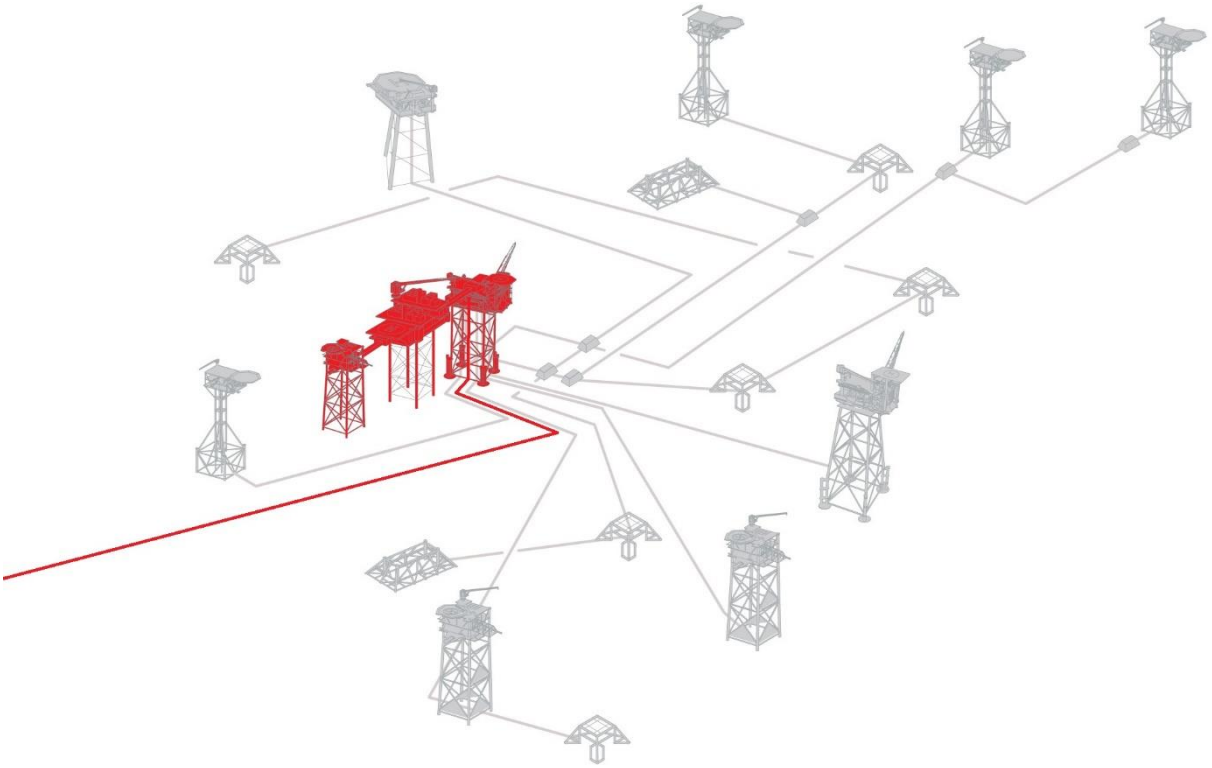
CHRYSAOR



# CDP3 Decommissioning Programmes for Murdoch Installations and Trunk Pipelines, CDP3

Murdoch MA, Murdoch MC, Murdoch MD, & Associated Trunk Pipelines

# DOCUMENT CONTROL

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| | | | |

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# TABLE OF TERMS AND ABBREVIATIONS

| Abbreviation | Explanation |
|---|---|
| ~ | Approximately |
| AB | Deprecated term 'Abandoned' but included in Table 2.7.1 to indicate extent to which wells have been decommissioned (Phase 1, Phase 2, etc.) |
| approaches | Refer to pipelines as they come nearer to the risers on the installations |
| CA | Comparative Assessment (Report) |
| CCUS | Carbon Capture Usage and Storage |
| Chrysaor | Chrysaor Production (UK) Limited |
| CMS | Caister Murdoch System |
| $CO_2$ | Carbon Dioxide |
| CSV | Construction Support Vessel |
| Cut and lift | The 'cut and lift' method of removing trenched and buried pipelines would involve excavating the pipelines from within the seabed and thereafter cutting the pipeline into recoverable and transportable lengths. |
| CWC | Concrete Weight Coated |
| Dia. / dia. | Diameter |
| DNO | DNO North Sea (ROGB) Limited |
| DOC | The blue line on the burial profiles shows the profile of cover. The area between the blue line and maroon line (DOL) shows the depth of sediment above the top of the pipeline. |
| DOL | Pipeline trench profile; depth of lowering to top of pipe. |
| DP | Decommissioning Programme |
| EA | Environmental Appraisal |
| EMS | Environmental Management System |
| EPS | European Protected Species |
| ESDV | Emergency Shutdown Valve |
| EU | European Union |
| EUNIS | European Nature information System |
| FBE | Fusion Bonded Epoxy |
| FishSAFE | The FishSAFE database contains a host of oil & gas structures, pipelines, and potential fishing hazards. This includes information and changes as the data are reported for pipelines and cables, suspended wellheads pipeline spans, surface & subsurface structures, safety zones& pipeline gates (www.fishsafe.eu) |
| FOCI | Feature of Conservation Importance |
| FPAL | First Point Assessment Limited (UK) |
| Freespan | Sometimes referred to as a 'span'. Similar to an exposure except that the whole of the section of pipeline is visible above the seabed rather than just part of it. Once the height and length dimensions meet or exceed certain criteria it becomes a potential snagging hazard, and the span becomes reportable to FishSAFE and is called a 'reportable span' |
| Full removal | The full removal options for decommissioning the pipelines would involve using the 'cut and lift' method of removal especially for the larger pipeline and the presence of concrete weight coating and piggyback clamps on the platform approaches |
| GJ | Giga Joules (unit of energy in the International System of Units) |
| GMG | Global Marine Group |
| HAT | Highest Astronomical Tide |
| HLV | Heavy Lift (Crane) Vessel |
| HSE | Health & Safety Executive |
| HVAC | Heating Ventilation and Air Conditioning |
| ID | Inside Diameter |
| in | Inch (1in = 25,4mm) |
| Ineos | INEOS UK SNS Limited |
| Ithaca | Ithaca Energy (UK) Limited |
| JUWB | Jack Up Work Barge |
| kg | kilogram |
| km | kilometre |
| KP | Kilometre Point, usually measured from point of origin, the start of the pipeline |

| Abbreviation | Explanation |
|---|---|
| LAT | Lowest Astronomical Tide |
| Leave *in situ* | Leave *in situ* for pipelines would involve leaving trenched and buried pipelines *in situ* and risk assessing any exposures and spans |
| LOD | Limit of Detection |
| m, µm | metres, micrometre (1m = 1,000,000µm) |
| MCV | Multipurpose Construction Vessel |
| MCZ | Marine Conservation Zone |
| MeOH | Methanol |
| mg/l | milligrams per litre |
| MLWM | Mean Low Water Mark (1.341km to 'Gas Line Termination' at TGT) |
| mm | Millimetre (1m = 1000mm) |
| MoD | Ministry of Defence |
| Murdoch Installation | The Murdoch Installation comprises Murdoch MA, Murdoch MC, and Murdoch MD. All installations are bridge linked. |
| n/a | Not Applicable |
| N,S,E,W | North, South, East & West |
| Neptune | Neptune E&P UKCS Limited |
| NFFO | National Federation of Fishermen's Organisations |
| NIFPO | Northern Ireland Fish Producers Organisation |
| NORM | Naturally Occurring Radioactive Material |
| NUI | Normally Unattended Installation |
| ø | Diameter, usually outside diameter |
| OD | Outside Diameter |
| OGA | Oil and Gas Authority |
| OGUK | Oil and Gas United Kingdom |
| OPRED | Offshore Petroleum Regulator for Environment and Decommissioning |
| OSPAR | Oslo-Paris Convention |
| PAH | Polycyclic aromatic hydrocarbon |
| Partial removal | The partial removal decommissioning option for pipelines would involve excavating trenched and buried pipelines local to the exposed ends of the pipeline and thereafter effecting removal of the section of pipeline using the 'cut and lift' method. Typically, the excavated locations and cut pipeline ends in the seabed may need to be remediated in some way, either by back-filling the excavated material or by depositing rock |
| Perenco | Perenco UK Limited |
| PMA | Pigging Manifold Assembly (Kelvin) |
| Pipeline crossing | A pipeline with a higher identification number crosses over the top of a pipeline with a lower identification number. Typically, pipeline crossings might be protected with concrete mattresses and overlain with deposited rock |
| PL | Pipeline identification numbers |
| Platform | Installation, typically comprising topsides and jacket |
| Premier | Premier Oil E&P UK Limited |
| PSNL | Pigging Skid Northern Lobe (PL1922 & PL1925, PL1923 & PL1926) inside Murdoch 500m zone |
| PSSL | Pigging Skid Southern Lobe or Cavendish Subsea Pigging Skid (PL2430 & PLU2431, PL1924 & PL1927) inside Murdoch 500m zone |
| PWA | Pipeline Works Authorisation |
| Reportable span | A reportable span is a significant span which meets set criteria (FishSAFE criteria) of height above the seabed and span length (10m long x 0.8m high) |
| Riser | Pipe that connects the pipeline to the topsides' pipework |
| SAC | Special Area of Conservation |
| SACFOR | The semi-quantitative SACFOR abundance scale (super-abundant, abundant, common, frequent, occasional, rare) was developed to support the observation of marine habitats, communities and species and is widely used in the UK |
| SDV | Shutdown Valve |
| SEI | Significant Environmental Impact |
| SFF | Scottish Fishermen's Federation |

| Abbreviation | Explanation |
|---|---|
| Shell | Shell U.K. Limited |
| SNS | Southern North Sea |
| SOPEP | Shipboard Oil Pollution Emergency Plans |
| SPA | Special Protection Area |
| Span | Sometimes referred to as a 'free-span'. Similar to an exposure except that the whole of the section of pipeline is visible above the seabed rather than just part of it. Once the height and length dimensions meet or exceed certain criteria it becomes a potential snagging hazard, and the span becomes reportable to FishSAFE and is called a 'reportable span' |
| SSCV | Semi-Submersible Crane Vessel |
| SPS | Subsea Pigging Skid (Kelvin-Murdoch) inside Murdoch 500m zone |
| STA | Subsea Tee Assembly (Kelvin) |
| Tampnet AS | Owners of the 36km long MCCS fibre-optic cable between two platforms in the Southern North Sea, and the NorSea Com 1 fibre-optic cable, connecting Draupner, Ula, Ekofosk, Valhal and Murdoch platforms to Lowestoft in Suffolk, UK and Kårstø, Rogaland, Norway. https://www.tampnet.com/about |
| Te | Tonne(s) |
| Tee | Section of pipeline furnished with additional valves and pipework to allow for future expansion. It is also provided with a protection structure with its own protection and stabilisation features such as mattresses and deposited rock |
| TGT | Theddlethorpe Gas Terminal (WGS84 Degrees: 53.362438° N .237783° E) |
| THC | Total Hydrocarbon Content |
| Trenched and buried | Pipeline installed into a trench and covered in seabed sediment. Refer Figure 1.1.1 |
| UK | United Kingdom |
| UK BAP | UK Biodiversity Action Plan |
| UKCS | United Kingdom Continental Shelf |
| UKOOA | United Kingdom Offshore Operators Association |
| UTM | Universal Transverse Mercator (Coordinate System) |
| WGS84 | World Geodetic System 84 is the reference coordinate system used by the Global Positioning System |
| Wintershall | Wintershall Noordzee B.V. |
| x | Number of (e.g. 16x = 16 in Number) |

