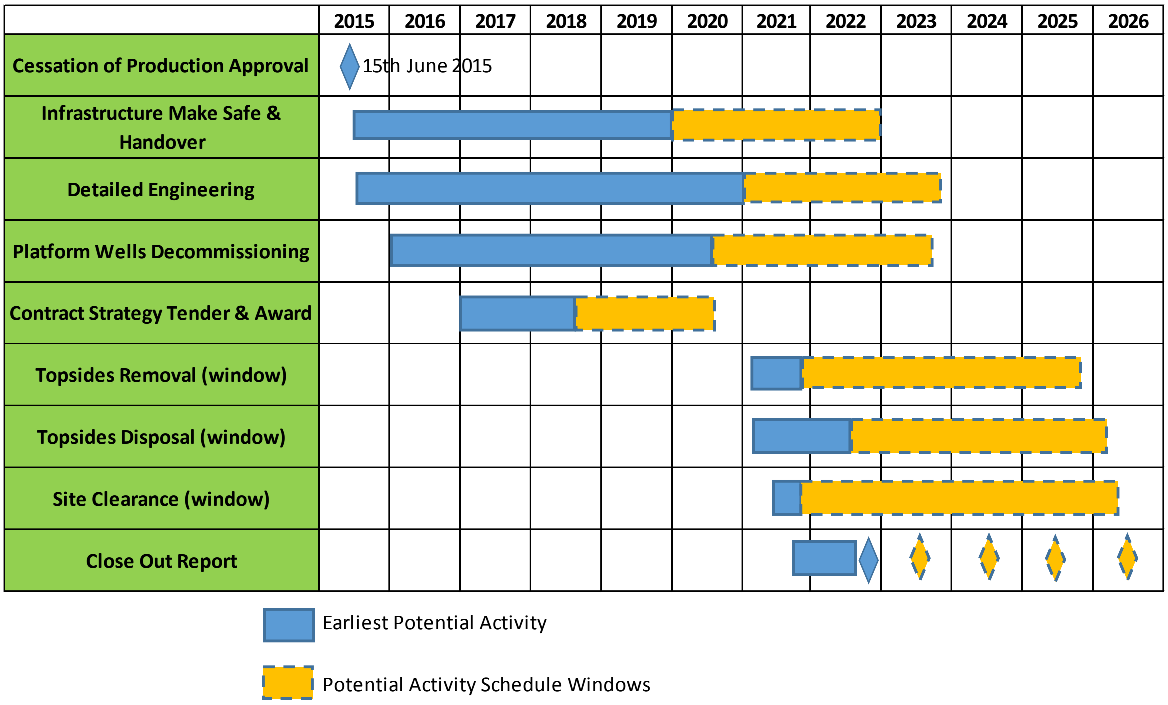


Figure 6-1: Gantt Chart of Project Schedule

6.4 Costs

Fairfield Betula Limited are following Oil and Gas UK Guidelines on Decommissioning Cost Estimation (Issue 3, September 2013) for the decommissioning of the Greater Dunlin Area.

Table 6-1: Provisional Decommissioning Programme Costs

Item	Estimated Cost (£m)
Installation Preparation / Removal and Disposal	Provided to BEIS separately
Pipelines Decommissioning	N/A
Subsea Installation and Stabilisation Features	N/A
Well Abandonment	Provided to BEIS separately
Continuing Liability – Future Pipeline and Environmental Survey Requirements	Provided to BEIS separately
Total Cost	Provided to BEIS separately

6.5 Close Out

In accordance with the BEIS guidance notes, a close out report will be submitted to BEIS explaining any applicable variations from the Decommissioning Programme within 12 months of the completion of the Greater Dunlin Area offshore decommissioning scope. This includes debris removal and independent verification of seabed clearance and the first post-decommissioning environmental survey.

6.6 Post-Decommissioning Monitoring and Evaluation

A post-decommissioning environmental seabed survey will be carried out around the installation. The survey will focus on chemical and physical disturbances of the decommissioning scope of work and be compared with the pre decommissioning survey. Results from this survey will be provided to BEIS once the work is complete. The installation site will be the subject of surveys when decommissioning activity has concluded. After the surveys have been sent to BEIS and reviewed, a post monitoring survey regime will be agreed by both parties. Typically a minimum of two post-decommissioning environmental surveys are expected at an interval to be agreed with BEIS.

