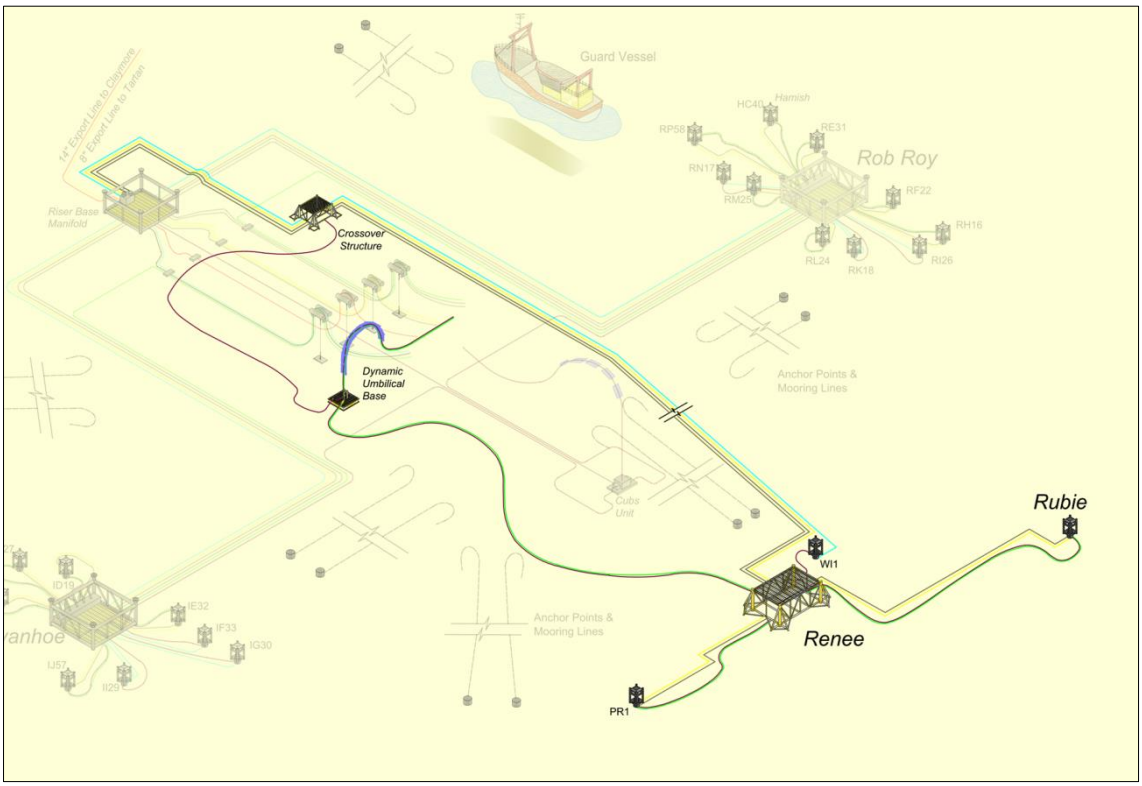
Endeavour




# RUBIE AND RENEE FIELDS DECOMMISSIONING PROGRAMMES

## Consultation Version – November 2013

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# DOCUMENT CONTROL

## Approvals

| | Name | Signature | Date |
|---|---|---|---|
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| Approved by | | | |

## Revision Control

| Revision | Reference | Changes/Comments | Issue Date |
|---|---|---|---|
| 1 | Pre-draft outline programmes | Issued for project comment | 21/08/2013 |
| 2 | Draft programmes | Endeavour comments incorporated | 03/09/2013 |
| 3 | Draft Programmes | DECC comments incorporated | 16/09/2013 |
| 4 | Draft Programmes | Endeavour comments incorporated | 19/09/2013 |
| 5 | Draft Programmes | DECC comments incorporated | 15/10/2013 |
| 6 | Draft Programmes | DECC and Partner's comments incorporated | 14/11/2013 |
| 7 | Consultation Draft Programmes | | |

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## A. Terms and Abbreviations

| Definition | |
|---|---|
| CA | Comparative Assessment |
| $CO_2$ | Carbon dioxide |
| COS | Cross-Over Structure |
| CSV | Construction Support Vessel |
| CUBS | Control Umbilical Base Structure |
| DECC | Department of Energy and Climate Change |
| DP | Decommissioning Programme |
| DUBS | Dynamic Umbilical Base Structure |
| EIA | Environmental Impact Assessment |
| ERT | Environment Resource Technology |
| ES | Environmental Statement |
| FBE | Fusion Bonded Epoxy |
| FLTC | UK Fisheries offshore oil and gas Legacy Trust Fund |
| FPF | Floating Production Facility |
| GMS | Global Marine System Ltd |
| IVRRH | Ivanhoe-Rob Roy and Hamish |
| JNCC | Joint Nature Conservation Committee |
| MCAA | Marine and Coastal Access Act |
| MPAs | Marine Protected Areas |
| NFFO | National Federation of Fishermen's Organisations |
| NIFPO | Northern Ireland Fish Producers Organisation |
| NORM | Naturally Occurring Radioactive Material |
| OBM | Oil Based Mud |
| OGUK | Oil and Gas UK |
| OPEP | Oil Pollution Emergency Plan |
| OPPC | Oil Pollution Prevention and Control |
| OSPAR | Oslo Paris Convention – The OSPAR Convention guides international cooperation on the protection of the marine environment of the North-East Atlantic |
| OSRL | Oil Spill Response Ltd |
| PON5 | Application to abandon or temporarily abandon a well |
| PON15 | Petroleum Operations Notice seeking that an ES is not required for offshore activity proposals including: Drilling (PON15b); pipeline installation (PON15c); development (PON15d); chemical discharge (PON15e); well intervention (PON15f). |
| RBM | Riser Base Manifold |
| ROV | Remotely Operated Vehicle |
| RPM | Renee Production Manifold |
| SAC | Special Area of Conservation |
| SFF | Scottish Fishermen's Federation |
| T | Tonnes |
| UKCS | United Kingdom Continental Shelf |
| UKDMAP | United Kingdom Digital Marine Atlas Project |
| USV | Unmanned Surface Vehicle |

## B. Figures and Tables

## C. Appendices

| Appendices | Description | Page |
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| 1: Statutory Consultees' Correspondence | Letter forwarded to statutory consultees (NFFO, SFF, NIFPO and GMS) informing them of the availability of the Decommissioning Programmes | 43 |

# 1.0 EXECUTIVE SUMMARY

## 1.1 Combined Decommissioning Programmes

This document covers four Decommissioning Programmes (DPs) for:

1. the Rubie installations;
2. the Rubie pipelines;
3. the Renee installations; and
4. the Renee pipelines.

All DPs address the decommissioning of the facilities outlined in the relevant notices, served under Section 29 of the Petroleum Act 1998.

## 1.2 Requirement for Decommissioning Programmes

**Installations:**

In accordance with the Petroleum Act 1998, Endeavour Energy UK Ltd (Endeavour) as operator of the Rubie and Renee Fields and on behalf of the Section 29 Notice Holders is applying to the Department of Energy and Climate Change (DECC) to obtain approval for decommissioning the installations (Table 1.1 and Table 1.2). Partners letters of support for these programmes are included in Section 8.

**Pipelines:**

In accordance with the Petroleum Act 1998, Endeavour as operator of the Rubie and Renee Fields and on behalf of the Section 29 Notice Holders is applying to DECC to obtain approval for decommissioning the pipelines (Table 1.3 and Table 1.4) also detailed in Section 2 of this document.

In conjunction with public, stakeholder and regulatory consultation, the decommissioning programmes are submitted in compliance with national and international regulations and DECC guidelines. The schedule for the main project outlined in this document is expected to last for up to four years. Preparatory works are complete and further work is expected to commence in the second quarter of 2014. Partners letters of support for these programmes are included in Section 8.

## 1.3 Introduction

The Rubie/ Renee Facilities are located in UK Continental Shelf (UKCS) Blocks 15/21, 15/26, 15/27 and 15/28 of the central North Sea, approximately 115 km east of the UK coastline and approximately 60 km west of the UK/Norway median line (Figure 1.1). Water depth ranges from 113 to 150 m. The Rubie and Renee Fields are located in Blocks 15/28 and 15/27 respectively, and lie approximately six kilometres apart. The Renee Field (Figure 1.2) consists of two production wells, one water injection well and the Renee Production Manifold (RPM) which was tied back to a Cross-Over Structure (COS) and on to the Riser Base Manifold (RBM) in the Ivanhoe, Rob Roy and Hamish (IVRRH) Development (Figure 1.3). The RPM was also tied back to the COS via a Dynamic Umbilical Base Structure (DUBS). The single Rubie production well (Figure 1.2) was tied back to the RPM, via a 5.6 km, 8” pipeline (PL1624).

Production from the Rubie and Renee Fields was achieved through the Hess operated Floating Production Facility (FPF) AH001 (HESS, 2010), which was located 21 km to

the northwest of the Renee field (Figure 1.3). AH001 also processed fluids from the IVRRH Development. A programme of work was completed in 2009 to flush and clean the production equipment and to release the *AH001* from the Rubie, Renee and IVRRH infrastructure following agreement with DECC. All flexible risers and the FPF mooring system were disconnected from the FPF and laid on the seabed. The *AH001* was then sailed away, leaving the IVRRH and Rubie/ Renee infrastructure on the seabed. The IVRRH facilities are subject to separate Section 29 Notices and a separate DECC-approved DP (HESS, 2013).

Endeavour has explored all options for continuing production from the fields but concluded that no option was economically viable and the Rubie and Renee installations and pipelines are now ready for decommissioning. Since production suspension in 2009, the spools connecting the RBM to the COS have been disconnected and removed to wet storage along with some mattresses. As the RBM was subject to a separate DECC-approved DP, it was removed during the IVRRH decommissioning programmes (HESS, 2013). All production and injection wells have been isolated and the DUBS removed from the seabed in June 2013. Where the Rob Roy umbilical crosses the RPM to COS pipelines, 160 m lengths of each pipeline (PL1616, PL1617, PL1618 and PL1620) were removed in 10 m sections and has been relocated into wet storage in June 2013. Further to this, 50 m lengths of PL1624, PL1625 and the umbilicals (PL1626.1 to PL1626.8 and PL1619.1 to PL1619.8) were also removed at trench transitions and pipeline ends and relocated to wet storage. In total, the amount of pipeline material currently in wet storage is approximately 70 tonnes. This material will be removed for onshore recycling during decommissioning.

The remaining infrastructure surrounding the Rubie/ Renee Facilities is listed in Table 1.6. A summary of the decommissioning programmes is provided in Table 1.5. The Rubie/ Renee Facilities which remain in-field and require decommissioning include:

- Renee Production Manifold (RPM);
- Rubie Subsea Completion (Rubie production well 15/28b-7Z);
- Renee Subsea Completions (Renee production wells (15/27-6y & 15/27-8 and water injection well 15/27-7);
- In-field pipelines and umbilicals (including spools and jumpers); and
- Cross-Over Structure (COS).