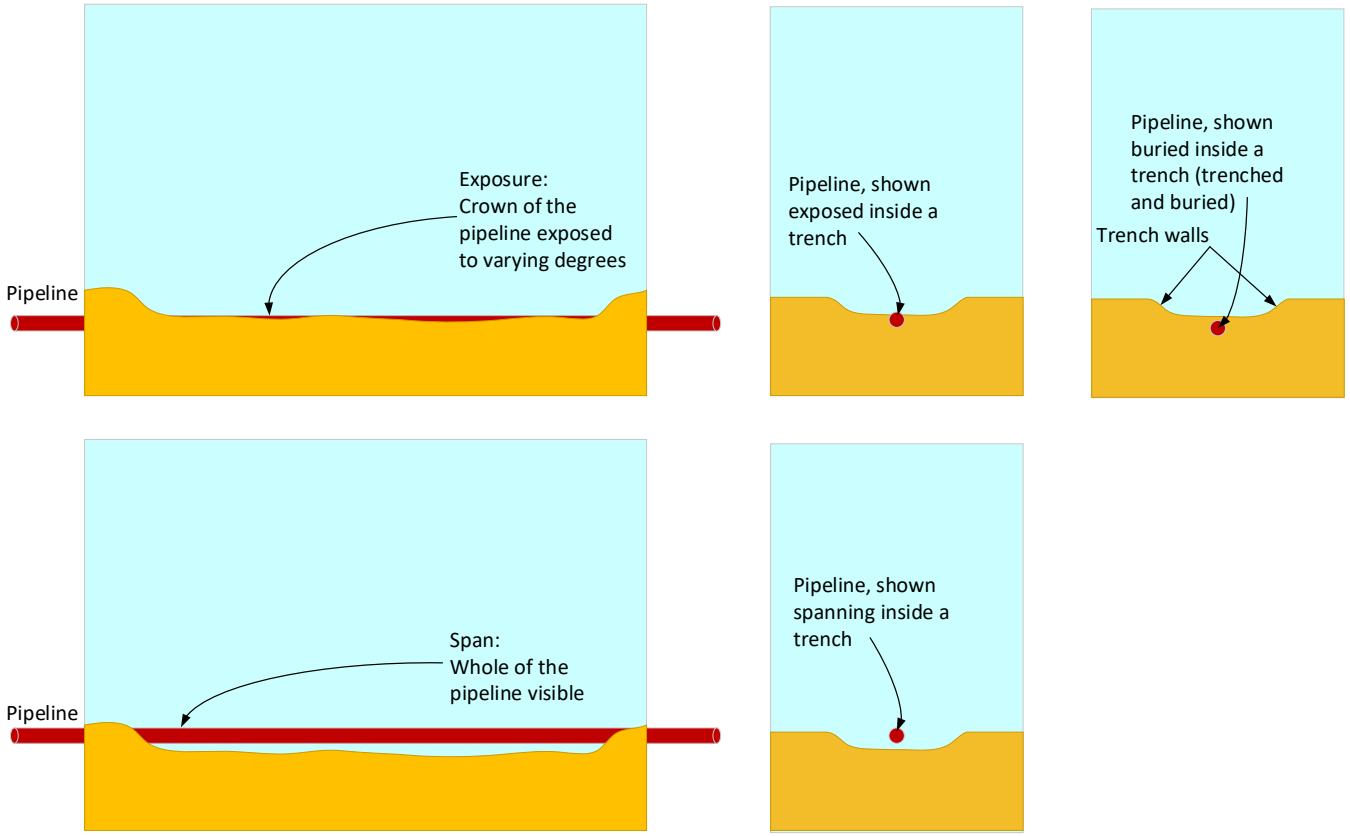



***Figure 1.1.1: The difference between pipeline burial, exposures, and spans[1]***

[1] Trench walls may or may not be prominent

# 1 Executive summary

## 1.1 Combined Decommissioning Programmes

This document contains three Decommissioning Programmes, one for each set of notices under Section 29 of the Petroleum Act 1998. The Decommissioning Programmes are:

- Caister-Murdoch System (CMS) joint facilities installations, including Murdoch MA, and Murdoch MC;
- The Murdoch MD installation & template;
- The pipelines associated with the Murdoch MD installation, PL929 and PL930.

Collectively the Murdoch MA, Murdoch MC, and Murdoch MD installations are known as the Murdoch Installation. Although decommissioning of these installations and pipelines is being treated in this document as a standalone project, the operational phase is being carried out as part of a wider decommissioning campaign in the CMS area. Chrysaor Production (U.K.) Limited (Chrysaor) shall also continue to explore cost saving synergies with other projects.

## 1.2 Requirement for Decommissioning Programmes

**Installations:** In accordance with the Petroleum Act 1998, Chrysaor, as operator of the CMS Joint Facilities Installations and Murdoch MD installation, and on behalf of the Section 29 notice holders listed in Table 1.4.2, and Table 1.4.3, is applying to the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) to obtain approval for decommissioning the installations detailed in Section 2 of this document. Following Statutory Consultation, the partner letters of support are included in Appendix 5.

**Pipelines:** In accordance with the Petroleum Act 1998, Chrysaor, as operator of the CMS trunklines, and on behalf of the Section 29 notice holders listed in Table 1.4.5 is applying to OPRED to obtain approval for decommissioning the pipelines detailed in Section 2 of this document. Following Statutory Consultation, the partner letters of support are included in Appendix 5.

**Risers:** In accordance with the Petroleum Act 1998, Chrysaor, as operator of the Boulton BM, Ketch and Schooner risers, and on behalf of the Section 29 notice holders listed in Table 1.4.6, Table 1.4.7 and Table 1.4.8 is applying to OPRED to obtain approval for decommissioning the risers detailed in Section 2 of this document. Partner letters of support will be provided separately to OPRED following statutory consultation.

In conjunction with public, stakeholder and regulatory consultation, the Decommissioning Programmes are submitted in compliance with national and international regulations and OPRED decommissioning guidance notes [12]. The schedule outlined in this document is for a decommissioning project with the well decommissioning and platform removal preparation commencing in 2021. Decommissioning of the facilities will continue for a further 8 years until completion in 2029.

## 1.3 Introduction

### 1.3.1 Overview of Murdoch Installation and CMS

Chrysaor's Caister-Murdoch System joint facilities installations, including Murdoch MA and Murdoch MD are collectively referred to as the Murdoch installation. The development consists of a single 'gas gathering' and controls complex which collected gas from a total of 8 'satellite' platforms and 8 subsea centres up to ~45km from the main Murdoch installation. Some of the platforms and subsea centres are operated and owned by companies other than Chrysaor.

The Murdoch installation is located in UKCS block 44/22a and consists of three bridge-linked platforms for accommodation, compression and wellheads creating three independent platforms designated MA, MC, and MD. The MC platform is linked to the MD platform by a 37m bridge at main deck level. MA platform is linked to the MC platform by a 45m bridge, connecting the mezzanine deck on MC to Level 1 of MA. The Murdoch Installation is based on three separate four leg vertical structures with horizontal bracing systems. The jackets are fixed to the seabed using piles. Above the jackets, vertical structural members support the topside modules and decking. The major decking on MD and MC consists of an under-deck, Cellar Deck, Main Deck and

Helideck, some areas have mezzanine or intermediate deck levels. There are four levels and a helideck on MA.

MA and MD support the pipeline and umbilical infrastructure. MA provided the electrohydraulic power for the umbilicals, while Murdoch MD received gas and exported it to TGT. Murdoch MD also imported methanol from TGT and distributed it to the various satellites and beyond. MD was built and installed in 1993, MC was built and installed in 1996 and MA was built and installed in 2002. First production was achieved in 1993. Production ceased in 2018. It is located ~160km North East-East of Easington on the East Riding of Yorkshire Coast, England.

The surface installation wells that are tied back to Murdoch MD (44/22a) include Boulton BM (44/21a), Caister CM (44/23a), Katy KT (44/19b), Kelvin TM (44/18 & 44/23b), Munro MH (44/17b). The subsea wells that are tied back to Murdoch include Murdoch K (KM) (44/22a), McAdam (MM) (44/17c), Hawksley (EM) (44/17a), Boulton H (HM) (44/22b) and Watt (QM) (44/22b). Collectively this is called the CMS.

The pipelines are all now shutdown, but gas used to be exported from CMS via Murdoch MD to TGT using the 26in trunk gas pipeline PL929. PL930 is a 4in methanol pipeline originating from TGT and tied into Murdoch MD which used to supply to the various satellite installations using 3in pipelines. It lies in a separate trench to PL929 although it crosses over PL929 about 20km from mean low water mark (MLWM). Most of the smaller 3in pipelines are piggybacked to the larger gas pipeline for each facility. The exception to this is the 3in Caister pipeline PL936 that was buried in a separate trench to its sister 16in gas pipeline PL935.

There are pipelines from other installations (e.g. Cavendish RM, Hunter HK, Rita RH, Ketch KA, Schooner SA) that also tied into Murdoch, but these are subject to decommissioning programmes being prepared by others and are therefore out of scope. Decommissioning Programmes for all these third party assets are available on the regulator's website (https://www.gov.uk/guidance/oil-and-gas-decommissioning-of-offshore-installations-and-pipelines).

The Decommissioning Programmes for the Caister platform, pipelines and the Caister-Murdoch System installations and infrastructure are addressed in Decommissioning Programmes submitted separately [1], [2] and [3].

The Murdoch installation acts as host to several third-party pipelines. These are presented in Figure 1.3.1.

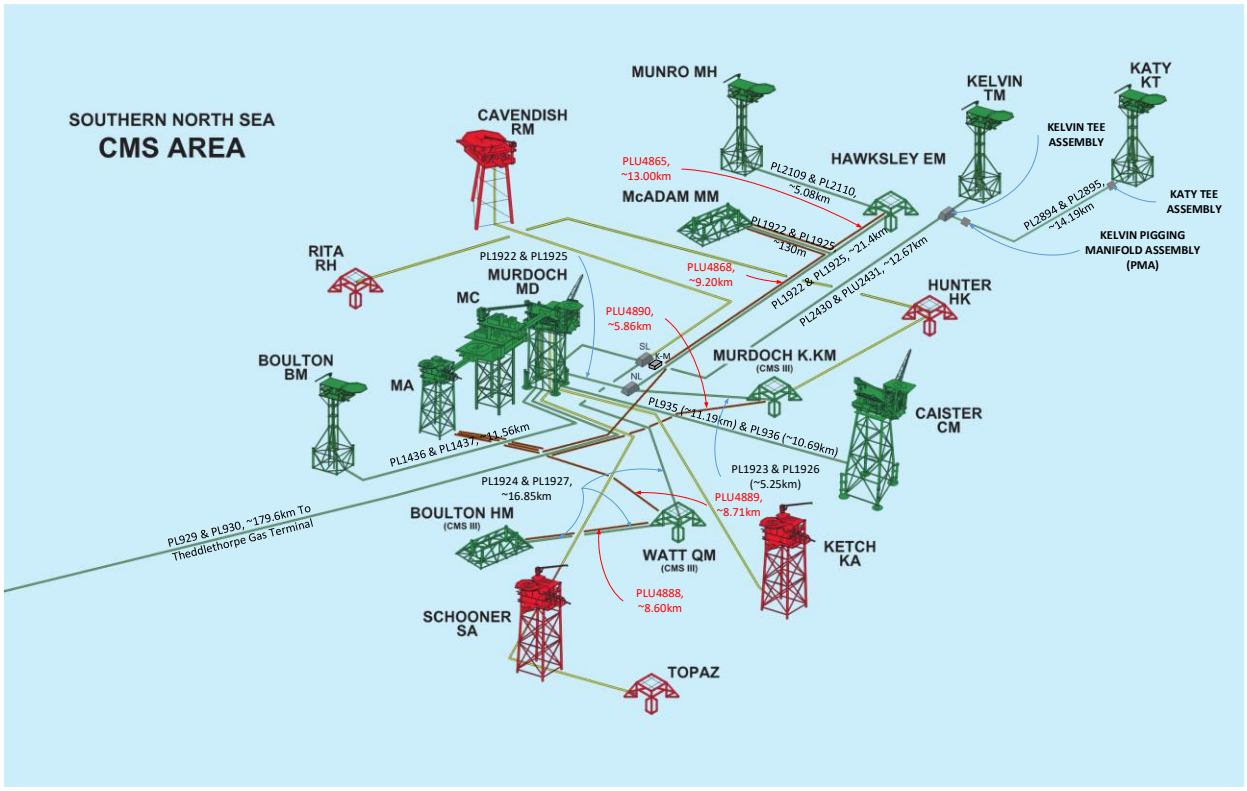



***Figure 1.3.1: Murdoch and CMS Area Installations and Pipelines***

The application for Cessation of Production of the Murdoch and CMS fields (including Boulton, Munro, McAdam, Kelvin, and Katy) was accepted by OGA on 10 May 2018. For Caister the CoP application was

accepted by OGA on 04 May 2016, for Hawksley, the CoP application was accepted by OGA on 10 February 2011 and for Watt the CoP application was accepted by OGA on 11 November 2009. Production and export from Murdoch MD ceased in 2018.