Analysis shows that the decommissioned substructure will remain intact for approximately 250 years by which time the steel transitions will have degraded to the point that the substructure will be submerged. It is predicted that navigation technology will be sufficiently advanced to enable avoidance of a submerged substructure – a view shared by the Northern Lighthouse Board. From 250 to 1250 years the legs will slowly degrade through spalling (see Section 6.6.1). Due to the geometry of the legs much of the concrete will fall inside the leg itself whilst the outer sections will break away and settle at the foot of the leg on the base caisson roof. The legs will therefore be below the IMO level of LAT-55 m in approximately 500 to 1000 years' time. The base caisson will start to degrade in >1000 years' time due to the lower oxygen levels at the sea floor. This process will take many millennia until all the steel reinforcement is fully corroded.

6.6.1 Spalling

Spalling takes place when the steel reinforcing ('rebar') of the substructure comes into contact with oxygenated seawater, corrodes and expands, breaking small pieces of concrete away in the process. The process of crumbling slows down through the water column as the oxygen levels reduce with depth.

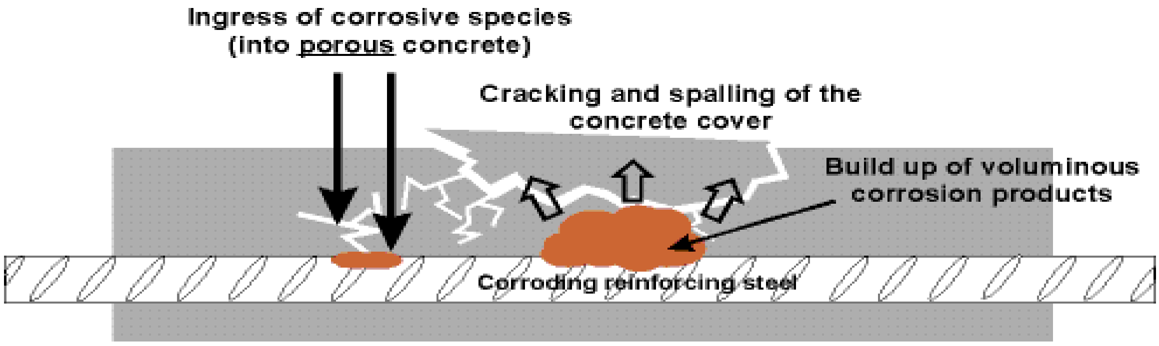


Figure 6-2: Spalling Process

Figure 6-3: Example of Reinforced Concrete Spalling (not Dunlin Alpha)

6.7 Management of Residual Liability

In the interim stage, whilst the CGBS remains *in situ* and above sea level, the 500 m safety zone will also remain and there will be no residual liability concerns. A navaid will be in place to mitigate the potential risk of ship collision. A Consent to Locate will be applied for and engagement with the relevant statutory bodies such as the Northern Lighthouse Board will be conducted to agree the specific markers. Fairfield will develop maintenance and monitoring procedures for the navaid that will include remote monitoring, periodic maintenance and testing in compliance with the Consent to Locate. The design, manufacture, installation and maintenance of the navaid will be assured via an independent verification scheme.

Fairfield has conducted longevity studies to assess the degradation of the substructure. These studies, which are referenced in the CA Report, have been undertaken by independent structural experts and reviewed and accepted by Fairfield. In addition, the most recent ROV survey of the substructure has not presented any anomalies. Whilst the topsides remain, scheduled inspections, surveys and integrity analysis as per the Fairfield Structural Inspection Plan and Verification Scheme will continue to be undertaken to support the ongoing Safety Case requirements for the installation. Once the topsides have been removed there will be no physical access to the substructure. From that point, general visual inspections will be completed by either drone or directly from a vessel bridge. The navaid will be changed out every four years by helicopter.