Following public, stakeholder and regulatory consultation, the decommissioning programmes are submitted without derogation and in full compliance with DECC guidelines. The decommissioning programmes explain the principles of the removal activities and are supported by an environmental impact assessment.

## 1.4 Overview of Installations/Pipelines Being Decommissioned

### 1.4.1 Installations

**Table 1.1: Installations Being Decommissioned**

| | | | | | |
|---|---|---|---|---|---|
| **Field Names** | Rubie<br>Renee | **Quad/Block** | 15/28b<br>15/27 | **Number of Platforms** | 0 |
| **Distance from nearest UK coastline (km)** | 115 km | **Distance to Median Line (km)** | 60 km | **Platform type** | N/A |
| **Number of Subsea Installations** | 4*<br>Rubie: 1<br>Renee: 3 | **Number of Drill Cutting piles and estimated Volume ($m^3$)** | 2 piles at Renee wells with a total volume of 1,432 $m^3$. The piles at the Rubie wellhead and the remaining Renee wellhead are indistinguishable from the surrounding sediment. | **Topsides weight (T):**<br>**Jacket weight (T):** | N/A |
| **Total No of Wells** | Rubie: 1<br>Renee: 3 | **Production Type** | Oil and Gas | **Water Depth (m)** | 113 - 150 |
| **Platform:** | 0 | | | | |
| **Subsea:** | 4 | | | | |

N/A – Not applicable

*Further details are included in table 2.2

**Table 1.2: Installations Section 29 Notice Holders Details**

| Section 29 Notice Holders | Registration Number | Equity Interest Rubie (%) | Equity Interest Renee (%) |
|---|---|---|---|
| Endeavour Energy (UK) Ltd | 05030838 | 40.78 | 77.5 |
| Endeavour North Sea Limited* | 03518803 | 0 | 0 |
| Hess Limited | 00807346 | 19.22 | 14 |
| Marubeni Oil & Gas (North Sea) Limited | 03947050 | 40 | 8.5 |
| Talisman Sinopec Alpha Limited* | 00825828 | 0 | 0 |
| Talisman Sinopec Energy UK Limited* | 04796268 | 0 | 0 |

*Companies that no longer have licence interest in the Rubie/ Renee Fields and no longer have a corresponding ownership interest in the associated Rubie/ Renee installations.

### 1.4.2 Pipelines

**Table 1.3: Pipelines Being Decommissioned**

| Flowline | Number to be decommissioned | |
|---|---|---|
| | Rubie | Renee |
| Infield pipelines * | 10 | 16 |

*Includes umbilicals and can be broken down into spool and jumper components. See table 2.3 for further details

### Table 1.4: Pipelines Section 29 Notice Holders Details

| Section 29 Notice Holders | Registration Number | Equity Interest Rubie (%) | Equity Interest Renee (%) |
|---|---|---|---|
| Endeavour Energy (UK) Ltd | 05030838 | 40.78 | 77.5 |
| Endeavour North Sea Limited* | 03518803 | 0 | 0 |
| Hess Limited | 00807346 | 19.22 | 14 |
| Marubeni Oil & Gas (North Sea) Limited | 03947050 | 40 | 8.5 |
| Talisman Sinopec Alpha Limited* | 00825828 | 0 | 0 |
| Talisman Sinopec Energy UK Limited* | 04796268 | 0 | 0 |

*Companies that no longer have licence interest in the Rubie/ Renee Fields and no longer have a corresponding ownership interest in the associated Rubie/ Renee pipelines.

## 1.5 Summary of Proposed Decommissioning Programmes

### Table 1.5: Summary of Decommissioning Programmes

| Selected Option | Reason for Selection | Proposed Decommissioning Solution |
|---|---|---|
| 1. Topsides | | |
| Not applicable | Not applicable | Not applicable |
| 2. Floating Facility | | |
| Not applicable | Not applicable | Not applicable |
| 3. Subsea Installations | | |
| All subsea installations will be removed. | To remove all seabed structures and leave a clean seabed. | COS and RPM will be removed by Construction Support Vessel (CSV) or similar vessel and returned to shore for recycling. MCAA application will be submitted in support of works undertaken. |
| 4. Pipelines, Flowlines & Umbilicals | | |
| Flush pipelines PL1616, PL1617, PL1618, PL1619.1 – 1619.8, PL1620, PL1624 and PL1625 and leave majority buried *in situ.*<br>Leave umbilical PL1626.1-1626.8 *in situ* | Minimal seabed disturbance, lower energy usage, reduced risk to personnel. | Preparatory work has removed sections of these pipelines, the details of which are detailed below. The cut ends will be re-buried under rock dump. Degradation will occur over a long period within seabed sediment, and is not expected to represent a hazard to other users of the sea. A MCAA application will be submitted in support of works undertaken. |
| Remove part of PL1616, PL1617, PL1618, PL1619.1 – 1619.8 PL1620, PL1624, PL1625 and PL1626.1-1626.8 | Reduce interference with removal of associated infrastructure (see Subsea installations above). | A 200m length of line from PL1616, PL1617, PL1618 and PL1620 (160 m at the crossing and 10m at each of the two trench transitions) and 40m from PL1624, PL1625 and the umbilicals PL1626.1 to PL1626.8 and PL1619.1 to PL1619.8 (20m at each end) will be removed. Parts that have been removed will be lifted on to a CSV (or similar) and returned to shore for recycling. MCAA application will be submitted in support of works undertaken. |
| Remaining flowlines : PL1621, PL1622, PL1623.1 – 1623.2 will be removed completely. | Meets DECC guidelines to remove all surface laid infrastructure to leave a clean seabed. | The remaining flowlines will be removed and returned to shore for recycling via a combination of reverse reel onto a reel vessel and short section recovery. MCAA application will be submitted in support of works undertaken. |
| 5. Well Abandonment Operations | | |
| Abandoned in accordance with Oil & Gas UK Guidelines for the Suspension and Abandonment of Wells. | Meets DECC regulatory Requirements. | PON5, PON15 and MCAA applications will be submitted in support of works carried out. |
| 6. Drill Cuttings | | |
| Leave in place to degrade naturally. | Cuttings piles are small, thin and widely dispersed and are very unlikely to exceed OSPAR 2006/5 thresholds for area and rate of hydrocarbon leaching. | Left undisturbed on seabed to degrade naturally. |
| 7. Interdependencies | | |
| No interaction expected between drill cuttings and decommissioning operations | | |