Chrysaor is aware that pipeline PL929 has been flagged as having potential for re-use for CCUS projects and have undertaken discussions with the OGA. The current proposed decommissioning option for PL929 does not preclude the potential for its reuse in the future.

### 1.3.2 Murdoch MA

Murdoch MA acts as origin for three umbilicals. The decommissioning of these is outside the scope of the CDP3 Decommissioning Programmes. Where available, the relevant Decommissioning Programmes are italicised in parentheses, together with the date if they have already been approved by the Secretary of State:

- PLU4686 96mm dia. electrohydraulic umbilical to McAdam MM ~9.2km long (*CDP2,* [3]);
- PLU4889 88mm dia. electrohydraulic umbilical to Watt QM ~8.7km long (*CDP2,* [3]);
- PLU4890 82mm dia. electrohydraulic umbilical to Murdoch K.KM ~5.9km long (*CDP2,* [3]).

All these umbilicals are out of use. The chemical cores have been flushed and filed with seawater. The hydraulic cores have been left filled with water-based hydraulic fluids.

### 1.3.3 Murdoch MC

Murdoch MC has no subsea infrastructure associated with the installation.

### 1.3.4 Murdoch MD

As well as being the hub for PL929 and PL930, Murdoch MD acts as host to several pipelines. All these pipelines are out of use and have been flushed, cleaned, and filled with seawater but they may remain connected to their respective risers.

The decommissioning of following pipelines is being addressed herein:

- PL929 26in Murdoch MD to TGT pipeline ~179.64km;
- PL930 4in TGT to Murdoch MD pipeline ~179.58km.

The decommissioning of the following pipelines is addressed in the CDP1b Decommissioning Programmes for Caister Pipelines [2].

- PL935 16in Caister CM to Murdoch MD ~11.2km long;
- PL936 3in MeOH Murdoch MD to Caister CM ~10.7km long.

The decommissioning of the risers for the following pipelines is addressed in the CDP2 Decommissioning Programmes for Caister-Murdoch System Installations and Associated Pipelines [3]:

- PL1922 10in Hawksley EM to Murdoch MD pipeline ~21.62km long;
- PL1925 3in Murdoch MD to Hawksley EM pipeline ~21.53km long;
- PL1924 10in Boulton HM to Murdoch MD riser ~76m long;
- PL1927 3in Murdoch MD to Boulton HM riser ~49m long.

The decommissioning of following risers is being addressed herein:

- PL1222 16in Schooner pipeline riser, ~56.5m long;
- PL1223 3in Schooner pipeline riser, 109.3m long;
- PL1311[2] 10in Murdoch MD riser tie-in flange to ESD valve, riser ~75m long;
- PL1312[2] 3in ESDV Murdoch MD to subsea tie-in flange, riser ~72m long;
- PL1612 18in Ketch pipeline riser, ~66.3m long;
- PL1613 3in Ketch pipeline riser, ~59.3m long;

[2] PL1311 is the riser for PL1436 at Murdoch MD and PL1312 is the riser for PL1437 at Murdoch MD.

The decommissioning of the following pipelines is addressed in the Decommissioning Programmes for Cavendish which were approved in June 2020.

- PL4612 Cavendish umbilical.

### 1.3.5 Murdoch installation 500m zone

The decommissioning of the following third-party pipelines and associated protection structures inside the 500m zone is also outside the scope of the CDP3 Decommissioning Programmes but for completeness they are listed here. Where available, the relevant Decommissioning Programmes are italicised in parentheses, together with the date if they have been approved by the Secretary of State.

- PL1222 16in Schooner pipeline, ~28.5km long (*Schooner*, August 2019);
- PL1223 3in Schooner pipeline, ~28.5km long, (*Schooner*, August 2019);
- PL1612 18in Ketch pipeline, ~26.9km long (*Ketch*, August 2019);
- PL1613 3in Ketch pipeline, ~26.9km long (*Ketch*, August 2019),
- PL2284 10in Cavendish pipeline, ~47.4km long (*Cavendish*, June 2020);
- PL2285 2in Cavendish pipeline, ~47.4km long (*Cavendish*, June 2020);
- PL4612 1.25in Cavendish fibre-optic cable, ~47.3km long (*Cavendish*, June 2020);

- PL935 16in Caister CM to Murdoch MD pipeline, ~11.2km long (*CDP1b*, [2]);
- PL936 3in Murdoch MD to Caister CM pipeline, ~10.7km long (*CDP1b*, [2]);
- PL1436 10in Boulton BM to Murdoch MD pipeline, ~11.6km long (*CDP2,* [3]);
- PL1437 3in Murdoch MD to Boulton BM pipeline, ~11.6km long (*CDP2,* [3]);
- PL1922 10in Hawksley EM to Murdoch MD pipeline, ~21.6km long (*CDP2,* [3]);
- PL1925 3in Murdoch MD to Hawksley EM pipeline, ~21.5km long (*CDP2,* [3]);
- PL1923 10in Murdoch K.KM to PSNL pipeline, 5.25km long (*CDP2,* [3]);
- PL1926 3in PSNL to Murdoch K.KM pipeline, ~5.25km long (*CDP2,* [3]);
- PL1924 10in Boulton HM to Murdoch MD pipeline, ~16.8km long (*CDP2,* [3]);
- PL1927 3in Murdoch MD to Boulton HM pipeline, ~16.9km long (*CDP2,* [3]);
- PL2430 12in Kelvin TM to PSSL pipeline, ~12.67km long (*CDP2,* [3]);
- PLU2431 3in PSSL to Kelvin TM pipeline, ~12.67km long (*CDP2,* [3]).

The Tampnet cable referenced in this document used to be connected to Murdoch MD but it has now been disconnected and rerouted. It remains operational.

### 1.3.6 Submission of Decommissioning Programmes

Following public, stakeholder and regulatory consultation, the Decommissioning Programmes will be submitted without derogation and in full compliance with the OPRED decommissioning guidance notes [12]. The Decommissioning Programmes explain the principles of the removal activities and are supported by an Environmental Appraisal [4] and a Comparative Assessment [5].

## 1.4 Decommissioning overview

### 1.4.1 Installations

| Table 1.4.1 Installations being decommissioned | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Field names** | | **Quad / Block** | | **Surface installations** | | | | | **Distances** | |
| **Fields** | **Water depth (LAT)** | **Type of production** | **UKCS block(s)** | **Number** | **Function** | **Type** | **Topsides mass (Te)** | **Jacket mass (Te)[3]** | **Distance to median (Netherlands)** | **Distance from nearest UK coastline** |
| **Murdoch MA** | ~29.8m | n/a | 44/22a | 1 | Accommodation Platform | Steel Jacket (4-Legs) | 835.3 | 1,012.9 | ~30km | ~160km |
| **Murdoch MC** | ~29.8m | Gas, condensate | 44/22a | 1 | Compression Platform | Steel Jacket (4-Legs) | 4,393.3 | 1,692.0 | ~30km | ~160km |
| **Murdoch MD** | ~29.8m | Gas, condensate | 44/22a | 1 | Wellhead Platform | Steel Jacket (4-Legs) | 2,256.5 | 2,907.3 | ~30km | ~160km |

| **Drill cuttings** | | | **Subsea installations** | | **Number of wells** | |
|---|---|---|---|---|---|---|
| **Field** | **Drill cuttings pile(s)** | **Total estimated volume ($m^3$)** | **Number** | **Type** | **Platform** | **Subsea** |
| **Murdoch MA** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Murdoch MC** | n/a | n/a | n/a | n/a | n/a | n/a |
| **Murdoch MD** | n/a | n/a | 1 | Drilling template | 8 | n/a |

[3] Includes mass of piles.

| Table 1.4.2: Installation Section 29 Notice Holder details – CMS Joint Facilities | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration number** | **Equity interest** |
| Chrysaor Production (U.K.) Limited (Operator) | 00524868 | 31.75% |
| Chrysaor (U.K.) Beta Limited | 02316577 | 15.00% |
| Neptune E&P UKCS Limited | 03386464 | 16.25% |
| Premier Oil E&P UK Limited | 02761032 | 20.00% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 17.00% |

| Table 1.4.3: Installation Section 29 Notice Holder details – Murdoch MD (incl. template) | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration number** | **Equity interest** |
| Chrysaor Production (U.K.) Limited | 00524868 | 54.50% |
| Neptune E&P UKCS Limited | 03386464 | 11.50% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 34.00% |

### 1.4.2 Pipelines

| Table 1.4.4: Pipelines being decommissioned | | |
|---|---|---|
| **Field** | **Number of pipelines** | |
| **Murdoch** | 2 | Refer Table 2.3.1 |

| Table 1.4.5: Pipeline Section 29 Notice Holder details – CMS trunklines | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration number** | **Equity interest** |
| Chrysaor (U.K.) Beta Limited | 02316577 | 15.00% |
| Chrysaor Production (U.K.) Limited | 00524868 | 31.75% |
| Neptune E&P UKCS Limited | 03386464 | 16.25% |
| Premier Oil E&P UK Limited | 02761032 | 20.00% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 17.00% |

### 1.4.3 Risers

Decommissioning of the following risers remains the responsibility of the owners of the CMS joint facilities installations. This section has been added to document this.

| Table 1.4.6: Pipeline Section 29 Notice Holder details – Boulton BM (PL1311 & PL1312) risers | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration Number** | **Equity Interest** |
| Chrysaor Production (U.K.) Limited (Operator) | 00524868 | 31.75% |
| Chrysaor (U.K.) Beta Limited | 02316577 | 15.00% |
| Neptune E&P UKCS Limited | 03386464 | 16.25% |
| Premier Oil E&P UK Limited | 02761032 | 20.00% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 17.00% |

| Table 1.4.7: Pipeline Section 29 Notice Holder details – Ketch (PL1612 & PL1613) risers | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration number** | **Equity interest** |
| Chrysaor Production (U.K.) Limited (Operator) | 00524868 | 31.75% |
| Chrysaor (U.K.) Beta Limited | 02316577 | 15.00% |
| Neptune E&P UKCS Limited | 03386464 | 16.25% |
| Premier Oil E&P UK Limited | 02761032 | 20.00% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 17.00% |

| Table 1.4.8: Pipeline Section 29 Notice Holder details – Schooner (PL1222 & PL1223) risers | | |
|---|---|---|
| **Section 29 Notice Holders** | **Registration number** | **Equity interest** |
| Chrysaor Production (U.K.) Limited (Operator) | 00524868 | 31.75% |
| Chrysaor (U.K.) Beta Limited | 02316577 | 15.00% |
| Neptune E&P UKCS Limited | 03386464 | 16.25% |
| Premier Oil E&P UK Limited | 02761032 | 20.00% |
| Tullow Oil PLC | 03919249 | - |
| Tullow Oil SK Limited | 05287330 | 17.00% |