Long term risks to fishermen of leaving the substructure *in situ* were evaluated based on available fishing activity data. The mitigations in place include the marking of the substructure on Admiralty Charts, appropriate Notices to Mariners e.g. Kingfisher bulletins and entering the substructure on the FishSafe system.

In the close out report described in Section 6.5, the arrangements for the subsequent management of on-going residual liabilities including managing and reporting the results of the agreed post-decommissioning monitoring (described in Section 6.6), will be detailed within an evaluation and remedial programme to be agreed with the regulator at close-out. The arrangements will also define appropriate contact points for any third party claims arising from damage caused by any remains from the Dunlin Alpha Decommissioning Programme. Liability for the substructure remains with MCX Dunlin (UK) Limited and other Section 29 notice holders.

7 SUPPORTING DOCUMENTS

<table>
<tr><th colspan="3">Table 7-1: Supporting Documents</th></tr>
<tr><th>Title</th><th colspan="2">Document Number</th></tr>
<tr><td>Dunlin Alpha Comparative Assessment Report</td><td>A-301649-S07-REPT-005</td><td rowspan="7">www.fairfield-energy.com/public-consultation</td></tr>
<tr><td>Dunlin Alpha Environmental Appraisal Report</td><td>XOD-DUN-HSE-RPT-00005</td></tr>
<tr><td>Dunlin Alpha Stakeholder Engagement Report</td><td>FBL-DUN-DUNA-FAC-01-RPT-00006</td></tr>
<tr><td>Dunlin Alpha Independent Review Group Report</td><td>DUN-HYD-XX-IRG-RP-GE-0001</td></tr>
<tr><td>Dunlin Alpha Cell Contents Technical Report</td><td>FBL-DUN-DUNA-FAC-24-RPT-00001</td></tr>
<tr><td>Dunlin Alpha Drill Cuttings Report</td><td>A301524-S09-TECH-002</td></tr>
<tr><td>Fairfield Waste Management Strategy</td><td>FBL-DUN-HSE-STR-00003</td></tr>
<tr><td>Dunlin Alpha Cost Summary Report (confidential, issued to BEIS only)</td><td colspan="2">FBL-DUN-DUNA-HSE-01-RPT-00004</td></tr>
</table>

Table 7-2: Reference Documents	
Title	**Date**
BEIS Decommissioning of Offshore Oil and Gas Installations and Pipelines Guidance Notes	May 2018 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/704675/Offshore_Oil_and_Gas_Decommissioning_Guidance_Notes_May_2018.pdf
DECC Guidance Notes for the Decommissioning of Offshore Oil and Gas Installations and Pipelines Under the Petroleum Act 1998 (now replaced by BEIS guidance notes, see above)	Version 6 March 2011
DFGI/DPI Pipelines & Structures Decommissioning Programmes (Approved)	FBL-DUN-DUNA-HSE-01-PLN-00002 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668458/DFGI-DPI_Final_DP_.pdf
Merlin Pipelines & Structures Decommissioning Programmes (Approved)	FFL-DUN-MER-HSE-01-PLN-00001 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668455/Merlin_Final_DP.pdf
Osprey Pipelines & Structures Decommissioning Programmes (Approved)	FFL-DUN-OSP-HSE-01-PLN-00001 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/668411/Osprey_Final_DP.pdf
Oil and Gas UK Guidelines for Well Abandonment	Issue 5 Jul 2015
Oil and Gas UK Guidelines for Comparative Assessment in Decommissioning Programmes	Issue 1 Oct 2015 https://oilandgasuk.co.uk/product/en038/
OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations	OSPAR 98/3 https://www.ospar.org/documents?d=32703

8 PARTNER LETTER OF SUPPORT

A Partner Letter of Support will be inserted into the Final Decommissioning Programme.

APPENDIX 1 – INDEPENDENT REVIEW GROUP STATEMENT

Dunlin Alpha Decommissioning Programme Statement of the Independent Review Group

Hydrock

1. FBL has commissioned a considerable number of programmes of investigation and study work to evaluate options for the decommissioning of the Dunlin Alpha CGBS. During the period of the IRG's engagement, the IRG has reviewed in excess of 100 technical reports.