## 1.6 Field Location/Layout and Adjacent Facilities

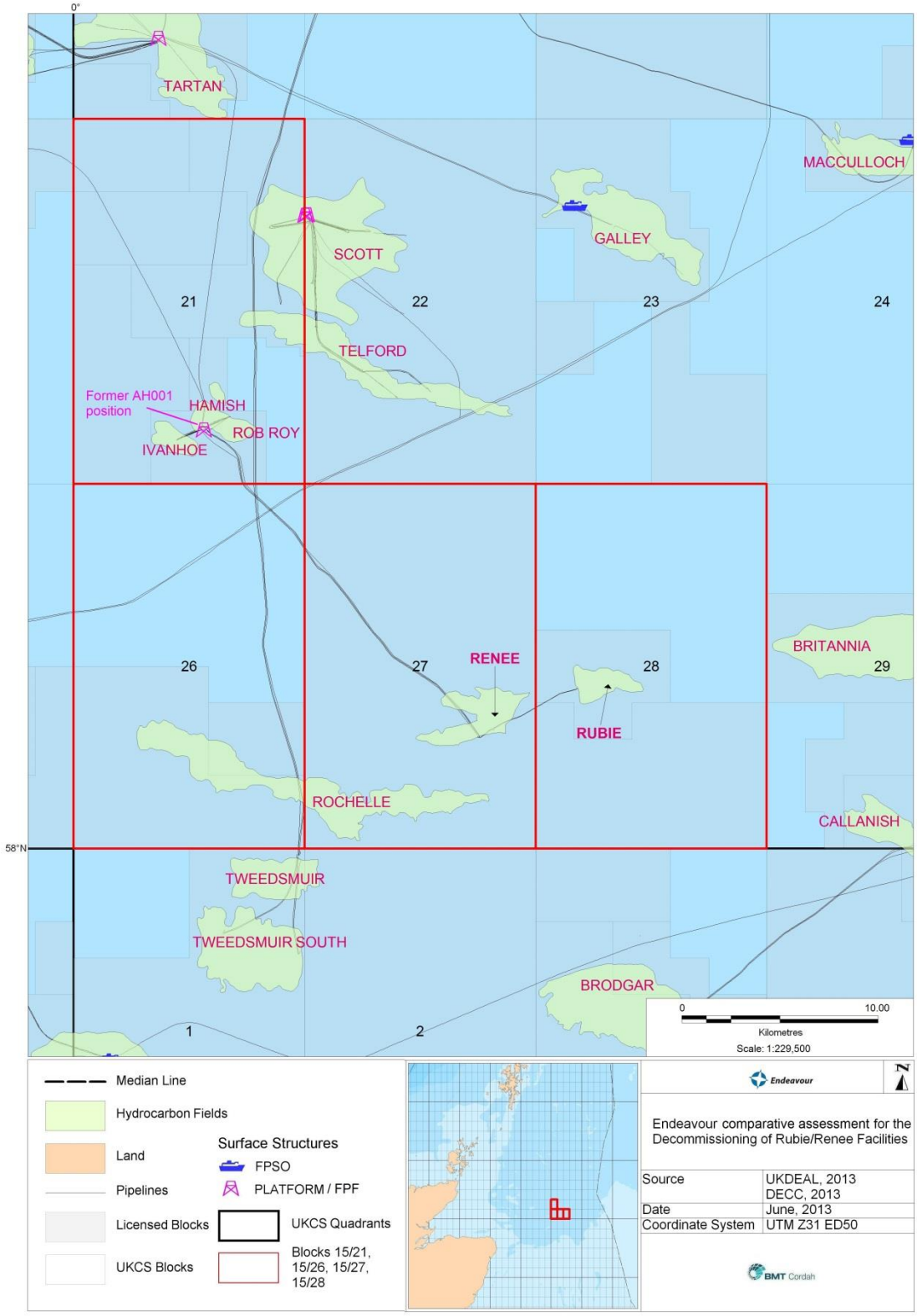



**Figure 1.1: Field Location on the UKCS**

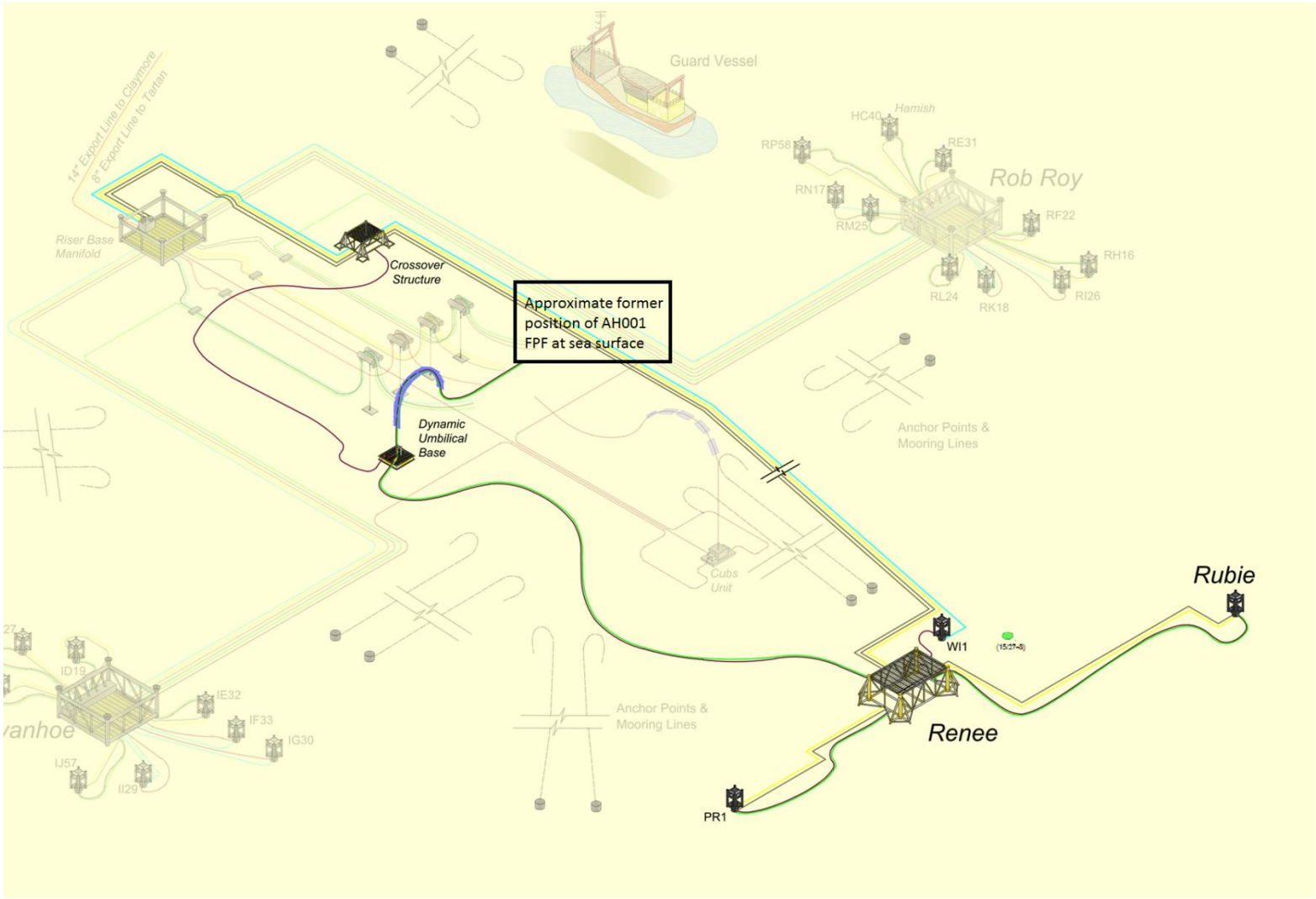



**Figure 1.2: Original Rubie/ Renee Field Infrastructure (Note: the current field layout is shown in Figure 1.3)**

## Table 1.6 List of Adjacent Facilities

| Owner | Name | Type | Distance/Direction from DUBs (platforms)/ pipeline location | Information | Status |
|---|---|---|---|---|---|
| Hess | AH001 | Floating Production Platform | 0.3 km N | Production/ processing and accommodation | Removed |
| Nexen | Scott JU | Platform | 12.2 km NNE | Accommodation | Operational |
| Nexen | Scott JD | Platform | 12.2 km NNE | Oil production | Operational |
| Talisman Sinopec Energy (UK) Lid | Tartan Alpha | Platform | 20 km N | Drilling, Production/ Processing and accommodation | Operational |
| Talisman Sinopec Energy (UK) Ltd | Buchan Alpha | FPSO | 32 km SSW | Floating semi-sub/ process facility and accommodation | Operational |
| BP Exploration Limited | PL720 | Gas Pipeline | 30" Miller to St Fergus | PL720 is under gravel dump and crosses under pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 | Not in Use |
| Apache North Sea Limited | PL762 | Gas Pipeline | 30" SAGE Beryl to St Fergus | PL762 is under gravel dump and crosses under pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 | Active |
| Hess | CU2* | Umbilical | CU3-CUBS Control Umbilical to Rob Roy Manifold * | Umbilical is under protective mattresses and crosses under pipelines PL1616, PL1617 and PL1618/PL1620 | Not in use |
| Talisman Sinopec Energy (UK) Ltd | PL2125 | Oil Pipeline | 12"/18" PIP Production Tweedsmuir Main Manifold to Piper Bravo USV | PL2125 crosses over pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 which are protected by gravel dump. | Active |
| Talisman Sinopec Energy (UK) Ltd | PL2127 | Water Pipeline | 10" Water Injection Tweedsmuir Main Manifold to Piper Bravo USV | PL2127 crosses over pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 which are protected by gravel dump. | Active |
| Talisman Sinopec Energy (UK) Ltd | PL2129 | Gas Lift Pipeline | 4" Gas Lift Tweedsmuir Main Manifold to Piper Bravo USV | PL2129 crosses over pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 which are protected by gravel dump. | Active |
| Talisman Sinopec Energy (UK) Ltd | PL2131 | Umbilical | Control Umbilical Piper Bravo to Tweedsmuir Main Manifold* | PL2131 crosses over pipelines PL1616, PL1617, PL1618/ PL1620 and PL1619 which are protected by gravel dump. | Active |
| BT | Not applicable | Cable | BT Telecommunications cable (Aberdeen to Bergen).** | Cable crosses under pipelines PL1616, PL1617, PL1618/PL1620, and PL1619 which are buried at this point. | Not in use |
| Hess | PL520 | Pipeline | Chemical Injection Wet-Store to Rob Roy Manifold ** | PL520 crosses over pipelines PL1616, PL1617, PL1619 and PL1618/PL1620 which are protected by mattresses. | Abandoned |
| Nexen | PL2921 | Pipeline | East Rochelle to Scott 30km 10/14" pipe-in-pipe | PL2921 crosses over pipelines PL1616, PL1617, PL1619 and PL1618/PL1620 which are protected by gravel dump. | Active |
| Nexen | PLU2925 | Umbilical | East Rochelle to Scott 30km control umbilical | PLU2925 crosses over pipelines PL1616, PL1617, PL1619 and PL1618/PL1620 which are protected by gravel dump. | Active |

**This umbilical does not have a PL number (Hess, 2013 p.26)  **information derived from Endeavour (2013)*

PL720 and PL762 cross underneath pipelines to be decommissioned, The fate of these undercutting pipelines was decided during the IVRRH decommissioning programme, during which it was agreed to leave the pipelines buried in situ under armourflex mattresses and overtrawlable rock dump. Endeavour has therefore taken care to remove sections of the overriding pipelines in order to honour this agreement. The decommissioning of the Rubie and Renee installations and pipelines will have a negligible impact on all other adjacent platforms as all decommissioning works will be within the 500m exclusion zone around the subsea facilities (Table 1.6).

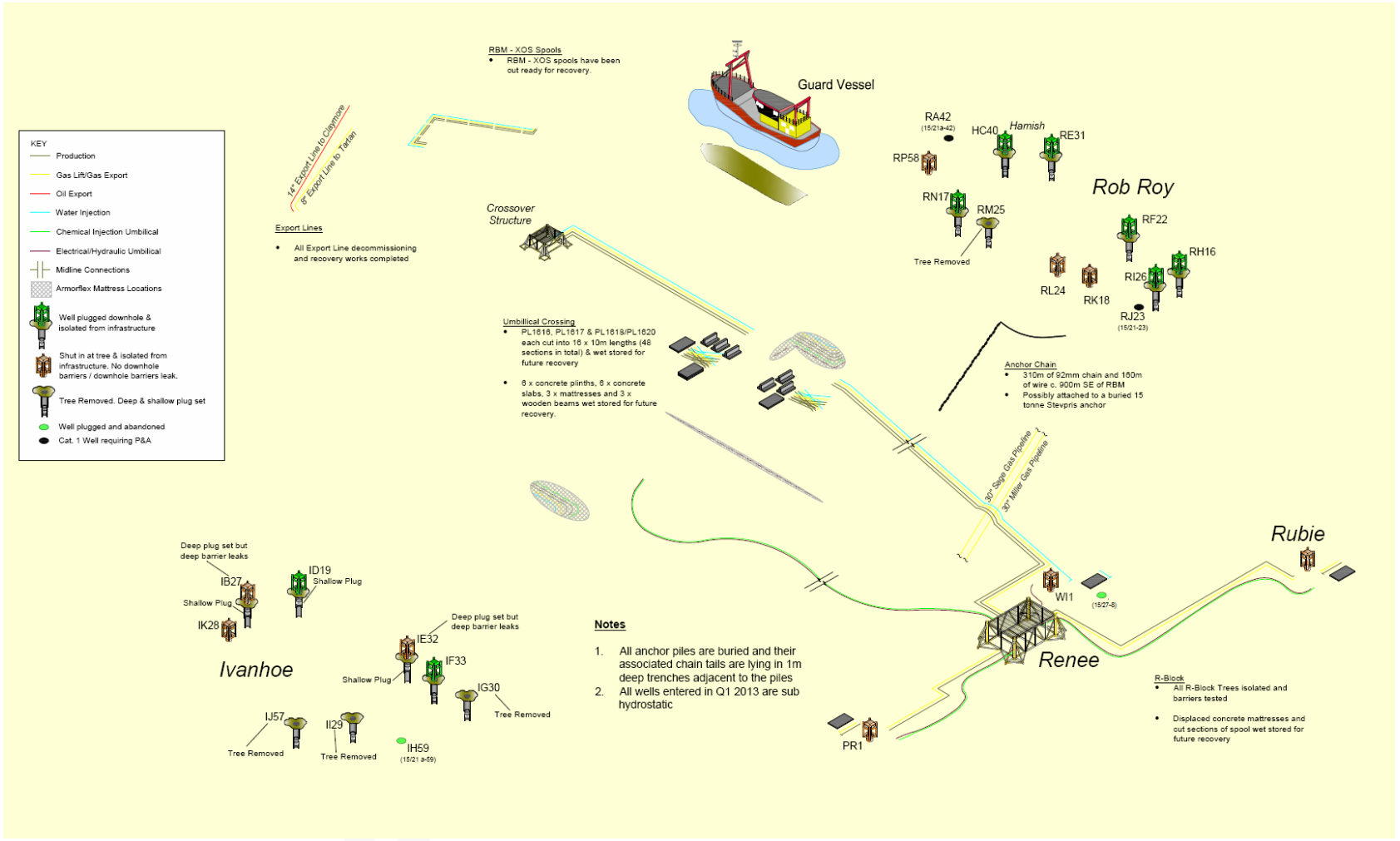



**Figure 1.3: The current Rubie/ Renee and IVRRH Field layout**

## 1.7 Industrial Implications

The intent is to combine logical scopes of work into manageable discrete campaigns such as DSV and CSV facilities removal campaigns in 2014/ 2015. Other more specialised vessels and services such as rockdumping, survey and equipment disposal services will be competitively tendered unless there is a compelling justification to single source with a particular supplier.