## 1.5 Summary of proposed Decommissioning Programmes

| Table 1.5.1: Summary of Decommissioning Programmes | |
|---|---|
| **Proposed decommissioning solution** | **Reason for selection** |
| **1. Topsides (Murdoch MA, MC & MD)** | |
| Complete removal and recycling. The topsides will be removed and recovered to shore and recycled. Environmental permit applications required for work associated with removal of the topsides will be applied for. | Allows jacket to be removed and maximises recycling of materials. |
| **2. Jackets (Murdoch MA, MC & MD)** | |
| Complete removal and recycling. The leg piles will be cut 3.0m below seabed and the jacket, along with all the risers will be removed and recovered to shore for recycling.<br>Environmental permit applications required for work associated with removal of the jacket will be applied for. | To comply with OSPAR requirements leaving unobstructed seabed. Removes a potential obstruction to fishing operations and maximises recycling of materials. |
| **3. Pipelines (Murdoch MD only)** | |
| PL929 & PL930 (each ~179.6km long between end of 525m long deposited rock and MLWM) have been flushed and will be left buried *in* situ along with the pipeline stabilisation features at KP4.8 and KP20.0 (refer Figure 2.6.3 and Figure 2.6.4 respectively).<br>PL929 & PL930, on approach to Murdoch MD remove all the associated mattresses and underlying piggybacked pipelines ~147m long up to point of burial at the deposited rock.<br>If the mattresses where PL930 separates from PL929 at KP4.8 (Figure 2.6.4) KP180.409 (Figure 2.6.1) or where PL930 crosses over PL929 at KP20 (Figure 2.6.3) are covered in sediment and barely distinguishable from the surrounding seabed they will be left *in situ*. Otherwise, if the perimeter edge of any one mattress at the location is more than 50% exposed, they will all be completely removed at the location along with | Outside the 500m safety zones the pipelines will already have been exposed to fishing activity and the situation would be no different to what it is now. The comparative assessment recommends that the pipelines be left *in situ*.<br>Potentially leaves PL929 available for reuse.<br>From the survey data reviewed, PL929 exhibits good burial depth and good depth of cover, although the expectation is that the pipeline suffers from exposures for ~7km. Regrettably no recent survey data were available for PL930 but given the bathymetry of the seabed it is assumed that PL930 would exhibit the same burial characteristics as PL929, but this will need to be confirmed by survey, noting that while PL929 was originally |

| Table 1.5.1: Summary of Decommissioning Programmes | |
|---|---|
| **Proposed decommissioning solution** | **Reason for selection** |
| the underlying surface laid flexible pipespools (~40m, ~80m, and 40m long respectively).<br>Should the point of burial of the cut pipeline end be in the seabed, it will be excavated locally with small quantities of rock potentially used to ensure that the remaining pipeline end(s) are buried.<br>Each cut pipeline or umbilical end at point of burial at or within deposited rock will be dealt with by the deposition of a small quantity of rock on top of or adjacent to existing rock. The amount used will be kept to a practical minimum but is estimated to be up to 25Te.<br>The deposition of such rock will be covered by a deposit consent.<br>Where identified it is intended that mattresses be fully recovered to shore. However, should practical difficulties ensue OPRED will be consulted;<br>All materials that are identified for removal will be recovered to shore for reuse, recycling, or disposal as appropriate.<br>Any permit applications required for work associated with cutting and removal will be submitted. | trenched to a minimum between 0.5m and 0.7m below seabed, PL930 was trenched to a minimum 1.0m to top of pipe below seabed throughout its length. PL930 will be surveyed in 2022.<br>Minimal seabed disturbance, lower energy usage, reduced risk to personnel engaged in the activity.<br>Reduces the requirement for the introduction of new material such as deposited rock to the Dogger Bank Special Area of Conservation (SAC).<br>Monitoring to confirm the pipelines remain buried will be completed to a schedule agreed with OPRED.<br>Given the mobile nature of the seabed the exposures will meantime be monitored but not remediated. |
| **4. Risers** | |
| All risers will be completely removed to shore for recycling along with the Murdoch MD jacket.<br>Environmental permit applications required for work associated with decommissioning of the risers will be applied for. | To comply with OSPAR requirements leaving unobstructed seabed. Removes a potential obstruction to fishing operations and maximises recycling of materials. |
| **5. Well decommissioning (Murdoch MD only)** | |
| Some of the wells have been partially decommissioned with conductor removal activities remaining. All the well decommissioning will be completed in accordance with the version of Oil & Gas UK Well Decommissioning Guidelines relevant at the time and to comply with HSE “Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996”.<br>Environmental permit applications required for work associated with decommissioning the wells will be applied for. | Meets the OGA and HSE regulatory requirements. |
| **6. Drill cuttings (Murdoch MD only)** | |
| None found. | No drill cuttings piles have been identified by seabed survey. |
| **7. Interdependencies** | |
| The whole of the three installations will be removed. The piles will be cut with seabed sediment potentially being displaced to allow access for cutting.<br>No third-party pipeline crossings will be disturbed as a result of the decommissioning proposals, although three umbilicals cross over the pipelines near Murdoch MD. This crossing is to be removed as explained in the CDP2 Decommissioning Programmes [3].<br>Any concrete mattresses and exposed grout bags that are removed to gain access to infrastructure will be fully recovered to shore for re-use, recycling, or disposal as appropriate. Grout bags that are exposed will also be removed to shore for re-use, recycling or disposal as appropriate. Deposited rock will remain *in situ*. | |