2. The IRG agrees with FBL that removal of the entire CGBS to leave a clean seabed (Option 4) is neither feasible nor desirable from an environmental, safety, technical or economic perspective.

3. Of the nine options considered, the IRG supports the early screening out of the following options ahead of the Comparative Assessment (CA) workshop, namely Option 1 In-situ re-use; Option 2 Re-float and re-use; Option 3 Re-float and destruct; and Option 8 Retain with the Module Support Frame (MSF) in place.

4. FBL did not take Option 7 (toppling the legs) beyond the screening stage because of advice from the Department for Business, Energy and Industrial Strategy (BEIS) that toppling would be regarded as being dumping at sea and not supportable.

5. Option 5 (shallow leg cut) and Option 6 (International Maritime Organization (IMO) compliant leg cut) both entail underwater cutting of heavy wall thickness concrete on a scale never previously attempted. The IRG considers the risks of attempting such an operation to be very high.

6. The remaining option, Option 9 (leave in situ with the four steel transition pieces up and protected by an extended Cathodic Protection (CP) system, internal coating and navigational aid), has been taken forward as the preferred decommissioning solution. The IRG agrees with the outcome of this assessment.

7. The IRG would have liked to have seen more consideration of the longer-term impacts, beyond 50 years, of Option 9 and believes that such consideration could have made some difference to the scoring outcome of the CA but would not change the overall conclusion. It should be noted that current legislation makes provision for longer term monitoring and assigns liability to those served with notices under Section 29 (S29) of the 1998 Petroleum Act.

8. There is a considerable volume of oil-based mud drill cuttings lying on top of and around the base of the structure, typical of many North Sea platforms. The release of hydrocarbons from this cuttings pile has been assessed as being compliant with Oslo-Paris Convention (OSPAR) hydrocarbon release limits. However, the cuttings pile contains a number of potentially highly toxic components including heavy metals such as tin compounds. Disturbing this pile to relocate it would create a considerably more significant environmental impact than leaving it in place.

9. Despite the extensive Attic Oil Recovery Project (AORP) of cell contents in 2007, remnant hydrocarbons remain in the storage cells. The methodology used to estimate the volumes, locations and nature of material remaining within the cells represents a reasonable approach. The modelling, which follows good practice, indicates that even if this volume has been underestimated, given the nature of the concrete containment and its likely failure mechanism, any release of oil would have an insignificant impact on the environment.

10. The IRG opinion is that the environmental impact and safety risk created by trying to remove and dispose of any remaining oil and sediment in the storage cells outweighs the benefit of recovery. The IRG therefore accepts that leaving the cell contents in-place is the preferred option.

11. The IRG notes that the integrity of the piping and pumping systems in the structure legs and base has been compromised in a number of places. FBL is reluctant to penetrate the storage cells for sampling before removal of the topsides because of the potential water inflow, which they believe could compromise overall structural integrity. Whilst the IRG considers that this risk could have been managed if action had been taken earlier, it considers that there is not a compelling engineering argument for FBL to undertake further cell contents sampling or survey to validate the previous modelling. The IRG considers that such investigations may be required to validate theoretical modelling, to satisfy stakeholder concerns, enhance public perception, and manage the risk to the decommissioning programme and therefore should be kept open as an option.

12. The IRG is generally satisfied that FBL has followed BEIS and OSPAR guidance when running the CA exercise. The IRG considers the technical data to be reliable and the assessment process transparent. Throughout the project, FBL has engaged with a wide range of stakeholders. The IRG has sampled the outputs from these interactions and notes the views held and responses given by FBL to the questions raised. The CA workshops attended by key stakeholders were well run. Ahead of the workshops, FBL provided extensive pre-read material and offered stakeholders one to one briefing sessions. However, there was limited take-up of these briefings.