Strategically suppliers with working vessels and assets on the UKCS will be favoured to avoid prolonged field transits and demobilisations.

The drilling rig will be competitively tendered or alternatively there is an option to be assigned the use of another operator's drilling rig. Drilling rig services and logistics will be provided by a drilling management supplier under a separate contract.

A contract already exists with the Scottish Fishermen's Federation (SFF) for overtrawl sweeps and guard vessel duties.

# 2.0 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

## 2.1 Surface Facilities

### Table 2.1: Surface Facilities

| Table 2.1: Surface Facilities Information | | | | | | | |
|---|---|---|---|---|---|---|---|
| Name | Facility Type* | Topsides/Facilities | | Jacket (if applicable) | | | |
| | | Weight (T) | No of modules | Weight (T) | Number of Legs | Number of piles | Weight of piles (T) |
| Not applicable | | | | | | | |

## 2.2 Subsea Installations and Stabilisation Features

Table 2.2 provides an overview of the remaining subsea installations.

### Table 2.2: Subsea Installations and Stabilisation Features

| Subsea installations and Stabilisation Features | No. | Size/Weight (T) | Location(s) | Comments/Status |
|---|---|---|---|---|
| Wellheads (Subsea Completions):<br>1. Rubie:15/28b-7z<br>2. Renee:15/27-6y<br>3. Renee:15/27-7 | 3 | Each well comprises of:<br>• A Xmas tree, approximately 5.3 m long, 5.3 m wide, and 4 m high, weighing 31.96 tonnes<br>• A guide base, approximately 2.9 m long, 2.9 m wide, and 3 m high, weighing 4.5 tonnes<br>• A wellhead, approximately 2 m long and wide and 0.8 m high, weighing 4.98 tonnes | 1. 58º 04’ 24”N 00º 26’ 10”E<br>2. 58º 02’ 59.9”N 00º 20’ 58.2”E<br>3. 58º 03’ 2.78”N 00º 21’ 5.72”E | 15/28b-7z, 15/27-6y and 15/27-7 are all suspended and will undergo plug and abandonment (P&A) |
| Wellheads (Subsea Completions):<br>Renee: 15/27-8* | 1 | The well comprises of:<br>• A guide base, approximately 2.9 m long, 2.9 m wide, and 3 m high, weighing 4.5 tonnes<br>• A wellhead, approximately 2 m long and wide and 0.8 m high, weighing 4.98 tonnes | 58º 03’ 1.63”N<br>00º 21’ 4.73”E | 15/27-8 has been P&A only guide base and wellhead remain to be removed |
| Manifold:<br>Renee Production Manifold (RPM) and protection frame: | 1 | Dimensions: 15 m long, 6 m wide, 5 m high<br><br>Weight: 105 tonnes | 58º 03’ 2.78”N<br>00º 21’ 5.72”E | The Renee Production Manifold (RPM) includes various equipment, including valves, subsea control modules, manifold and pigging equipment. The RPM is located approximately 6 km from the Rubie production well and 21 km from the former location of the AH001 FPF (Figure 1.3).<br>The structure is secured to |

| Subsea installations and Stabilisation Features | No. | Size/Weight (T) | Location(s) | Comments/Status |
|---|---|---|---|---|
| | | | | the seabed by four steel piles. Skirted mud mats underneath the RPM provide seabed stability and scour protection. Although the RPM does not include a true protective structure, some over-trawlability was achieved by sloping deflectors on the corners of the structure. |
| Template(s) | N/A | N/A | N/A | N/A |
| SSIV(s) | N/A | N/A | N/A | N/A |
| Concrete mattresses | See Table 2.4 for information regarding mattresses covering pipelines | | | |
| Grout 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 Dump | N/A | N/A | N/A | N/A |

N/A – Not applicable

*As well 15/27-8 was drilled as an appraisal well, it is not essential that it is included within the scope of these DPs. However, as the procedures surrounding the removal of this well will influence the overall vessel spread, energy usage and emissions, Endeavour feel that the inclusion of this well contributes to a complete overview.

Note: the Cross Over Structure (COS) has not been included in this table as it is not considered to be an installation. However, the weight of the COS (10 tonnes) has been included in inventory calculations (Section 2.6 and Table 3.7).

## 2.3 Pipelines/ Flowlines/ Umbilicals

Table 2.3 provides a breakdown of the characteristics of each of the pipelines, flowlines and umbilicals currently in place in the Rubie/ Renee Fields and Table 2.4 outlines the current pipeline stabilisation features.

**Table 2.3: Renee and Rubie Pipeline/ Flowline/ Umbilical Information**

| Description | Pipeline No. (as per PWA) | Diameter (inches/ mm) | Length | Composition[1] | Contents[2] | From – To End Points | Condition | Status[3] | Contents[4] |
|---|---|---|---|---|---|---|---|---|---|
| **Renee Pipeline/ Flowline/ Umbilical Information** | | | | | | | | | |
| Oil test production pipeline | PL1616 | $8^{5/8}$/ 219.1 | 21.6 km* | Steel<br>Plastic<br>Aluminium<br>37mm SPU coating | Production fluid | RPM to COS | Trenched and buried | Suspended in place (160 m in wet storage) | *RX-2030 (Chemicals in line)* |
| COS to RBM spool | PL1616 connector | $8^{5/8}$/ 219.1 | 40 m | Steel<br>Plastic<br>Aluminium<br>37mm SPU coating | Production fluid | COS to RBM | Surface laid | Removed to wet storage | Flushed |
| COS to PL1616 Spool | PL1616 connector | $8^{5/8}$/ 219.1 | 20 m | Steel<br>Plastic | Production fluid | Pipeline to COS | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| RPM to PL1616 Spool | PL1616 connector | $8^{5/8}$/ 219.1 | 20 m | Steel<br>Plastic | Production fluid | RPM to PL1616 | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| Oil production pipeline | PL1617 | $8^{5/8}$/ 219.1 | 21.6 km* | Steel<br>Plastic<br>Aluminium<br>37mm SPU coating | Production fluid | RPM to COS | Trenched and buried | Suspended in place (160 m in wet storage) | *RX-2030 (Chemicals in line)* |
| COS to RBM spool | PL1617 | $8^{5/8}$/ 219.1 | 40 m | Steel<br>Plastic<br>Aluminium | Production fluid | COS to RBM | Surface laid | Removed to wet storage | Flushed |

| Description | Pipeline No. (as per PWA) | Diameter (inches/ mm) | Length | Composition[1] | Contents[2] | From – To End Points | Condition | Status[3] | Contents[4] |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 37mm SPU coating | | | | | |
| COS to PL1617 Spool | PL1617 connector | 8$^{5/8}$/ 219.1 | 20 m | Steel<br>Plastic | Production fluid | Pipeline to COS | Surface laid | Suspended in place | Flushed |
| RPM to PL1617 Spool | PL1617 connector | 8$^{5/8}$/ 219.1 | 20 m | Steel<br>Plastic | Production fluid | RPM to PL1616 | Surface laid | Suspended in place | Flushed |
| Gas lift pipeline piggybacked on PL1620 | PL1618 | 4½ / 114.3 | 21.6 km* | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Gas | RPM to COS (piggybacked on PL1620) | Trenched and buried | Suspended in place (160 m in wet storage) | *RX-2030 (Chemicals in line)* |
| COS to RBM spool | PL1618 | 4½ / 114.3 | 40 m | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Gas | COS to RBM | Surface laid | Removed to wet storage | Flushed |
| COS to PL1618 Spool | PL1618 connector | 4½ / 114.3 | 45 m | Steel<br>Plastic | Production fluid | Pipeline to COS | Surface laid | Suspended in place | Flushed |
| RPM to PL1618 Spool | PL1618 connector | 4½ / 114.3 | 55m | Steel<br>Plastic | Production fluid | RPM to PL1616 | Surface laid | Suspended in place | Flushed |
| Two methanol umbilicals | PL1619.1 to PL1619.2 | ¾/ 19.05 | 21.6 km | Steel<br>Copper<br>Plastic | Methanol | RPM to DUBS | Trenched and buried | Suspended in place | Potable water |
| Six chemicals umbilicals | PL1619.3 to PL1619.8 | ½ / 12.7 | 21.6 km | Steel<br>Copper<br>Plastic | Chemicals | RPM to DUBS | Trenched and buried | Suspended in place | Potable water |

| Description | Pipeline No. (as per PWA) | Diameter (inches/ mm) | Length | Composition[1] | Contents[2] | From – To End Points | Condition | Status[3] | Contents[4] |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| Water injection pipeline | PL1620 | 8 5/8 / 219.1 | 21.6 km* | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Water | Renee water injection well to COS | Trenched and buried | Suspended in place (160 m in wet storage) | *RX-2030 (Chemicals in line)* |
| COS to RBM spool | PL1620 | 8 5/8 / 219.1 | 60 m | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Water | COS to RBM | Surface laid | Removed to wet storage | Flushed |
| Wellhead production jumper | PL1621 | 6 5/8 / 168.3 | 37 m | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Production fluid | Renee production wellhead to RPM | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| Flexible jumper | PL1622 | 2 3/8 / 60.3 | 37 m | Steel<br>Plastic<br>Aluminium<br>3LPP coating | Gas | RPM to production wellhead | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| Two wellhead chemical jumpers | PL1623.1 and PL1623.2 | ¾/ 19.05 | 37 m | Steel<br>Plastic<br>Copper | Chemicals | Renee production well to RPM | Surface laid | Suspended in place | Potable water |
| **Rubie Pipeline/ Flowline/ Umbilical Information** | | | | | | | | | |
| Oil production pipeline | PL1624 | 8 5/8 / 219.1 | 5.6 km* | Steel<br>Plastic<br>Aluminium<br>37mm SPU coating | Production fluid | Rubie production well to RPM | Trenched and buried | Suspended in place | *RX-2030 (Chemicals in line)* |
| Rubie wellhead to PL1624 Spools | PL1624 connector | 8 5/8 / 219.1 and 6 5/8 / 168.3 | 20 m | Steel<br>Plastic | Production fluid | Rubie wellhead to PL1624 | Surface laid | Suspended in place | Flushed |

| Description | Pipeline No. (as per PWA) | Diameter (inches/ mm) | Length | Composition[1] | Contents[2] | From – To End Points | Condition | Status[3] | Contents[4] |
|---|---|---|---|---|---|---|---|---|---|
| PL1624 to RPM Spool | PL1624 connector | $8^{5/8}$/ 219.1 | 20 m | Steel<br>Plastic | Production fluid | PL1624 to RPM | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| Gas lift pipeline | PL1625 | 3½/ 88.9 | 5.6 km* | Steel<br>Plastic<br>3LPP coating | Gas | RPM to Rubie production well (Piggybacked on PL1624) | Trenched and buried | Suspended in place | *RX-2030 (Chemicals in line)* |
| Rubie wellhead to PL1625 Spools | PL1625 connector | 3½/ 88.9 and $2^{3/8}$/ 60.3 | 20 m | Steel<br>Plastic | Production fluid | Rubie wellhead to PL1625 | Surface laid | Suspended in place | Flushed |
| PL1625 to RPM Spool | PL1625 connector | 3½/ 88.9 | 20 m | Steel<br>Plastic | Production fluid | PL1625 to RPM | Surface laid | Suspended in place | *RX-2030 (Chemicals in line)* |
| Two methanol umbilicals | PL1626.1 to PL1626.2 | ¾/ 19.05 | 5.6 km* | Steel<br>Plastic<br>Copper | Methanol | RPM to Rubie production well via Rubie Subsea Umbilical Termination (SUT) | Trenched and buried | Suspended in place | Potable water |
| Six chemicals umbilicals | PL1626.3 to PL1626.8 | ½ / 12.7 | 5.6 km* | Steel<br>Plastic<br>Copper | Chemicals | RPM to Rubie production well via Rubie SUT | Trenched and buried | Suspended in place | Potable water |