## 1.6 Field location incl. field layout and adjacent facilities

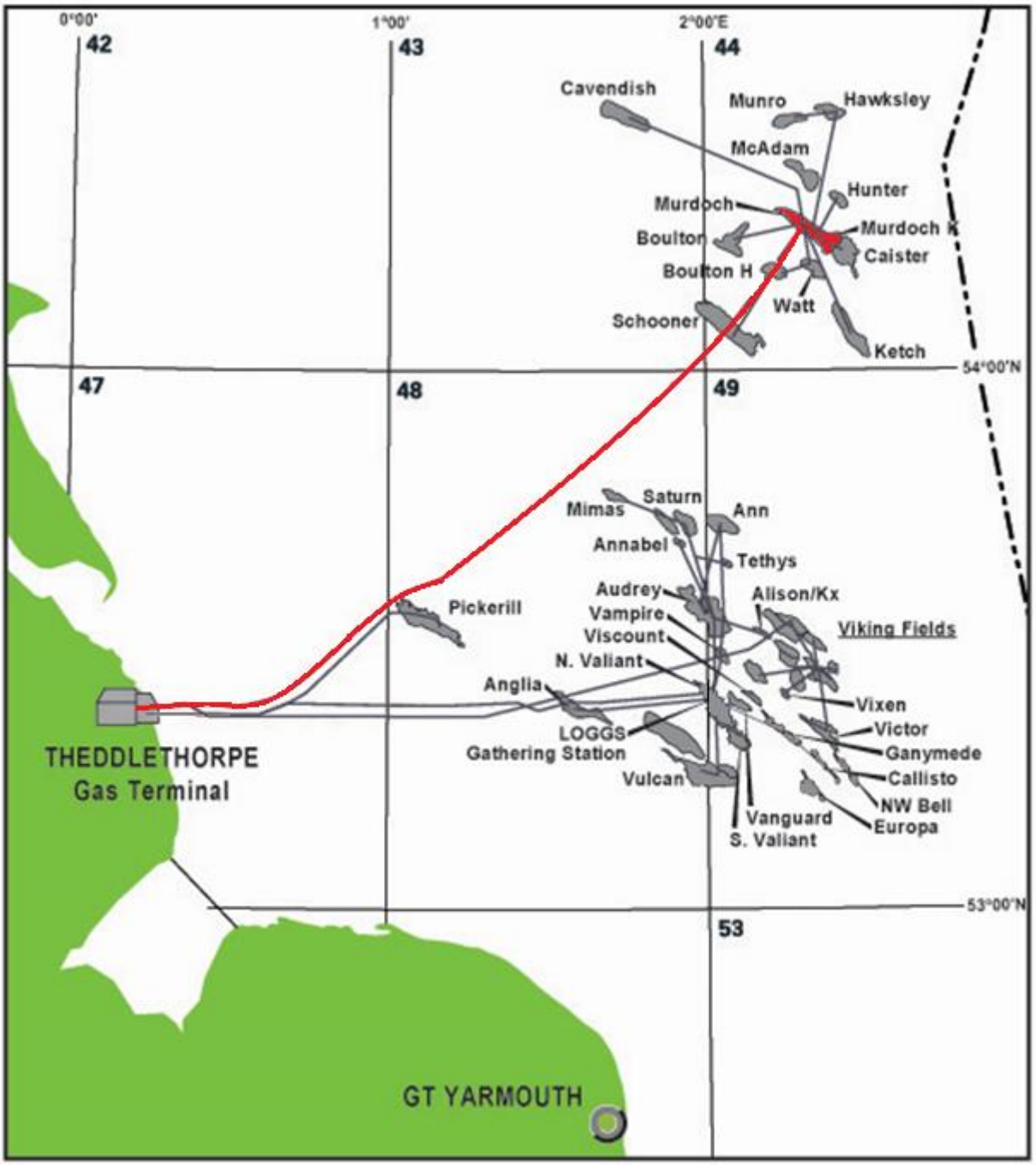



***Figure 1.6.1: Murdoch installation location in UKCS (indicated in red)***

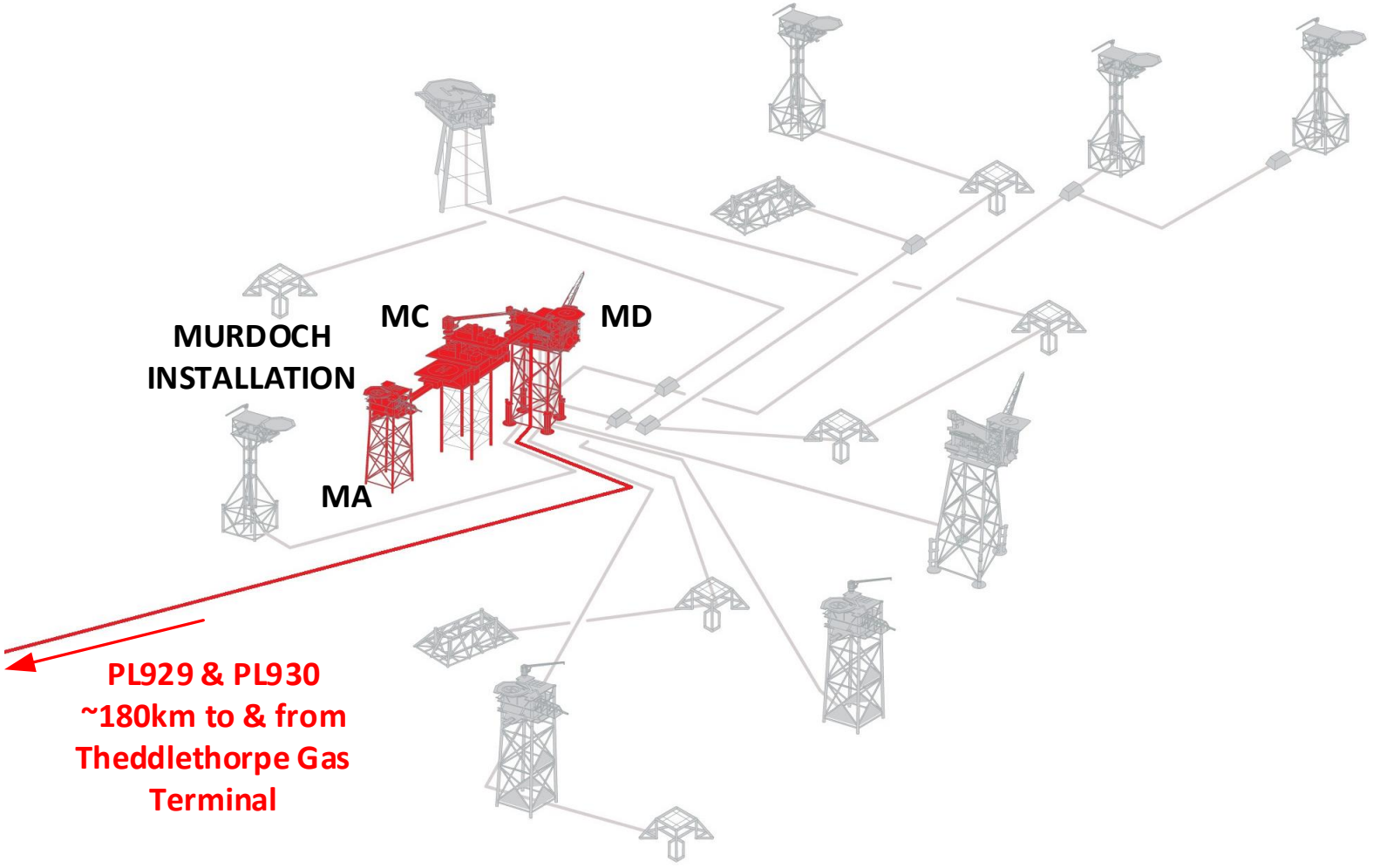



***Figure 1.6.2: Murdoch installation layout***

| Table 1.6.1: List of adjacent facilities | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Owner** | **Name** | **Type** | **Murdoch MA** | **Murdoch MC** | **Murdoch MD** | **Information** | **Status** |
| Chrysaor | Murdoch MA | Accommodation Platform | n/a | SW, 0.09km | SW, 0.16km | Subject of this DP | Out of use |
| Chrysaor | Murdoch MC | Compression Platform | NE, 0.09km | n/a | SW, 0.07km | Subject of this DP | Out of use |
| Chrysaor | Murdoch MD | Drilling Platform | NE, 0.2km | NE, 0.1km | n/a | Subject of this DP | Out of use |
| Chrysaor | Murdoch K.KM | Subsea Template (1-Slot) | ESE, 5.6km | ESE, 5.5km | ESE, 5.5km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Boulton BM | Wellhead Platform | WSW, 11.4km | WSW, 11.4km | WSW, 11.5km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | McAdam MM | Subsea Template (2-Slot) | N, 8.7km | N, 8.6km | N, 8.6km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Munro MH | Wellhead Platform | NNW, 18.4km | NNW, 18.4km | NNW, 18.3km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Hawksley EM | WHPS (1-Slot) | N, 21.3km | N, 21.2km | N, 21.2km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Kelvin TM | Wellhead Platform | NE, 12.5km | NE, 12.4km | NE, 12.3km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Katy KT | Wellhead Platform | NE, 26.5km | NE, 26.4km | NE, 26.3km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Watt QM | WHPS (1-Slot) | SSE, 8.4km | SSE, 8.4km | SSE, 8.5km | Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Boulton HM | WHPS (1-Slot) | SSW, 11.5km | SSW, 11.6km | SSW, 11.7km | Refer DP for CDP2 [3] | Out of use |
| Ineos | Cavendish RM | Fixed Platform (NUI) | NWW, 44.3km | NWW, 44.3km | NWW, 44.3km | DP approved May 2020 | Out of use |
| Chrysaor | PSSL | Pigging skid & protection structure | NE, 0.23km | NNE, 0.14km | NNE, 0.07km | Inside Murdoch 500m zone; Refer DP for CDP2 [3] | Out of use |
| Chrysaor | PSNL | Pigging skid & protection structure | NE, 0.23km | NE, 0.15km | NE, 0.07km | Inside Murdoch 500m zone; Refer DP for CDP2 [3] | Out of use |
| Chrysaor | Kelvin/Murdoch SPS | Pigging skid & protection structure | NE, 0.28km | NNE, 0.2km | NNE, 0.12km | Inside Murdoch 500m zone; Refer DP for CDP2 [3] | Out of use |
| Premier | Hunter HK | WHPS | NE, 7.9km | NE, 7.8km | NE, 7.8km | Export via Murdoch K.KM DP approved in April 2021 | Out of use |
| Premier | Rita | WHPS | W, 7.4km | W, 7.4km | W, 7.5km | Export via Hunter HK and Murdoch K.KM. DP approved April 2021 | Out of use |
| DNO | Ketch KA | Piled steel jacket | SE, 26.7km | SE, 26.7km | SE, 26.7km | DP approved Aug 2019 | Out of use |
| DNO | Schooner SA | Piled steel jacket | SSW, 28.2km | SSW, 28.3km | SSW, 28.4km | DP approved Aug 2019 | Out of use |
| Ineos | Topaz | WHPS | S, 36.1km | S, 36.2km | S, 36.3km | DP approved Feb 2021 | Out of use |
| Chrysaor | Kelvin TM STA | Pipeline Tee Piece | NE, 12.4km | NE, 12.4km | NE, 12.3km | Refer DP for CDP2 [3] | Out of use |

| Table 1.6.1: List of adjacent facilities | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Owner** | **Name** | **Type** | **Murdoch MA** | **Murdoch MC** | **Murdoch MD** | **Information** | **Status** |
| Chrysaor | Kelvin PMA | PMA | NE, 12.5km | NE, 12.4km | NE, 12.3km | Refer DP for CDP2 [3] | Out of use |
| Wintershall | Wingate | Satellite Platform | NEE, 19.9km | NEE, 19.8km | NEE, 19.8km | | Operational |
| Chrysaor | Katy Tee | Pipeline Tee Piece | NE, 26.5km | NE, 26.4km | NE, 26.3km | Refer DP for CDP2 [3] | Out of use |
| Perenco | Tyne | Wellhead Platform | NNE, 22.5km | NNE, 22.4km | NNE, 22.3km | DP approved Jan 2019 | Out of use |
| Neptune | Minke | Wellhead Platform | E, 27.3km | E, 27.2km | E, 27.2km | DP approved Sept 2019 | Out of use |
| Various | Various | Umbilical crossings | Within Murdoch 500m zone | | | Refer Table 2.5.1 | Out of use |
| Tampnet | Tampnet fibre-optic cables | Cable crossings | Refer Figure 2.5.1 and Figure A1.1.1 in Appendix 1 for general routing of the Tampnet cables, and the crossing over PL929 & PL930 at KP19.097. | | | Refer Table 2.5.1 for Tampnet cable crossing | Operational |
| **Impacts of decommissioning proposals** | | | | | | | |
| No impact is expected although the pipeline crossings associated with PLU4686, PLU4888, and PLU4890 will be affected by the decommissioning proposals and will need to be dealt with in a coordinated effort. Refer Table 2.5.1 and the Decommissioning Programmes for CDP2 [2]. | | | | | | | |

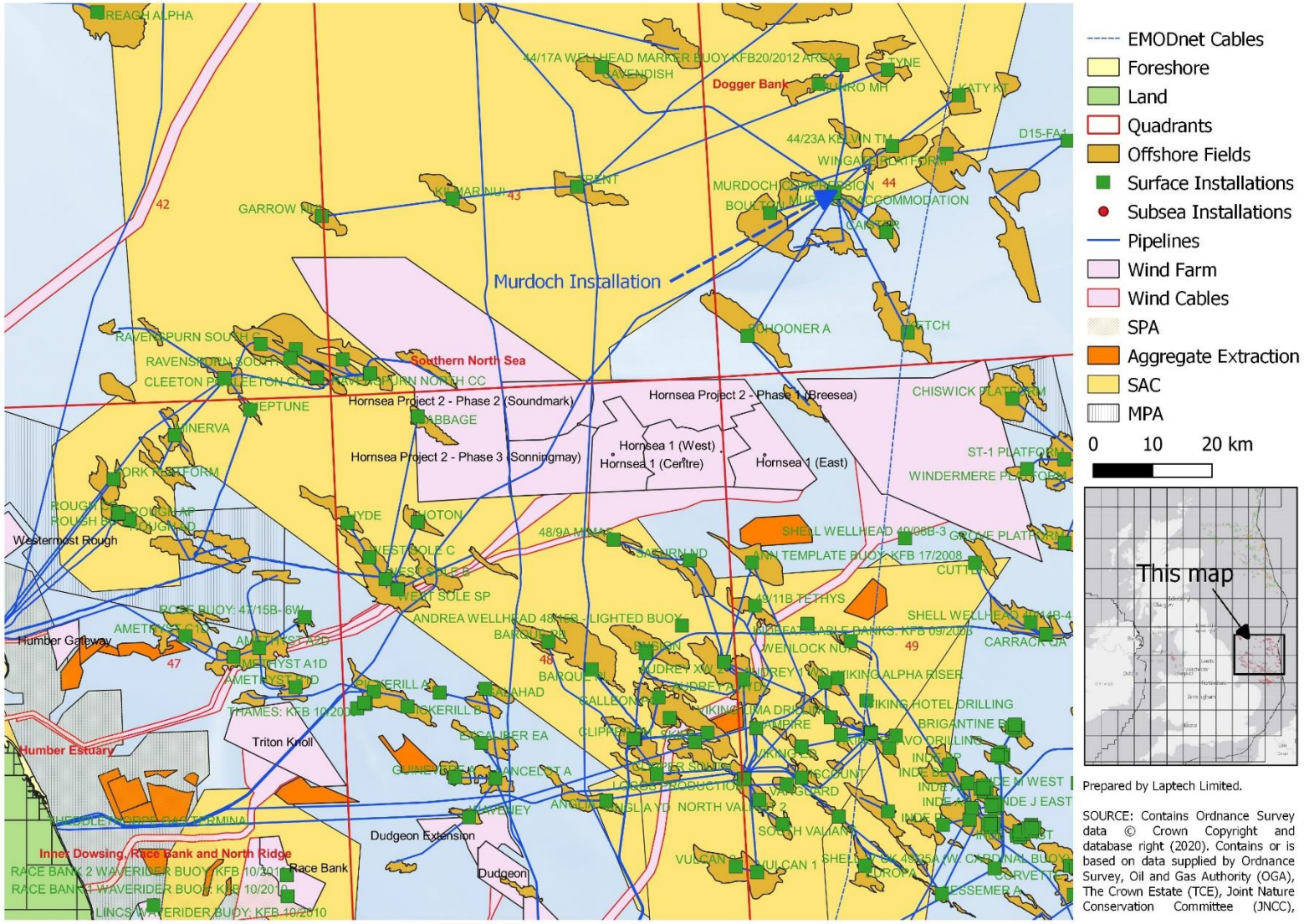



***Figure 1.6.3: Location, adjacent facilities, and environmentally sensitive areas***

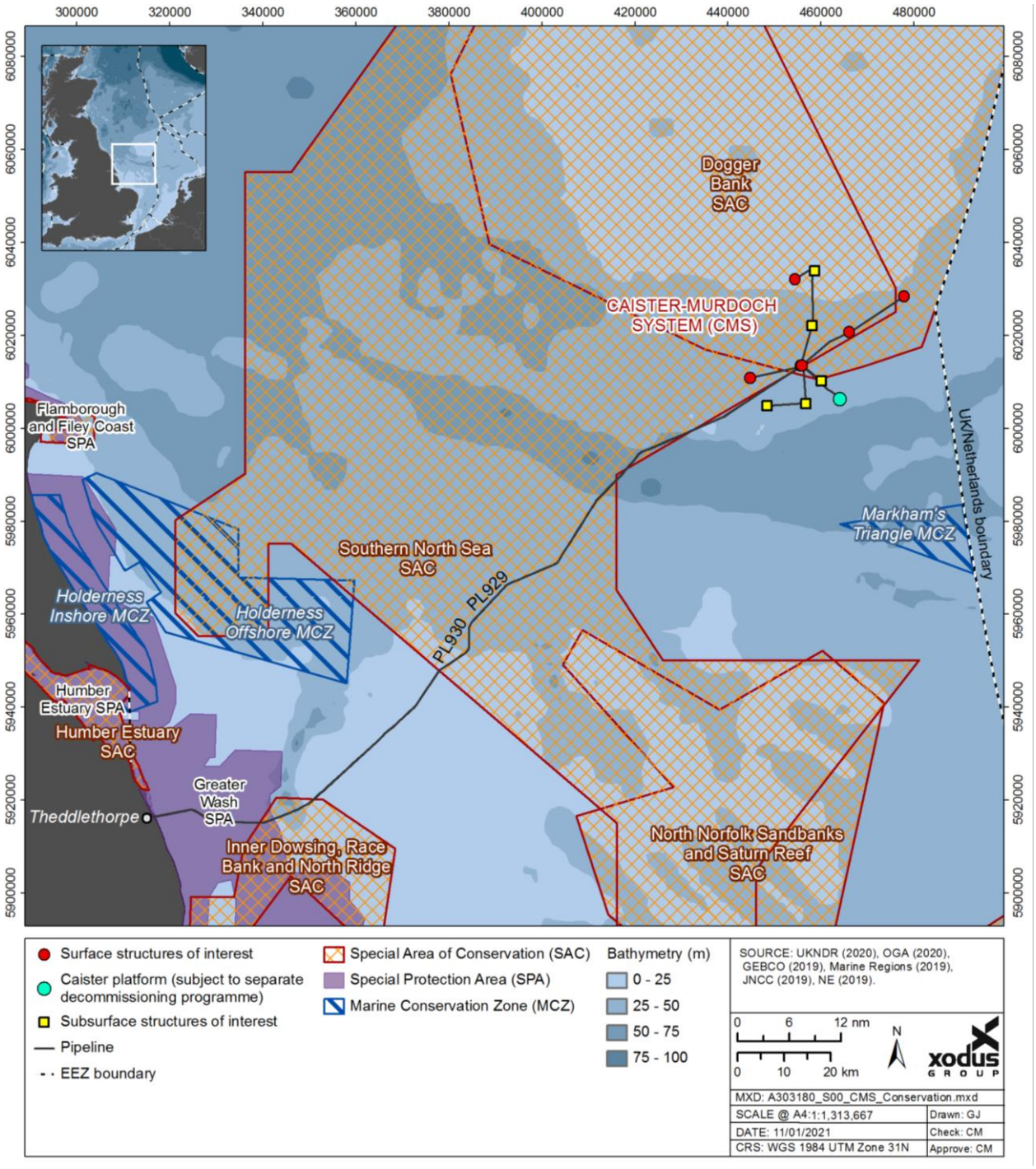



***Figure 1.6.4: Location and environmentally sensitive areas***

## 1.7 Industrial implications

It is Chrysaor's intention to develop a contract strategy and Supply Chain Action Plan that will result in an efficient and cost-effective execution of the decommissioning works. Principles of the contracting and procurement strategies to be used by Chrysaor as operator and on behalf of the other Section 29 notice holders, for the decommissioning of the Murdoch Installation (Murdoch MA, Murdoch MC, and Murdoch MD) and associated pipelines are listed below:

1) Chrysaor participates in the PILOT Share Fair events providing one-to-one sessions with the UK supply chain on the SNS decommissioning programmes and timeline.
2) The First Point Assessment (FPAL) database is the primary source for establishing tender lists for contracts or purchases valued at US$ 100,000 and above, although it is also used under this limit.
3) Chrysaor is committed to competitively bidding all its major contracts where possible and practicable. We are supporters of the UK Supply Chain Code of Practice and our performance in this regard has been acknowledged through Excellence Awards from Oil & Gas UK.
4) Chrysaor are active participants in various industry initiatives including:
    a. Oil & Gas UK Supply Chain Forum;
    b. Inventory sharing initiative (Ampelius);
    c. OGA Decommissioning & Supply Chain Task Forces.