Dunlin Alpha Decommissioning Programme: IRG Statement| 1 August 2018

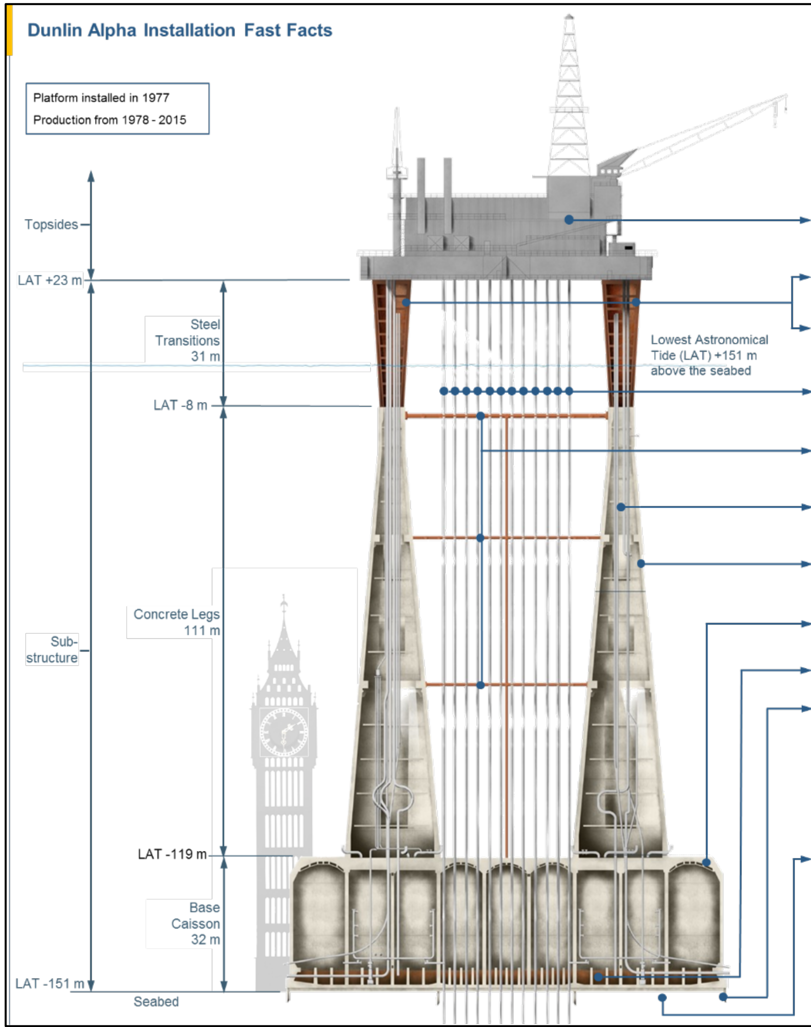
APPENDIX 2 – STATUTORY CONSULTEE CORRESPONDENCE

To be populated post consultation

APPENDIX 3 – DUNLIN ALPHA INSTALLATION FAST FACTS

Dunlin Alpha Installation Fast Facts

Platform installed in 1977
Production from 1978 - 2015



Infrastructure	Dimensions	Weight (te)	Weight Excludes
Topsides (dry)	19,255 te 63.7 m x 82.3 m Incl. 30 te of NORM 355 te of hazardous materials	**≈19,640**	Operational Weights e.g. Process Fluids Laydown
Steel Transition A & B	2 x 295 te 5.4 m in diameter (cylindrical) 31 m tall	**≈590**	Leg Internals Marine Growth
Steel Transition C & D	2 x 500 te 5.4 m to 8.9 m in diameter (conical) 31 m tall	**≈1,000**	Leg Internals Marine Growth
Conductors	45 x 185 m (long) x 30" conductors from LAT+31 m to below seabed	**≈3,840**	Inner completions Marine Growth Clamps / Braces
Conductor Guide Frames and Vertical Supports	1 at LAT-10 m 1 at LAT-40 m 1 at LAT-76 m	**≈540**	Marine Growth Cathodic Protection Skid
Leg Internals (e.g. pipework, stairs)	Within 4 steel transitions and concrete legs from LAT+23 m to LAT-119 m	**≈1,250**	-
Concrete Legs (reinforced concrete)	Concrete legs: 4 x 8,625 te 22.65 m to 6.7 m in diameter (conical) 111 m tall	**≈34,500**	Leg Internals
Base Caisson	104 m x 104 m x 32 m	**≈202,000**	Base Caisson Internals Cell Contents Ballast
Iron Ore Ballast and Concrete Cover Layer	Approximately 104 m x 104 m x 3 m deep	**≈96,800**	-
Seabed Skirts	8 x 104 m x 4 m	**≈1,450**	-
Total Weight of substructure (including contingency)	-	**≈342,000**	Topsides Marine Growth Debris Drill Cuttings Cell Contents Under Caisson Grout
Marine Growth (wet)	-	**≈1,400**	-
Under Caisson Grout	-	**≈500**	-
Drill Cuttings	19,555 m^3 over 9,184 m^2	**≈48,888**	-