1 e.g. Concrete; Steel; Umbilical; Flexible; Bundle

2 e.g. Oil; Gas; Water; Chemicals

3 e.g. Operational; Out-of-use; Interim pipeline regime

4 e.g. Cleaned; Flushed; Chemicals in-line

*Note: A 200 m length of line has been removed from PL1616, PL1617 and PL1618/PL1620 (160 m at the crossing and 10 m at each of the two trench transitions) and 40m from PL1624, PL1625 and the umbilicals PL1626.1 to PL1626.8 and PL1619.1 to PL1619.8 (20 m at each end). This was undertaken to adhere to the IVRRH decommissioning programmes, during which it was decided that these pipelines should be left in situ under concrete mattresses and overtrawlable rock dump (Figure 1.3).

Table 2.4 provides a list of current pipeline stabilisation features and their current locations.

**Table 2.4: Subsea Pipeline Stabilisation Features**

| Stabilisation Feature | Number | Weight (T) | Location(s) | Comments/ Status |
|---|---|---|---|---|
| Segmented concrete mattresses | 200-250*<br>*(250 has been used here to provide a worst-case scenario) | 1,238 | Prior to preparatory works, between 20 to 40 mattresses were located on each of pipelines PL1616, PL1617, PL1618/1620, PL1619, PL1624/1625 and PL1626 on approach to the RBM, COS, RPM and Rubie wellhead. PL1621 and PL1622 were covered in their entirety between the RPM and Renee wellhead. | Mattresses will be removed and transported to shore for disposal in landfill. Exact quantity to be removed will be clarified during operations. |
| Grout 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 Dump | N/A | N/A | N/A | N/A |

N/A – Not applicable

## 2.4 Wells

Table 2.5 provides a list of current wells and their current status.

**Table 2.5 Well Information**

| Subsea Wells | Designation[1] | Status | Category of Well (as per OGUK guidelines: Group 1-5) |
|---|---|---|---|
| Rubie:15/28b-7z | Production | Suspended | 2 |
| Renee:15/27-6y | Production | Suspended | 2 |
| Renee:15/27-7 | Injection | Suspended | 2 |
| Renee: 15/27-8 | Appraisal | Plugged and abandoned | 1 |

[1] e.g. Production; Injection; Oil or Gas well

Group 1 – Rig will be required;

Group 2 – Currently deemed to require a rig. For Plug and Abandonment plug installation according to OGUK guidelines, entire completion retrieval;

Group 3 – Currently deemed to require a rig. For Plug and Abandonment plug installation according to OGUK guidelines, partial lifting of completion;

Group 4 – Rigless 'through-completion' abandonment;

Group 5 – SWAT type well. Plugged wellbore, requiring annulus plugs.

## 2.5 Drill Cuttings

Table 2.6 provides details of the drill cuttings piles that have accumulated around the existing well centres (as shown in table 2.5). The Rubie drill cuttings pile and one of the Renee cuttings piles are indistinguishable from the surrounding sediments and have therefore been excluded from further investigation (HESS, 2010). Further information is available in section 3.6.

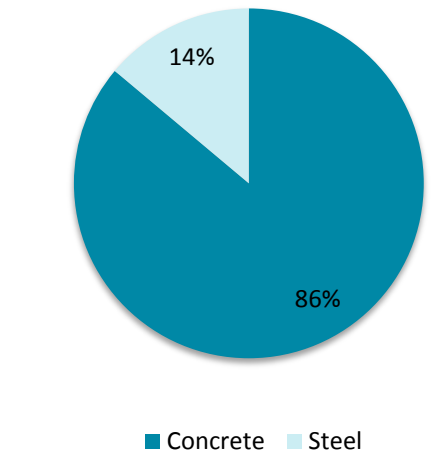
**Table 2.6: Drill Cuttings Pile(s) Information**

| Location of Pile Centre (Latitude/ Longitude) | Seabed Area ($m^2$) | Estimated volume of cuttings ($m^3$) |
|---|---|---|
| Renee production well:<br>58º 02' 59.9"N<br>00º 20' 58.2"E | 488 (total) | 1,432 (total) |
| Renee water injection well:<br>58º 03' 2.78"N<br>00º 21' 5.72"E | | |
| Renee production well:<br>58º 03' 1.63"N<br>00º 21' 4.73"E | Undetectable | Undetectable |
| Rubie production well:<br>58º 04' 24"N<br>00º 26' 10"E | Undetectable | Undetectable |

## 2.6 Inventory Estimates

Figure 2.1 shows the inventory for the subsea installations and support structures. The concrete mattresses comprise the majority (86%) of the material. The remaining 14% represents the subsea installations, including the RPM, COS and wellheads*.

**Figure 2.1: Pie Chart of Estimated Inventories (subsea installations and mattresses)**

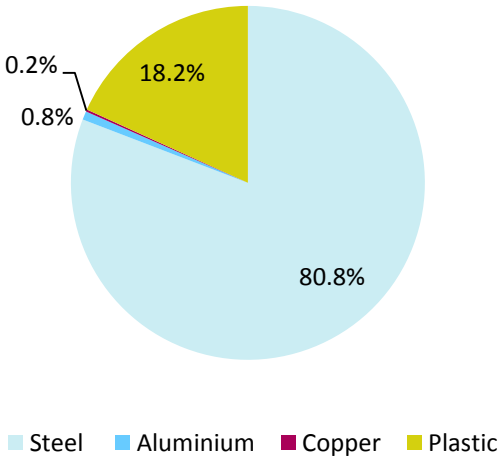



Note: No NORM/ Hazardous waste is anticipated – refer to EIA.

*The total mass is 1,518 tonnes

Figure 2.2 shows the inventory of materials included in the pipelines, umbilicals jumpers and spools. The majority of the inventory is comprised of steel (~81%), with plastic making up 18.2%. Small quantities of aluminium and copper (0.8% and 0.2% respectively) are also present*.

**Figure 2.2: Pie Chart of Estimated Inventory (Pipelines, umbilicals, jumpers and spools)**




Note: No NORM/ Hazardous waste is anticipated – refer to EIA

*The total mass is 6,843 tonnes

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# 3.0 REMOVAL AND DISPOSAL METHODS

Over the course of decommissioning operations, waste materials will be generated, mostly from the removal of various types of seabed infrastructure. Wastes generated during decommissioning will be segregated and recorded by type and periodically transported to shore in an auditable manner through licensed waste contractors. Steel and other scrap metal are estimated to account for the greatest proportion of the materials inventory from the Rubie/ Renee pipelines, and installations.

Where possible, the materials will be reconditioned and reused, or component parts may be stripped out for recycling. Only where reclaiming or recycling is not technically possible will any material ultimately be sent to landfill for disposal. The disposal routes for subsea installations and pipeline infrastructure are shown in Tables 3.1 and 3.2, respectively.

Once the infrastructure is recovered to the vessels, it will be examined for the presence of NORM. If any contamination is found, the items will be sealed and delivered to specialist contractors for decontamination treatment and disposal. NORM contamination in Rubie/ Renee infrastructure would require specialised waste transport and handling processes and is regulated under the Radioactive Substances Act 1993. However, the Rubie/ Renee infrastructure is not expected to contain any NORM.

## 3.1 Subsea Installations and Stabilisation Features

**Table 3.1: Subsea Installation and Stabilisation Features for Decommissioning**

| Subsea installations and stabilisation features | Number/ Quantity | Option | Disposal Route (if applicable) |
|---|---|---|---|
| 15/28b-7z Wellhead<br>15/27-6y Wellhead<br>15/27-7 Wellhead | 3 | Remove using drilling rig | Return to shore for reuse or recycling |
| 15/27-8 Wellhead | 1 | Remove using Construction Support Vessel (CSV) | Return to shore for reuse or recycling |
| Manifold(s) | 1 | Remove using CSV | Return to shore for reuse or recycling |
| Template(s) | N/A | N/A | N/A |
| Protection Frame(s) | 1 | Remove using CSV | Return to shore for reuse or recycling |
| SSIV(s) | N/A | N/A | N/A |
| Concrete mattresses | 200-250 | Remove using CSV | Return remaining to shore for recycling or landfill. |
| 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: COS | 1 | Remove using CSV | Return to shore for reuse or recycling |

N/A - Not Applicable

## 3.2 Pipelines/ Flowlines/ Umbilicals

### Decommissioning Options:

**Table 3.2: Pipeline or Pipeline Groups/Decommissioning Options**

| Pipeline or Group (as per PWA)* | Status of the line or characteristics of the pipeline group | Decommissioning Options considered | Whole or part of pipeline/ group being decommissioned |
|---|---|---|---|
| Rubie | | | |
| PL1624 (oil), PL1625 (gas) | Trenched and buried | 1, 2, 3, 4, 5, 6, 7 | Part (to leave *in situ*) |
| PL1626.1 – PL1626.8 (methanol and chemicals) | Trenched and buried | 1, 5, 7 | Part (to leave *in situ*) |
| 40m from PL1624, PL1625 and the umbilical PL1626.1 to PL1626.8 (20m at each end). | Surface laid | 5 | Part (to remove) |
| Spools (various) | Surface laid | 5 | Part of pipelines ends (to remove) |
| Renee | | | |
| PL1616 (oil), PL1617 (oil), PL1618 (gas), PL1620 (water), PL1619 (umbilical) | Trenched and buried | 1, 2, 3, 4, 5, 6, 7 | Part (to leave *in situ*) |
| A 200m length of line from PL1616, PL1617, and PL1618/ PL1620 (160 m at the crossing and 10m at each of the two trench transitions). | Surface laid | 5 | Part (to remove) |
| PL1621 (oil), PL1622 (oil) | Trenched and buried | 5 | Part (to remove) |
| PL1623.1 – PL1623.2 (chemical) | Surface laid | 5 | Part (to remove) |
| Spools (various) | Surface laid | 5 | Part of pipelines ends (to remove) |

Key to Options:

1) Remove - reverse reeling 2) Remove - Reverse S lay 3) Long section recovery

4) Removal by tow recovery 5) Short section recovery 6) J-lift recovery

7) Leave *in situ*

*For further details see Table 2.3

### Comparative Assessment Method:

As required by the Petroleum Act 1998, and as described in the DECC Guidance Notes (DECC, 2011), detailed Comparative Assessments (CA) are required to identify the best overall option for decommissioning the pipelines and umbilicals. Endeavour have compiled a CA (BMT Cordah, 2013a) of the available options for decommissioning the pipelines and umbilicals, to determine which options are most suitable in view of the status, condition and environmental setting of those facilities. Endeavour used the

selection criteria recommended by DECC to compare the different options, namely safety, environmental impacts, $CO_2$ emissions, social impacts, technical feasibility and cost.