# 2 Description of items to be decommissioned

## 2.1 Surface facilities (Topsides and Jackets)

| Table 2.1.1: Surface facilities information | | | | | | | |
|---|---|---|---|---|---|---|---|
| Name | Facility type | Location | Topsides / facilities | | Jacket | | |
| | | WGS84 Decimal<br>WGS84 Decimal minute | Mass (Te) | No of modules | Mass (Te)[4] | No of legs, piles | Mass of piles (Te) |
| Murdoch MA | Fixed Steel Jacket | 54.269009° N 2.321724° E<br>54°16.1405' N 02°19.3034' E | 835.3 | 1 | 672.9 | 4, 4 | 340.0 |
| Murdoch MC | Fixed Steel Jacket | 54.269407° N 2.322904° N<br>54°16.1644' N 02°19.3742' E | 4,393.3 | 1 | 1,217.6 | 4, 4 | 474.4 |
| Murdoch MD | Fixed Steel Jacket | 54.269861° N 2.323702° E<br>54°16.1916' N 02°19.4221' E | 2,256.5 | 1 | 2,089.6 | 4, 4 | 817.7 |

***Figure 2.1.1: Photograph of the Murdoch installation (left to right, MA, MC & MD)***

[4] Jacket mass excluding piles.

*Figure 2.1.2: Photograph of the Murdoch installation (left to right, MD, MC & MA)*

## 2.2 Subsea installations

| Table 2.2.1: Subsea installation and stabilisation features | | | | |
|---|---|---|---|---|
| **Total Number** | **Size/Mass (Te)** | **Location(s) WGS84 Decimal** | **Locations(s) WGS84 Decimal Minute** | **Comments / Status** |
| 1 | 7.7m x 8m x 3.75m<br>418 | 54.269861° N<br>2.323702° E | 54°16.1916' N<br>02°19.4221' E | 3x 30inOD piles |
| **NOTE:**<br>The Murdoch template is installed within the footprint of the Murdoch MD jacket. Refer Figure 2.2.1. | | | | |

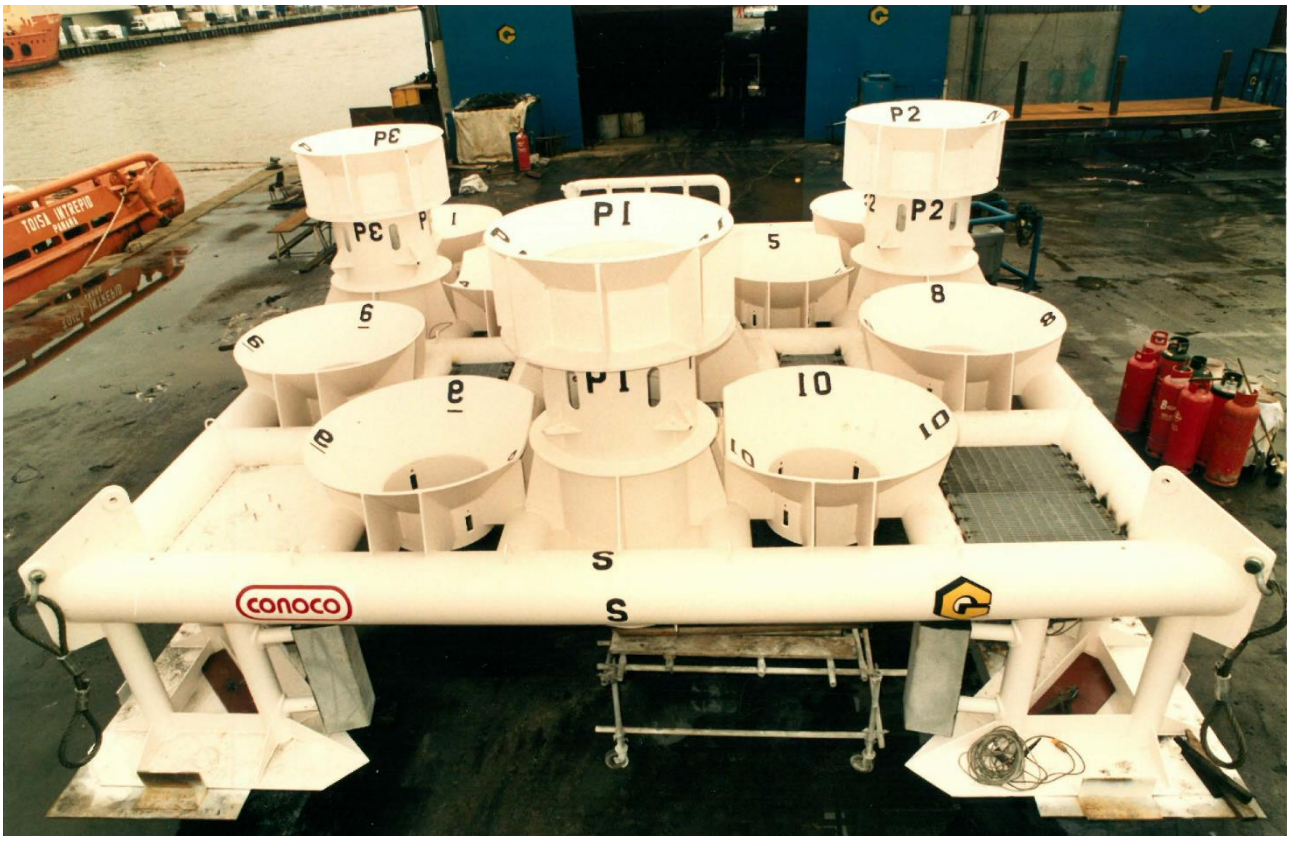



***Figure 2.2.1: Photograph of the Murdoch MD Template***

## 2.3 Pipelines

| Table 2.3.1: Pipeline / flowline / umbilical information | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Description** | **Pipeline No (as per PWA)** | **Diameter (inches)** | **Length (km)[2,3]** | **Description of component parts** | **Product conveyed** | **From – to end points[6]** | **Burial status[1]** | **Pipeline status** | **Current content** |
| 26in gas export pipeline | PL929 | 26in | 179.64 | FBE coated steel pipeline coated with CWC for most of its length | Natural gas, condensate, water | Sphere launcher on ESDV Murdoch MD to MLWM | Trenched and buried. Exhibits good burial depth but with the total length of exposures and spans <5% of the overall length of the pipeline. | Out of use | Inhibited seawater |
| 4in methanol import pipeline | PL930 | 4in | 179.58 | FBE resin coated steel pipeline with 3x polyethylene flexible tie-in spools[5] | Methanol and corrosion inhibitor | MLWM to ESDV at Murdoch MD | Trenched and buried. Trenched to ≥1.0m to top of pipe. | Out of use | Inhibited seawater |

**NOTES:**

1. For further information refer the Comparative Assessment report [5]. The total number and length of exposures and spans is difficult to quantify as the survey data are not directly comparable. Historically in 2006 one reportable span 61m long was recorded at ~KP57.432, but it has not been observed since. For pipeline crossings refer Table 2.5.1;
2. PWA variation (354/V/18) quotes 179.643km for PL929. This *excludes* the distance between MLWM and termination of the pipeline at TGT (1.341km);
3. PWA variation (354/V/18) quotes 179.577km for PL930. This *excludes* the distance between MLWM and the ESDV at TGT (1.097km);
4. PL930 is piggybacked on PL929 for the first ~500m from Murdoch MD and for ~4.6km up to MLWM;
5. The length of PL930 is interspersed with three flexible transition spool pieces between 40m (3x) and 80m (1x) long. The first flexible spool piece is 40m long and is located ~4.8km from mean low water mark (MLWM), the next, 80m long, is located ~20km from MLWM, the third is located at ~KP180.409 on approach to the 500m zone is 40m long, while a fourth and last flexible spool piece ~100m long, connects the end of the pipeline to the 4in riser at the platform. The 'as-built' lengths and number of flexible flowlines may differ from the PWA details;
6. Note that decommissioning of the onshore section of pipelines beyond MLWM is not addressed in this Decommissioning Programme as OPRED has a regulatory remit that only extends as far as MLWM. Regulatory responsibility of the onshore section of pipeline beyond MLWM lies with the Local Planning Authority under the Town and Country Planning Act. At the time of writing, the decommissioning plan for the onshore sections of the pipelines out to the MLWM has not been fully defined, but please refer Appendix 1.

## 2.4 Risers

| Table 2.4.1: Riser information | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Description** | **Pipeline No (as per PWA)** | **Diameter (inches)** | **Length (m)** | **Description of component parts** | **Product conveyed** | **From – to end points** | **Burial status** | **Pipeline status** | **Current content** |
| 10in gas import riser | PL1311 | 10 | 75 | Coated carbon steel. Neoprene / Thermal Sprayed Aluminium (TSA) | Gas | Riser tie-in flange (Murdoch MD platform) to ESD Valve (Murdoch MD) | Exposed (mounted on jacket) | Out of use | Seawater |
| 3in MeOH riser | PL1312 | 3 | 72 | Coated carbon steel. Neoprene / Thermal Sprayed Aluminium (TSA) | Methanol and corrosion inhibitor | ESDV (Murdoch MD platform) to Subsea Tie-in Flange (Murdoch MD) | Exposed (mounted on jacket) | Out of use | Seawater |
| 18in Gas export pipeline riser | PL1612 | 18 | 66.3 | Coated carbon steel | Gas | From Murdoch riser flange to pipeline end closure at end of primary pig receiver on Murdoch platform | Exposed (mounted on jacket) | Out of use | Seawater |
| 3” Gas MeOH pipeline riser | PL1613 | 3 | 59.3 | Coated carbon steel | Methanol and corrosion inhibitor | From Murdoch riser flange to Murdoch platform ESDV | Exposed (mounted on jacket) | Out of use | Seawater |
| 16in Gas export pipeline riser | PL1222 | 16 | 56.5 | Coated carbon steel | Gas | From Murdoch riser flange to pipeline end closure at end of primary pig receiver on Murdoch platform | Exposed (mounted on jacket) | Out of use | Seawater |
| 3in MeOH export riser | PL1223 | 3 | 109.3 | Coated carbon steel | Methanol and corrosion inhibitor | From Murdoch riser flange to Murdoch platform SDV | Exposed (mounted on jacket) | Out of use | Seawater |

**NOTES:**

1. PL1612 & PL1613 are the Ketch pipeline risers; the associated pipelines are dealt with in the Ketch Decommissioning Programmes [7];
2. PL1222 and PL1223 are the Schooner pipeline risers; the associated pipelines are dealt with in the Schooner Decommissioning Programmes [8].