Note: Weights are as of CoP

Rev: Jun 18

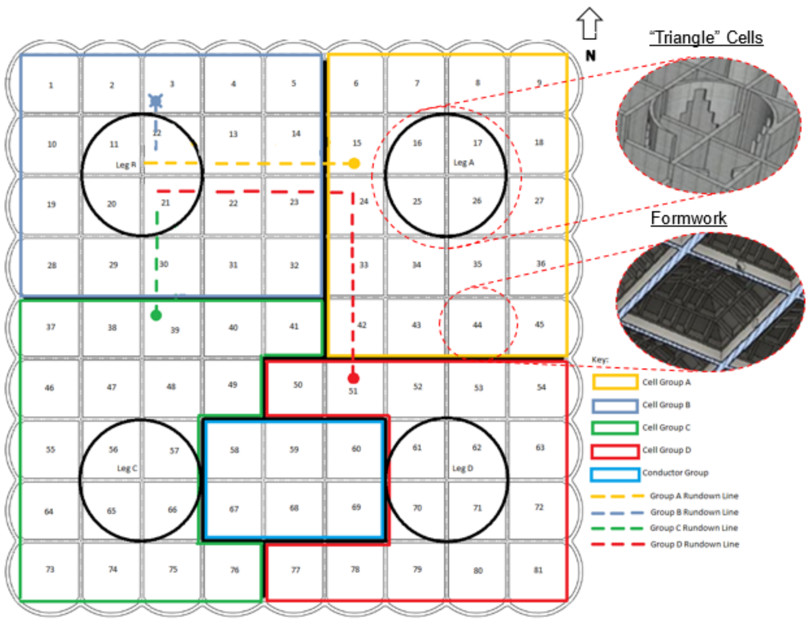
APPENDIX 4 – DUNLIN ALPHA CELL CONTENTS FAST FACTS

Storage Cell Overview

This fact sheet provides an overview of the Dunlin Alpha cell contents characterisation work to define the residual inventory within the Concrete Gravity Base Structure (CGBS).

Production commenced in 1978, with the cells operating on a continual basis through until 1995, where thereafter use was limited to occasional periods mainly during start-up. In 2004 the decision was made to no longer use the storage cells and planning commenced to take them out of service permanently. Over this production history the throughput totalled nearly 139 million m^3 of oil and produced water combined.

In 2007, Shell executed a project to recover the mobile oil from within the cells using Carbon Dioxide (CO_2) gas to displace the oil.

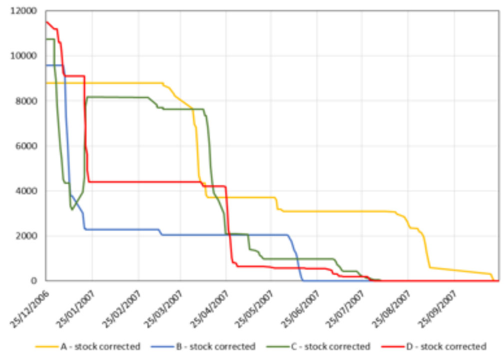


Cell Contents Inventory Summary

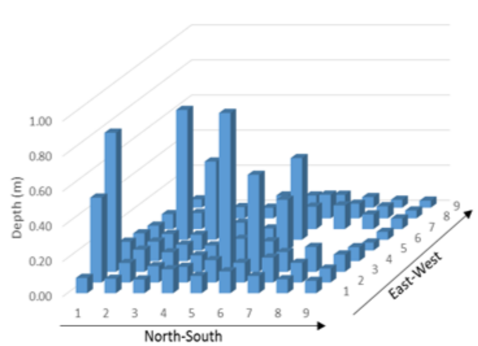
Total Inventory	Volume (m^3)	%
Residual Attic Oil	988	0.42
Trapped Oil	449	0.19
Diffused Oil	128	0.05
Total Mobile Oil	**1,565**	**0.66**
Sand / Clay	363	0.15
Scale	159	0.07
Hydrocarbon	363	0.15
Water	363	0.15
Total Sediment	**1,248**	**0.53**
Wall Residue	**462**	**0.19**
Water Phase	**233,631**	**98.62**