In accordance with DECC's Guidance Notes (DECC, 2011), the CA scope covered the comparison of the decommissioning options for six redundant lines which are currently trenched and buried, including:

- 5 x 21.6km pipelines (production (x2), gas lift, water injection and umbilical)
- 2 x 5.6 km pipelines (production and gas lift) and associated umbilicals

In line with DECC's Guidance Notes (2011) a CA is not required for the remaining infrastructure as it will be decommissioned by recovery; leading to re-use, recycling or final disposal onshore.

Initially seven decommissioning methods were considered for the decommissioning of buried pipelines at the RR field location. These included:

1. Leave in place;
2. Recovery by reverse reel
3. Recovery by reverse lay
4. Long section recovery;
5. Towed recovery;
6. Short section recovery (cut-and-lift); and
7. J-lift recovery.

Based on technical feasibility and resource availability these methods were narrowed down to the two most feasible, namely:

- **Option 1: *Leave in Place*** where a short offshore programme will render the pipelines overtrawlable with the pipelines remaining undisturbed below the sediment surface; and
- **Option 2: *Recovery by reverse reel*** for the majority of long sections of pipeline with **Option 6: *Short Section Recovery*** for shorter or corroded sections unsuitable for reverse reel.

Both environmental impact and social impact displayed a weak differentiation. The majority of criterion displayed a strong differentiation between the considered options. The comparative derived for the two options as follows:

- Option 1: *Leave in Place* scored higher in the assessments for technical feasibility, safety, and cost.
- Options 2 and 6: *Recovery* scored higher in the assessment of energy usage and emissions.

**Outcomes of Comparative Assessment:**

**Table 3.3: Outcomes of Comparative Assessment (BMT Cordah, 2013a)**

| Pipeline or Group | Recommended Option* | Justification |
|---|---|---|
| PL1616, PL1617, PL1618, PL1620, PL1619, PL1624, PL1625, PL1626 | Option 1 | Line condition makes full removal impractical and results in unacceptable risk to personnel as these pipelines represent 75% of the material to be decommissioned. Remedial rock covering will minimise snagging risk for fishermen. |

**Table 3.3a: Pipelines selected for removal (BMT Cordah, 2013a)**

| Pipeline or Group | Recommended Option* | Justification |
|---|---|---|
| PL1621, PL1622, PL1623 | Options 2 and 6 | Line condition makes full removal the best option for these pipelines. |

Key to Options:

1) Leave in place; 2) Remove – Reverse Reel; 3) Remove – Reverse lay; 4) Long section recovery; 5) Towed recovery; 6) Short section recovery; 7) J-lift recovery

In conclusion it is recommended that Option 1 (*Leave in Place*) is the preferred option for the decommissioning of the Rubie Renee trenched lines. The outcomes of the CA process for the selection of the recommended option for decommissioning the pipelines (BMT Cordah, 2013a) are summarised in Table 3.3.

The remedial rock cover used to cover the lines left *in situ* will use graded crushed rock that matches the existing rock material specification. The graded rock will be placed onto the seabed in a carefully controlled operation using a dedicated rock placement vessel equipped with a dynamically positioned fall pipe. The operation will be monitored by an ROV during placement and after completion to confirm the material is deposited in the correct position on the seabed. Graded rock material will be used to cover any exposed pipeline sections.

## 3.3 Wells

**Table 3.4: Well Plug and Abandonment**

The number and type of barriers will be designed in accordance with the Oil & Gas UK Guidelines for the Suspension and Abandonment of Wells, Issue 4, published in July 2012. Once all the deep-set reservoir barriers have been established, a shallow cement plug will be placed and the casing strings cut a minimum of 10 ft below the seabed and recovered to surface, such that no well component is left protruding above the seabed. A seabed survey will then be undertaken using an ROV, to check for debris.

All well abandonment activities will be consented, completed and reported under current UK permitting legislation, i.e. Petroleum Operations Notices for the use and discharge of chemicals during abandonment, and OPPC permit for the discharge of reservoir hydrocarbons during abandonment operations. Individual close-out reports will be prepared for each well and these will be submitted to and stored in the UK National Hydrocarbon Data Archive.

Applicable regulatory permit applications will be submitted in support of any such work that is to be carried out.

## 3.4 Drill Cuttings

### Drill Cuttings Decommissioning Options

The Renee wells were drilled in 1998, while the Rubie well was drilled in 1999. The upper hole sections were drilled with Water-Based Muds (WBM) and cuttings from this section were discharged onto the seabed. Subsequently, part of the small cuttings pile that had accumulated on the seabed as a result of the top hole drilling was shifted to allow the Xmas trees and wellheads to be properly located on the seabed.

As the Rubie drill cuttings pile and the third Renee (plugged and abandoned) cutting pile resulted from single wells and are indistinguishable from the surrounding sediments, they are therefore exempt from further assessment. Following analysis of the drilling data it was also concluded that the Renee Field did not require full Stage 1 screening. This assessment was made on the following basis:

- The two wells were drilled at some distance approximately 68m from each other and cannot be seen as contributing to a single cuttings pile as defined by the OSPAR recommendation.
- The cuttings from sections drilled with OBM were returned to the drilling rig through the mud return line where they will have been contained throughout the rig's closed loop OBM system. The recovered mud and cuttings were skipped and shipped to shore.

On this basis it is anticipated that no further decommissioning actions will be required for drill cuttings in the Renee Rubie Fields (Table 3.5).

**Table 3.5 Drill Cuttings Decommissioning Options**

| |
|---|
| How many drill cuttings piles are present? ***3 (Three associated with the Renee wellheads and one associated with the Rubie wellhead).*** |
| **Pile 1: Rubie production** |
| How has the cuttings pile been screened? ***Desktop exercise*** |
| Dates of sampling (if applicable) ***Not Applicable*** |
| Sampling to be included in pre-decommissioning survey? ***No*** |
| Does it fall below both OSPAR thresholds? ***Yes*** |
| Will the drill cuttings pile have to be displaced in order to remove the jacket? ***Not Applicable*** |
| What quantity would have to be displaced / removed? ***Not Applicable*** |
| Have you carried out a Comparative Assessment of options for the Cuttings Pile? ***No*** |
| Tick options examined for this pile: |
| 1) Remove and re-inject☐ |
| 2) Remove and treat onshore☐ |
| 3) Remove and treat offshore☐ |
| 4) Relocate on seabed☐ |
| 5) Cover☐ |
| 6) Leave in place ✓ |
| 7) Other (describe briefly)☐ |
| **Pile 2: Renee water injection** |
| How has the cuttings pile been screened? ***Desktop exercise*** |
| Dates of sampling (if applicable) ***Not Applicable*** |
| Sampling to be included in pre-decommissioning survey? ***No*** |
| Does it fall below both OSPAR thresholds? ***Yes*** |

Will the drill cuttings pile have to be displaced in order to remove the jacket? ***Not Applicable***
What quantity would have to be displaced / removed? ***Not Applicable***
Have you carried out a Comparative Assessment of options for the Cuttings Pile? ***No***

Tick options examined for this pile:
1) Remove and re-inject☐
2) Remove and treat onshore☐
3) Remove and treat offshore☐
4) Relocate on seabed☐
5) Cover☐
6) Leave in place ✓
7) Other (describe briefly)☐

**Pile 3: Renee production**
How has the cuttings pile been screened? ***Desktop exercise***
Dates of sampling (if applicable) ***Not Applicable***
Sampling to be included in pre-decommissioning survey? ***No***
Does it fall below both OSPAR thresholds? ***Yes***
Will the drill cuttings pile have to be displaced in order to remove the jacket? ***Not Applicable***
What quantity would have to be displaced / removed? ***Not Applicable***
Have you carried out a Comparative Assessment of options for the Cuttings Pile? ***No***

Tick options examined for this pile:
1) Remove and re-inject☐
2) Remove and treat onshore☐
3) Remove and treat offshore☐
4) Relocate on seabed☐
5) Cover☐
6) Leave in place ✓
7) Other (describe briefly)☐

**Pile 4: Renee production (plugged and abandoned)**
How has the cuttings pile been screened? ***Desktop exercise***
Dates of sampling (if applicable) ***Not Applicable***
Sampling to be included in pre-decommissioning survey? ***No***
Does it fall below both OSPAR thresholds? ***Yes***
Will the drill cuttings pile have to be displaced in order to remove the jacket? ***Not Applicable***
What quantity would have to be displaced / removed? ***Not Applicable***
Have you carried out a Comparative Assessment of options for the Cuttings Pile? ***No***

Tick options examined for this pile:
1) Remove and re-inject☐
2) Remove and treat onshore☐
3) Remove and treat offshore☐
4) Relocate on seabed☐
5) Cover☐
6) Leave in place ✓
7) Other (describe briefly)☐

## 3.5 Waste Streams

Tables 3.6 and 3.7 provide an outline of the disposal routes for the items outlined in the inventory, and any associated materials contained within or on the outside of the

remaining facilities. Further information on waste streams is provided in section 13 of the Rubie/ Renee Environmental Statement (ES) (BMT Cordah, 2013b).