## 2.5 Pipeline crossings

| Table 2.5.1: Pipeline crossing information | | |
|---|---|---|
| **OUTSIDE MURDOCH 500M ZONE** | **KP** | **Protection** |
| Tampnet fibre-optic cable (over PL929 & PL930), indicative only, to be confirmed. | KP19.097 | Picked up in survey as cable bridge over PL929 & PL930, no details available. Refer Figure A1.1.1 in Appendix 1. |
| PL3121 Juliet to Pickerill A gas pipeline & PLU3122 Juliet to Pickerill umbilical. | KP65.7 | Unknown. Expectation is that the crossing will be protected with concrete mattresses overlain with deposited rock. |
| PL2641 8in Seven Seas Newsham gas export & PLU2642 Seven Seas control umbilical. | KP90.8 | Unknown. As above. |
| PL1570 Shearwater to Bacton 34in gas pipeline (SEAL). | KP112.1 | Unknown. As above. |
| PL253 Esmond to Bacton 24in gas export pipeline (over). | KP129.1 | Concrete mattresses buried under deposited rock. Refer Figure 2.6.2 and Table 2.6.2. |
| **INSIDE MURDOCH 500M ZONE** | | |
| PLU4686 Murdoch MA to McAdam umbilical. | KP180.915 | Shared. 2x concrete mattresses. Refer Figure 2.5.1. |
| PLU4888 Watt QM to Boulton HM umbilical. | KP180.915 | |
| PLU4890 Murdoch MA to Murdoch K.KM umbilical. | KP180.915 | |
| **NOTES:**<br>1. A higher PL number will cross over the top of a pipeline with a lower PL number. For example, PL929 & PL930 would cross over PL253. | | |

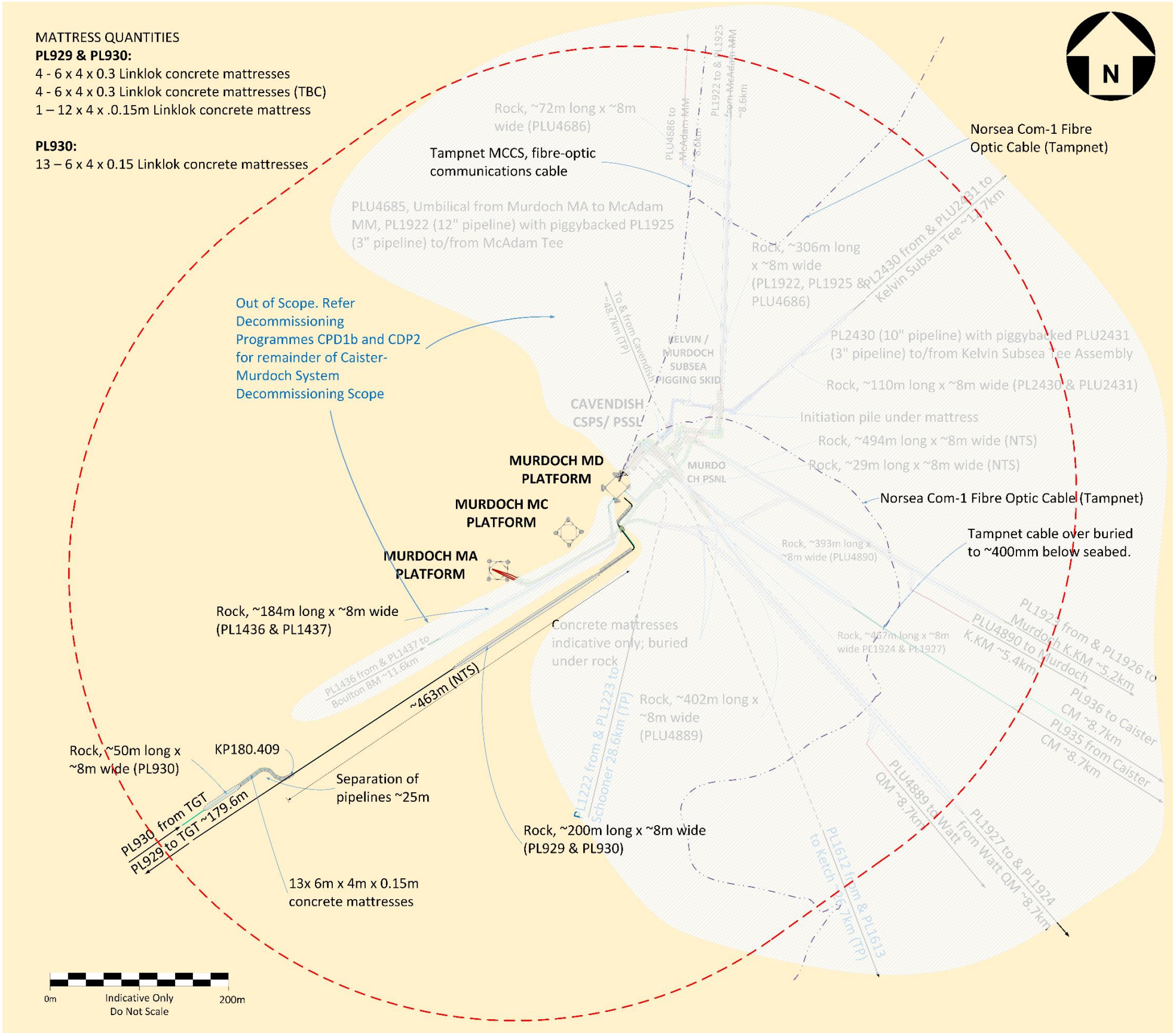



***Figure 2.5.1: Murdoch installation 500m zone[5]***

[5] Mattress quantities only include those in the Murdoch 500m Zone. For example, they exclude those used for the PL253 Esmond crossing.