Variation from Individual Cell to Cell	Volume (m^3)	
	Min	Max
Mobile Oil	14.5	59.7
Sediment	5.7	101
Wall Residue	2.3	11.4
Water Phase	2627	3479

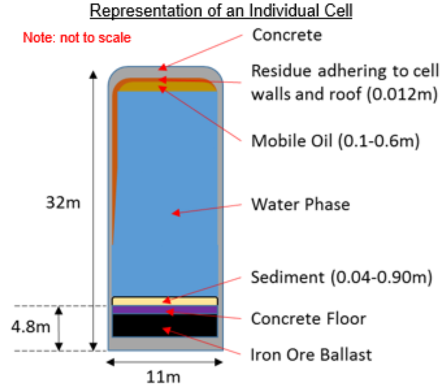
2007 Attic Oil Recovery Project (AORP) – Cell Stock Levels (m^3)



Sediment Distribution



Representation of an Individual Cell



Cell Contents Management Option	**Option 1** **High Oil and Sediment Recovery (R7 Hybrid)**	**Option 2** **Mid Oil and Sediment Recovery (R12 Hybrid)**	**Option 3** **Mid Oil Recovery (R12)**	**Option 4** **Leave In Situ**
Number of cell penetrations and directly accessed cells (XX small + X larger = XX total)	23 small + 8 larger = 31 total	14 small + 4 larger = 18 total	15 small + 0 larger = 15 total	0 small + 0 larger =0 total
No of cells indirectly accessed	43	23	21	0
No of cells mobile oil to be recovered from	74	41	36	0
No of cells sediment to be recovered from	8	4	0	0
Total volume of materials recovered	Mobile Oil = 599m^3 Sediment = 270m^3	Mobile Oil = 299m^3 Sediment = 147m^3	Mobile Oil = 274m^3 Sediment = 0m^3	Mobile Oil = 0m^3 Sediment = 0m^3
Residual inventory	Mobile Oil = 966m^3 Sediment = 978m^3	Mobile Oil = 1,266m^3 Sediment = 1,101m^3	Mobile Oil = 1,291m^3 Sediment = 1,248m^3	Mobile Oil = 1,565m^3 Sediment = 1,248m^3
Waste generated	Mobile Oil = 599m^3 Sediment Slurry = 2,701m^3	Mobile Oil = 299m^3 Sediment Slurry = 1,470m^3	Mobile Oil = 274m^3 Sediment Slurry = 0m^3	Mobile Oil = 0m^3 Sediment Slurry = 0m^3
Loss of containment (operational)	Mobile Oil = 15m^3 Sediment = 0.2m^3	Mobile Oil = 15m^3 Sediment = 0.2m^3	Mobile Oil = 15m^3 Sediment = 0m^3	Mobile Oil = 0m^3 Sediment = 0m^3
Loss of containment (legacy)	Mobile Oil = 31m^3 Water = 12,821m^3	Mobile Oil = 31m^3 Water = 12,821m^3	Mobile Oil = 31m^3 Water = 12,821m^3	Mobile Oil = 62m^3 Water = 12,789m^3
Extent of drill cuttings disturbance	Full removal	Minimal removal	Minimal removal	No removal
Area of drill cuttings disturbed	6,431m^3	2,057m^3	1,815m^3	0 m^3
Volume of drill cuttings disturbed	10,333m^3	358m^3	303m^3	0m^3
Offshore Execution Duration	445 days	272	224	0
Number of Seasons Campaign	3	2	2	0
Key Directly accessed cell (externally penetrated via cell top) Indirectly accessed cells (accessed via communication port) Not accessed Drill cuttings pile CGB leg Communication port