**Table 3.6: Waste Stream Management Methods**

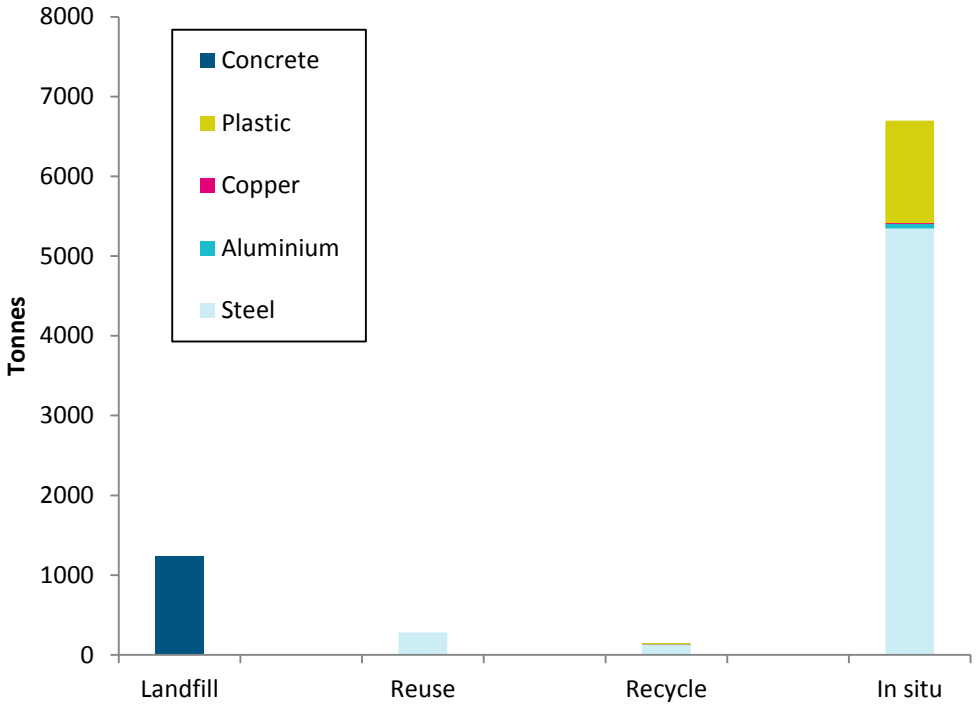
| Waste Stream | Removal and Disposal method |
|---|---|
| Bulk Liquids | Not applicable |
| Marine growth | Removed onshore if any marine growth present. Disposal options will be managed through a Decommissioning Environmental Management Plan. |
| NORM/ LSA Scale | Presumed to be absent from Rubie/ Renee Facilities but disposed of according to the guidelines for the management of NORM (OGP, 2008) if found to be present. |
| Asbestos | Not applicable |
| Other hazardous wastes | Not applicable |
| Onshore Dismantling sites | Appropriate licensed sites will be selected. Chosen facility must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver innovative recycling options. |

**Table 3.7: Inventory Disposition**

| | Total Inventory Tonnage | Planned tonnage to shore (T) | Planned left *in situ (T)* |
|---|---|---|---|
| Installations (Including 3 wellheads, trees, guide-bases, RPM and COS) | 239 | 239 | 0 |
| Pipelines and umbilicals | 6,843 | 690 | 6,153 |
| Mattresses | 1,238 | 1,238 | 0 |

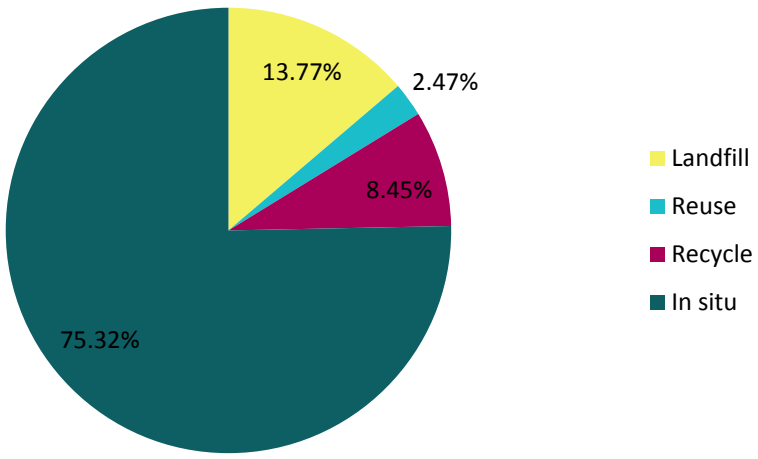
Figure 3.1 represents the ideal disposal routes for the decommissioned material and figure 3.2 shows the estimated percentages of material expected to be disposed of in landfill, to be recycled/ re-used and to remain *in situ*. The majority (comprising of the pipelines PL1616, PL1617, PL1618, PL1619, PL1620, PL1624, PL1625 and PL1626) will remain in situ. It is anticipated that approximately 1,000 tonnes of material, including the wellheads, will be re-used or recycled, although it is possible that surplus material (concrete in particular) will be disposed of at landfill sites.

**Figure 3.1: Bar chart of estimated tonnage and predicted disposal routes of decommissioned material.**




Note: Depending on the conditions of pipeline material recovered during decommissioning, a small proportion may be sent to landfill.

**Figure 3.2: Pie chart of estimated disposal location percentages**



# 4.0 ENVIRONMENTAL IMPACT ASSESSMENT

## 4.1 Environmental Sensitivities

Section 4 of the ES (BMT Cordah, 2013b) presents the findings of the Environmental Impact Assessment (EIA) undertaken by the Rubie/ Renee Section 29 Notice Holders for the recommended decommissioning option for the Rubie/ Renee subsea infrastructure. A breakdown of the main environmental sensitivities for the Rubie/ Renee area is provided in Table 4.1.

**Table 4.1: Environmental Sensitivities**

| Environmental Receptor | Main Features |
|---|---|
| **Conservation interests** | There are no known Annex I habitats in the Rubie/ Renee area. Marine conservation areas (SACs and MPAs) exist in UKCS Blocks to the east, north and west of the facilities. Some of which have qualifying features that meet those stated in Annex I.<br>Of the Annex II species, only the harbour porpoise has been sighted in the Rubie/ Renee Facilities area, with high abundance in July, moderate numbers throughout February and August and low numbers in January (UKDMAP 1998). |
| **Seabed** | Benthic communities in the Rubie/ Renee Facilities area are similar to those found throughout a large surrounding area of the northern North Sea. No rare species are known to occur in this area (Fugro ERT, 2011). |
| **Fish** | The Rubie/ Renee Facilities are located in spawning grounds for cod (Jan to Apr), Norway pout (Jan to Apr) and *Nephrops* (Jan to Dec); and in nursery grounds for anglerfish, blue whiting, cod, European hake, herring, ling, mackerel, *Nephrops*, Norway pout, sandeels, spotted ray, sprat, spurdog and whiting (Coull *et al*., 1998; Ellis *et al*., 2010). |
| **Marine Mammals** | Marine mammals sighted in and around the Rubie/ Renee Facilities area include minke whales, killer whales, white-beaked dolphins, white-sided dolphins, harbour porpoises, common dolphin and Risso's dolphin. Peak sightings generally occur from May to September (Reid *et al*., 2003; UKDMAP, 1998). |
| **Birds** | Seabird vulnerability to oil pollution in the Rubie/ Renee Facilities area is "very high" in October and November, "high" in January, July, August and September and moderate or Low for the remainder of the year except for December where there is no data. The overall vulnerability in the Rubie/ Renee Facilities area is "moderate" (JNCC, 1999). |
| **Onshore Communities** | An onshore decommissioning facility will be used that complies with all relevant permitting and legislative requirements |
| **Other Users of the Sea** | ***Fisheries***<br>The Rubie/ Renee Facilities area "medium" relative value for whitefish gear and a "very high" Nephrops relative value. Fishing effort is "low" for whitefish gear and "very high" for Nephrops. Historically, shellfish dominate the landings in the vicinity of the Rubie/ Renee facilities area targeting mostly Nephrops (Marine Scotland, 2012, 2011b).<br>***Shipping***<br>The majority of shipping volume comprises offshore industry shipping activity and cargo voyages. |
| **Atmosphere** | Local atmospheric conditions will be influenced by emissions from vessel usage during decommissioning operations and adjacent (operational) oil and gas facilities. |

Further details on environmental sensitivities are described in Section 4 of the ES (BMT Cordah 2013b).

## 4.2 Potential Environmental Impacts and their Management

**Environmental Impact Assessment Summary:**

- Overall, it is concluded that the environmental impacts of the proposed Rubie and Renee Fields decommissioning operations are unlikely to give rise to any significant, long-lasting environmental impacts. The area of seabed disturbed by the removal of infrastructure will be relatively small in comparison to that regularly affected by trawling activities. Disturbance to the seabed will also be temporary and re-colonisation of benthic habitats is expected to begin soon after decommissioning ends.
- The atmospheric emissions and energy use associated with the proposed decommissioning programme are not considered to be significant, given their relatively small scale in comparison with total UK emissions and the potential for cumulative or transboundary effects arising from activities is low.
- Materials brought to shore will be largely reused or recycled with only a small amount sent to landfill.
- There will be beneficial impacts from decommissioning the Rubie and Renee Fields, both to the environment and to society. The area will be opened up to fishing and a larger area of habitat will be available for colonisation by benthic fauna and demersal fish. Material that can be brought to shore and recycled will reduce the requirement for new material to be produced with associated and environmental benefits.

Table 4.2 outlines how any potential environmental impacts will be managed to minimise the impact on the surrounding environment.

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## Table 4.2: Environmental Impact Management

| Activity | Main Impacts | Management |
|---|---|---|
| Topsides Removal | • Not Applicable | Not Applicable |
| Floating facility removal | • Not Applicable | Not Applicable |
| Subsea Installation, and flowline removal | • Gaseous emissions from retrieval and disposal of equipment may cause temporary deterioration in local air quality and contribute to global processes such as global warming and acid rain deposition<br>• Underwater noise<br>• Disturbance to sediments and potential for debris to remain on the seabed.<br>• Accidental hydrocarbon release<br>• Gaseous emissions during cutting and re-cycling. Where materials are disposed of, use of landfill space and loss of resources. | • Emissions will be minimised through the use of well-maintained equipment.<br>• UK Hydrographical Office will be informed of all activities and any structures left in place. Endeavour will establish lines of communication to inform other sea users, including fishermen, of vessel operations during decommissioning.<br>• Offshore vessels will avoid concentrations of marine mammals<br>• Post-decommissioning debris removal and seabed environmental surveys will be undertaken.<br>• As part of the Rubie/ Renee OPEP, Endeavour have specialist oil spill response services provided by Oil Spill Response Ltd (OSRL).<br>• Strict compliance with legislation on wastes and emissions.<br>• Materials are re-used or re-cycled where possible.<br>• Compliance with UK waste legislation and Duty of Care.<br>• Use of designated licensed recycling and landfill sites only. |
| Decommissioning pipelines (left *in situ*) | • Gaseous emissions from retrieval and disposal of equipment may cause temporary deterioration in local air quality and contribute to global processes such as global warming and acid rain deposition<br>• Underwater noise<br>• Damage or loss of fishing gear<br>• Disturbance to sediments and potential for debris to remain on the seabed during cutting of the pipeline ends<br>• Deterioration of sediment structure and water quality around the pipeline.<br>• Potential effects on marine benthos and sediment chemistry. | • See subsea installations removal<br>• Underwater cutting is expected to be a short-term source of high-pitched sound. The operation of well-maintained equipment during decommissioning will ensure noise of operating machinery is kept as low as possible.<br>• Pipelines have been pre-flushed with chemicals approved by DECC and risk assessments will indicate the potential for any environmental impact.<br>• Pipeline ends and exposed areas will be buried in situ preventing the release of pipeline contents into the marine environment<br>• Rock placement will be deposited from a dedicated rock placement vessel using an ROV controlled fall pipe equipped with cameras, profiles and pipe tracker to ensure accurate placement of rock over the pipeline, minimising seabed disturbance.<br>• Post-decommissioning seabed environmental surveys will be undertaken. |
| Decommissioning stabilisation features | • Disturbance to sediments and potential for debris to remain on the seabed. | Post-decommissioning a debris survey will be undertaken to remove any objects remaining on the seabed. |
| Decommissioning drill cuttings (left *in situ*) | • Long term presence of hydrocarbons in sediments<br>• Leaching of hydrocarbons into the surrounding sediments and water column | The single Rubie drill cuttings pile is undetectable and is exempt from the stipulations of OSPAR (2006/5). The two Renee drill cuttings piles are thin and widely dispersed. Based on the volume calculation for the Renee drill cuttings piles, desk top studies estimate an oil leaching rate of 0.09 t/yr for this pile, well below the OSPAR threshold of 10 t/yr (HESS, 2009). |

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# 5.0 INTERESTED PARTY CONSULTATIONS

## Consultations Summary:

*NOTE: Consultations with JNCC, Marine Scotland, MCA and the SFF are on-going and will be included in the next submission of this DP.*

### Table 5.1 Summary of Consultee Comments

| Who | Comment | Response |
|---|---|---|
| **Informal Consultations** | | |
| DECC | DECC 22nd July 2013 | Response sent to BMT Cordah |
| DECC | Advisory meeting with DECC on 3rd September 2013 | Endeavour and BMT Cordah to amend decommissioning programmes accordingly |
| | | |
| **Statutory Consultations** | | |
| | | |
| | | |
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# 6.0 PROGRAMME MANAGEMENT

## 6.1 Project Management and Verification

An Endeavour project management team will be appointed to manage the operations of competent contractors selected for the well abandonment, decommissioning, and removal and disposal scopes of work. Endeavour Safety, Health and Environmental Management Processes will be used to govern operational controls, hazard identification and risk management. The work will be coordinated with due regard to the interfaces with other operators' oil and gas assets and with other users of the sea. Endeavour will control and manage the progress of all permits, licences, authorisations, notices, consents and consultations required. Any changes to these decommissioning programmes will be discussed with DECC and approval sought if substantive.

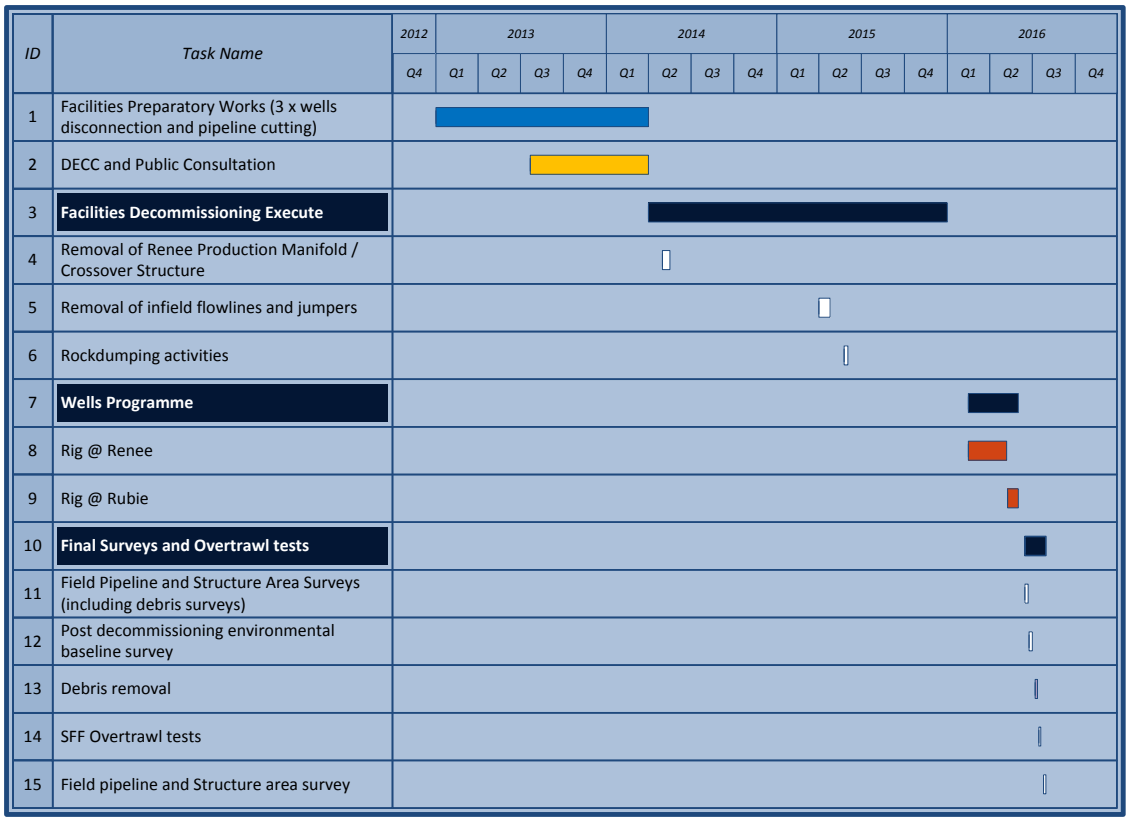
## 6.2 Post-Decommissioning Debris Clearance and Verification

ROV surveys will be undertaken throughout the decommissioning process tracker to ensure that operations go smoothly, minimising seabed and water column disturbance.

A post decommissioning site survey will be carried out around 500 m radius of installation sites and 200 m corridor along each existing pipeline route. Any remaining significant seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the platform area. This will be followed by a field ROV survey report to be submitted to DECC.

## 6.3 Schedule

Figure 6.1 provides a breakdown of the decommissioning schedule including the management, legal, financial, regulatory and operational aspects.



| ID | Task Name | 2012 | 2013 | | | | 2014 | | | | 2015 | | | | 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| 1 | Facilities Preparatory Works (3 x wells disconnection and pipeline cutting) | | | | | | | | | | | | | | | | | |
| 2 | DECC and Public Consultation | | | | | | | | | | | | | | | | | |
| 3 | **Facilities Decommissioning Execute** | | | | | | | | | | | | | | | | | |
| 4 | Removal of Renee Production Manifold / Crossover Structure | | | | | | | | | | | | | | | | | |
| 5 | Removal of infield flowlines and jumpers | | | | | | | | | | | | | | | | | |
| 6 | Rockdumping activities | | | | | | | | | | | | | | | | | |
| 7 | **Wells Programme** | | | | | | | | | | | | | | | | | |
| 8 | Rig @ Renee | | | | | | | | | | | | | | | | | |
| 9 | Rig @ Rubie | | | | | | | | | | | | | | | | | |
| 10 | **Final Surveys and Overtrawl tests** | | | | | | | | | | | | | | | | | |
| 11 | Field Pipeline and Structure Area Surveys (including debris surveys) | | | | | | | | | | | | | | | | | |
| 12 | Post decommissioning environmental baseline survey | | | | | | | | | | | | | | | | | |
| 13 | Debris removal | | | | | | | | | | | | | | | | | |
| 14 | SFF Overtrawl tests | | | | | | | | | | | | | | | | | |
| 15 | Field pipeline and Structure area survey | | | | | | | | | | | | | | | | | |

**Figure 6.1: Gantt Chart of Project Plan**

## 6.4 Costs

The provisional costs associated with the decommissioning of the infrastructure are outlined in Table 6.1.

**Table 6.1: Provisional Decommissioning Programmes costs**

| Item | Estimated Cost (£m) |
|---|---|
| Pipeline(s) and Umbilical(s) Infrastructure Decommissioning | *Provided to DECC* |
| Subsea Installation(s) and Stabilisation Feature(s) | *Provided to DECC* |
| Well Abandonment | *Provided to DECC* |
| Continuing Liability – Future Pipeline and Environmental Survey Requirements | *Provided to DECC* |
| **TOTAL** | *Provided to DECC* |

*Note that this section contains commercially sensitive, confidential data which Endeavour will only make available to DECC. Costs are therefore omitted from this version of and are submitted to DECC under cover of a separate letter.*

## 6.5 Close Out

In accordance with the DECC Guidelines, a close out report will be submitted to DECC within four months of the completion of the offshore decommissioning scope, explaining any variations from the Decommissioning Programmes, including debris removal and independent verification of seabed clearance and the results first post-decommissioning environmental survey, if available at that time.

## 6.6 Post-Decommissioning Monitoring and Evaluation

Post decommissioning site surveys will be carried out around a 500 m radius of installation sites, wellhead sites and 200 m corridor along each existing pipeline route in late June/ early July 2015 (Figure 6.1). The Environmental Surveys will also focus on chemical and physical disturbance of the decommissioning activities with the findings being compared against those from the pre- decommissioning survey. Any seabed debris will be recovered for onshore disposal or recycling in line with existing disposal methods. Independent verification of seabed state will be obtained by trawling the 500 m safety zone surrounding the installations and a 200 m corridor along the pipeline routes. Results of this survey will be available once the work is complete, with a copy forwarded to DECC.

All pipeline routes and structure sites will be the subject of surveys when decommissioning activity has concluded. After the surveys have been sent to DECC and reviewed, a post monitoring survey regime will be agreed by both parties, typically two post decommissioning environmental surveys and structural pipeline surveys.

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# 7.0 SUPPORTING DOCUMENTS

*NOTE: A full list of supporting documents will be included in the final version of the Decommissioning Programme once these documents have been finalised*

**Table 7.1: Supporting Documents**

| Document Number | Title |
|---|---|
| TBC | Rubie/ Renee Comparative Assessment |
| TBC | Rubie/ Renee Environmental Statement |
| | |

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## 8.0 PARTNER(S) LETTER(S) OF SUPPORT

*NOTE: To be included in a later submission of this DP*

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# APPENDIX 1: STATUTORY CONSULTEES CORRESPONDENCE

**Endeavour Energy UK Ltd**

**40 Queens Road**
Aberdeen
AB15 4YE
Scotland
**Telephone** +44 (0)1224 202 850
**Website** http://www.endeavourcorp.com/

## September 2013

*Name*
*Organisation*
*Address*
*Address*
*Address*
*Postcode*

Dear ####,

Endeavour Energy UK Limited, as operator of the Rubie and Renee Fields in Blocks 15/21, 15/26, 15/27 and 15/28 of the Central North Sea, wish to advise you of the impending submission of decommissioning programmes for the offshore subsea installations and pipelines associated with these fields. Section 29 notices issued under The Petroleum Act 1998 to Endeavour Energy UK, DECC have advised that consultation regarding the decommissioning programmes is required before the document is submitted for approval. The document attached to this letter describes the proposed plan and schedule, along with some background information on the fields.

We invite you to respond to this letter with any comments or questions you may have on the information contained herein, within 28 days of the date of this letter, to enable timely submission of the decommissioning programmes. Alternatively, if you would prefer to arrange a meeting to discuss the programmes in further detail, please don't hesitate to contact me. You will of course be given the opportunity to provide comments formally during the consultation period once the decommissioning programmes are issued for comment.

Yours Sincerely,

Endeavour Energy UK
40 Queens Road
Aberdeen AB15 4YE