## 2.6 Pipeline stabilisation features

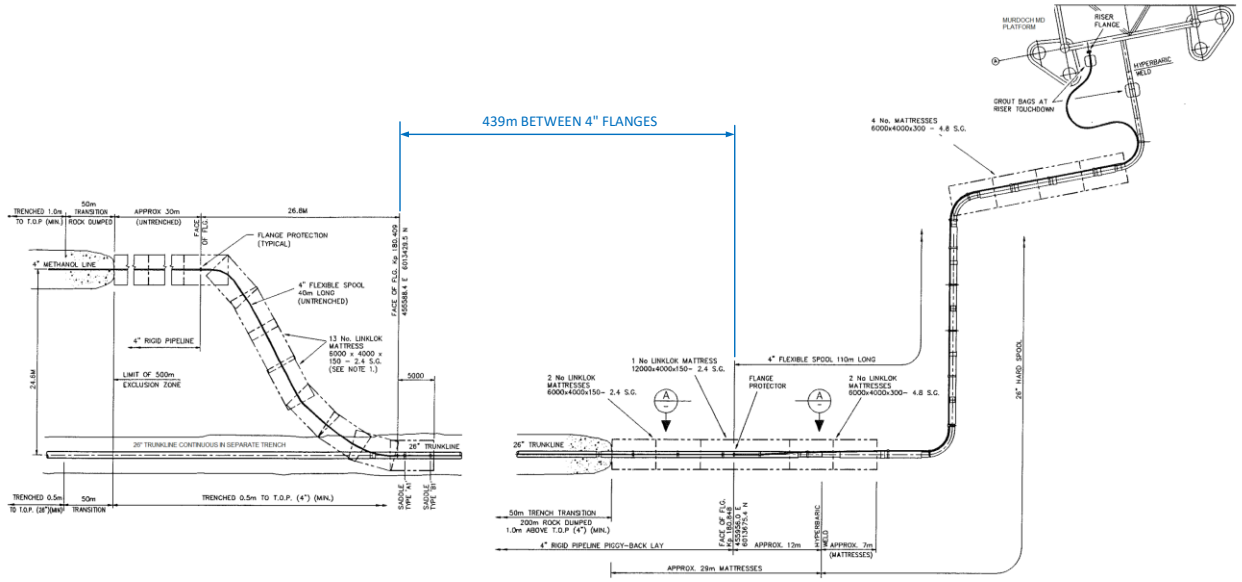



*Figure 2.6.1: Separation of PL929 & PL930 at KP180.409 (NTS)*

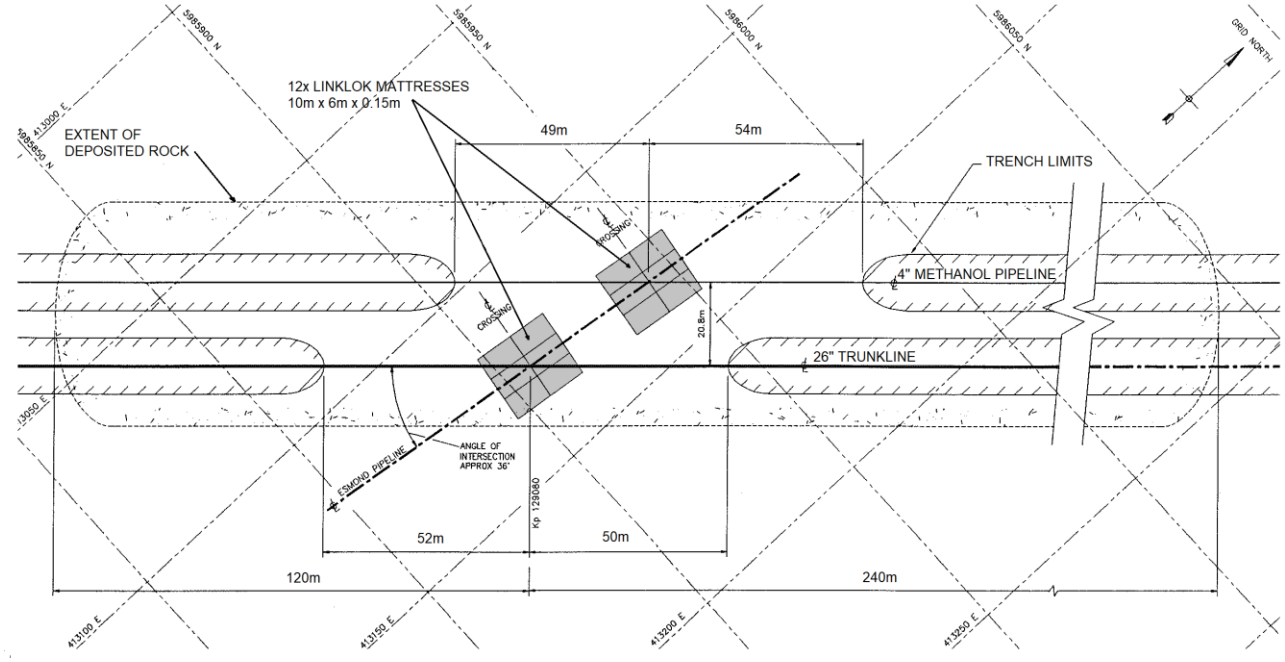



*Figure 2.6.2: PL253 Esmond pipeline crossing PL929 & PL930 at ~KP129 (NTS)*

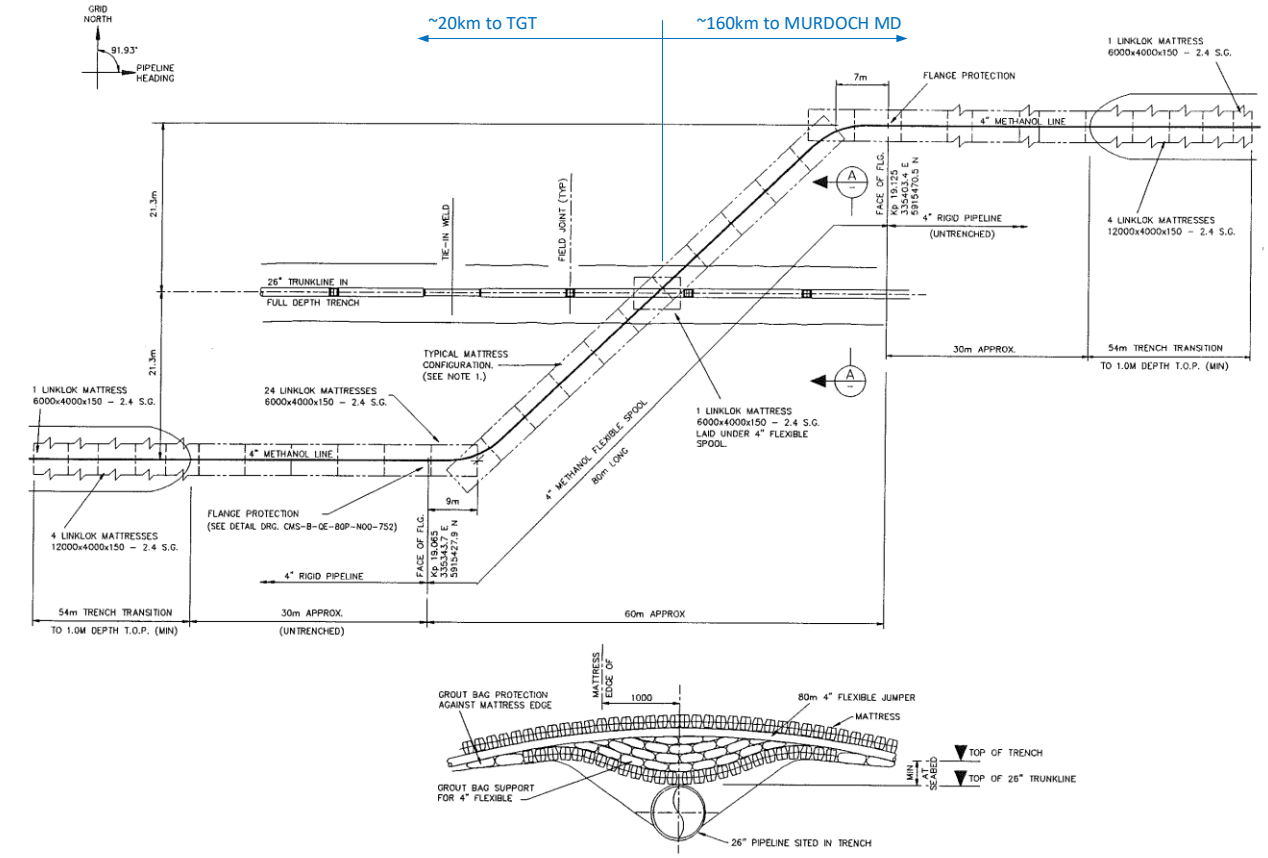



***Figure 2.6.3: PL930 crosses over PL929 at ~KP20.0 from MLWM (NTS)***

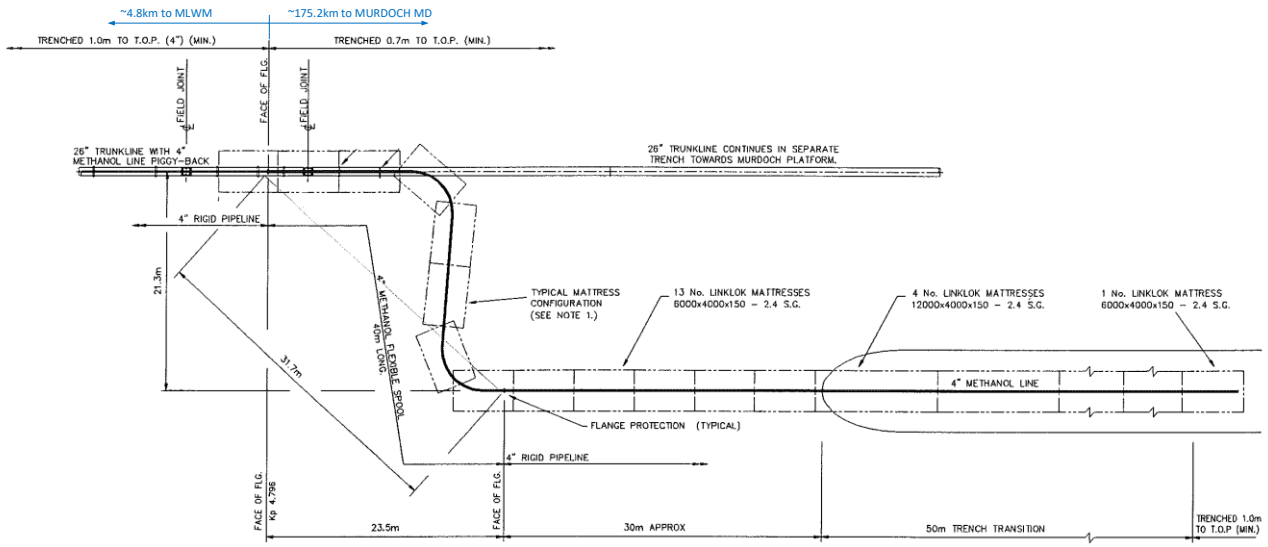



***Figure 2.6.4: Separation of PL930 & PL929 ~4.8km from MLWM (NTS)***

| Table 2.6.1: Pipeline stabilisation features (PL1311 & PL1312) | | | | |
|---|---|---|---|---|
| **Stabilisation feature** | **Total number** | **Total mass (Te)** | **Location(s)** | **Exposed / buried / condition** |
| **INSIDE MURDOCH 500M ZONE** | | | | |
| **NOTE:**<br>1. No stabilisation features as associated with PL1311 & PL1312. | | | | |

| Table 2.6.2: Pipeline stabilisation features (PL929 & PL930) | | | | |
|---|---|---|---|---|
| **Stabilisation feature** | **Total number** | **Total mass (Te)** | **Location(s)** | **Exposed / buried / condition** |
| **INSIDE MURDOCH 500M ZONE** | | | | |
| Concrete mattresses | 4 | 36.8 | Murdoch MD approach (PL929 & PL930), 6m x 4m x 0.15m Linklok concrete mattresses. Refer Figure 2.6.1. | Expected to be buried. Current status unknown. |
| | 4 | 36.8 | Murdoch MD approach (PL929 & PL930), 6m x 4m x 0.15m. Linklok concrete mattresses. Refer Figure 2.6.1. | Expected to be buried. Current status unknown. |
| | 1 | 9.2 | Murdoch MD approach (PL929 & PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.1. | Expected to be buried. Current status unknown. |
| | 13 | 59.9 | KP180.409 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.1. | Expected to be buried. Current status unknown. |
| Grout bags (25kg) | n/a | n/a | n/a | No mention of grout bags on drawings or survey reports. |
| Deposited rock[2,4] | 50m | 1,855 | Between KP180.302 and KP180.352 over PL930 at separation. Refer Figure 2.5.1 and Figure 2.6.1. | Likely exposed with dusting of sediment but to be confirmed. |
| Deposited rock[2,4] | 200m | 3,180 | Between KP180.631 and KP180.831. Refer Figure 2.5.1 and Figure 2.6.1. | Likely exposed with dusting of sediment but to be confirmed. |
| **OUTSIDE MURDOCH 500M ZONE** | | | | |
| Concrete mattresses | 12 | 138.2 | Esmond pipeline PL253 crossing (PL929, PL930) at ~KP129.1 10m x 6m x 0.15m Linklok mattresses. Refer Figure 2.6.2. | Buried under deposited rock. |
| Concrete mattresses | 4 | 36.8 | ~KP20 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |
| | 1 | 4.6 | ~KP20 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |
| | 24 | 110.5 | ~KP20 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |

| Table 2.6.2: Pipeline stabilisation features (PL929 & PL930) | | | | |
|---|---|---|---|---|
| **Stabilisation feature** | **Total number** | **Total mass (Te)** | **Location(s)** | **Exposed / buried / condition** |
| | 1 | 4.6 | ~KP20 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |
| | 4 | 36.8 | ~KP20 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |
| | 1 | 4.6 | ~KP4.8 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | Expected to be buried. Status unknown. |
| | 4 | 36.8 | ~KP4.8 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | Expected to be buried. Status unknown. |
| | 4 | 18.4 | ~KP4.8 (PL929 & PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | Expected to be buried. Status unknown. |
| | 10 | 46.0 | ~KP4.8 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | Expected to be buried. Status unknown. |
| Grout bags (25kg) | 500 | 12.5 | At separation point at KP20. Refer Figure 2.6.3. | Expected to be buried. Status unknown. |
| Deposited rock[2,4] | 360m | 26,847 | PL253 Esmond pipeline crossings between KP128.96 and KP129.320, ~360m long x ~55m wide (estimated). Refer Figure 2.6.2. | Likely exposed with dusting of sediment but to be confirmed. |

**NOTES:**

1. Origin of pipeline KP taken at MLWM and ends at base of PL929 riser at Murdoch MD;
2. No quantities of grout bags are stated on drawings or survey reports;
3. Mass of deposited rock is estimated, based on the estimated volume and profile;
4. Quantity of deposited rock excludes rock used to protect and stabilise pipeline crossings installed *after* PL929 and PL930;
5. Total numbers of mattresses as follows:
   - 58x 6m x 4m x 0.15m;
   - 12x 10m x 6m x 0.15m;
   - 17x 12m x 4m x 0.15m.

## 2.7 Wells

| Table 2.7.1: Well information | | | |
|---|---|---|---|
| **Murdoch MD platform wells** | **Designation** | **Status** | **Category of well** |
| 44/22a-D1 | Gas production | Decommissioned, AB2 | PL 4-0-3 |
| 44/22a-D3 | Gas production | | PL 1-0-3 |
| 44/22a-D6 | Gas production | Decommissioned, AB3 | PL 3-0-3 |
| 44/22a-D7 | Gas production | Decommissioned, AB2 | PL 4-0-3 |
| 44/22a-D8 | Gas production | | PL 1-0-3 |
| 44/22a-D9 | Gas production | Decommissioned, AB3 | PL 1-0-3 |
| 44/22a-D10 | Gas production | Decommissioned, AB2 | PL 4-0-3 |
| 44/22a-D11z | Gas production | | PL 3-0-3 |

For details of well categorisation see the latest version of the Oil & Gas UK Guidelines for the Decommissioning of Wells.

## 2.8 Inventory estimates

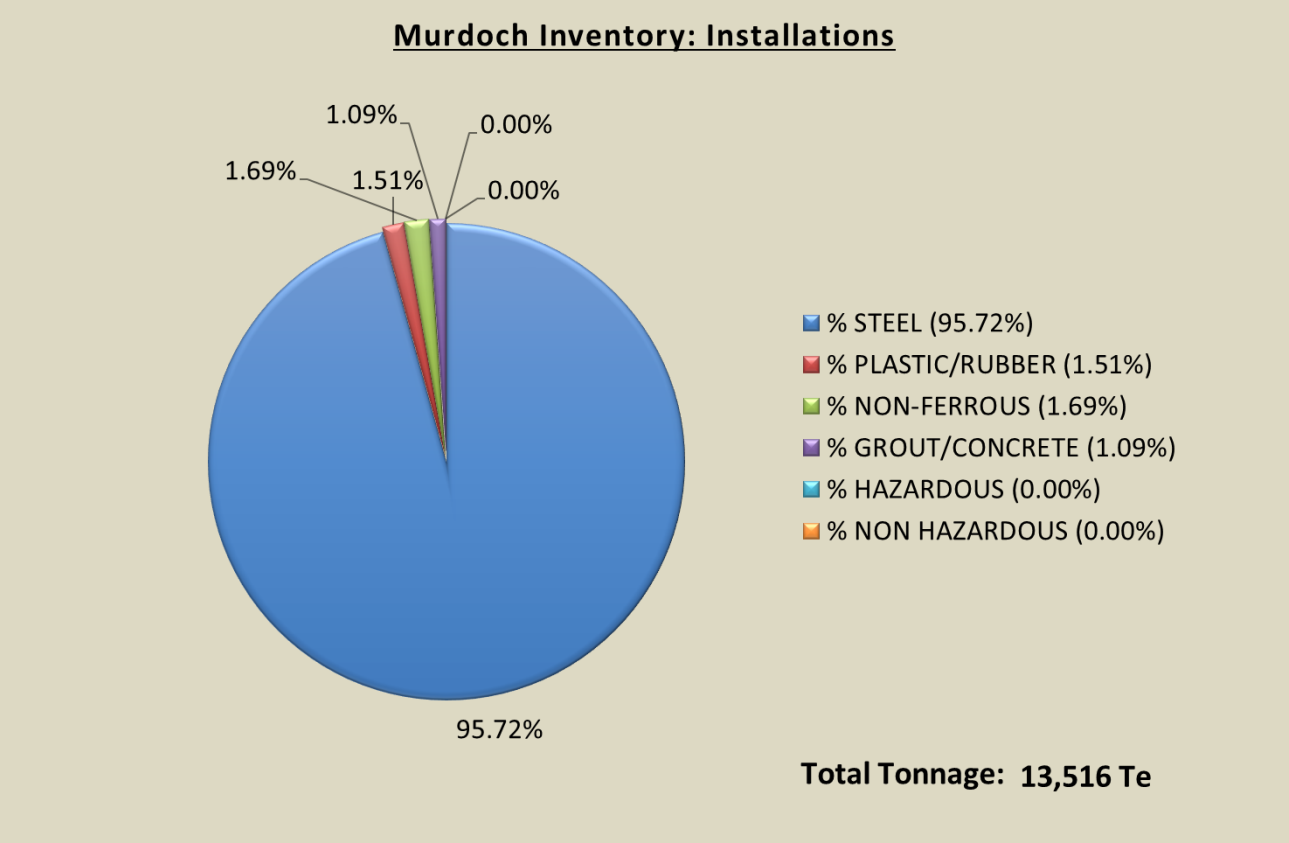



***Figure 2.8.1: Pie-chart of estimated installation inventory***

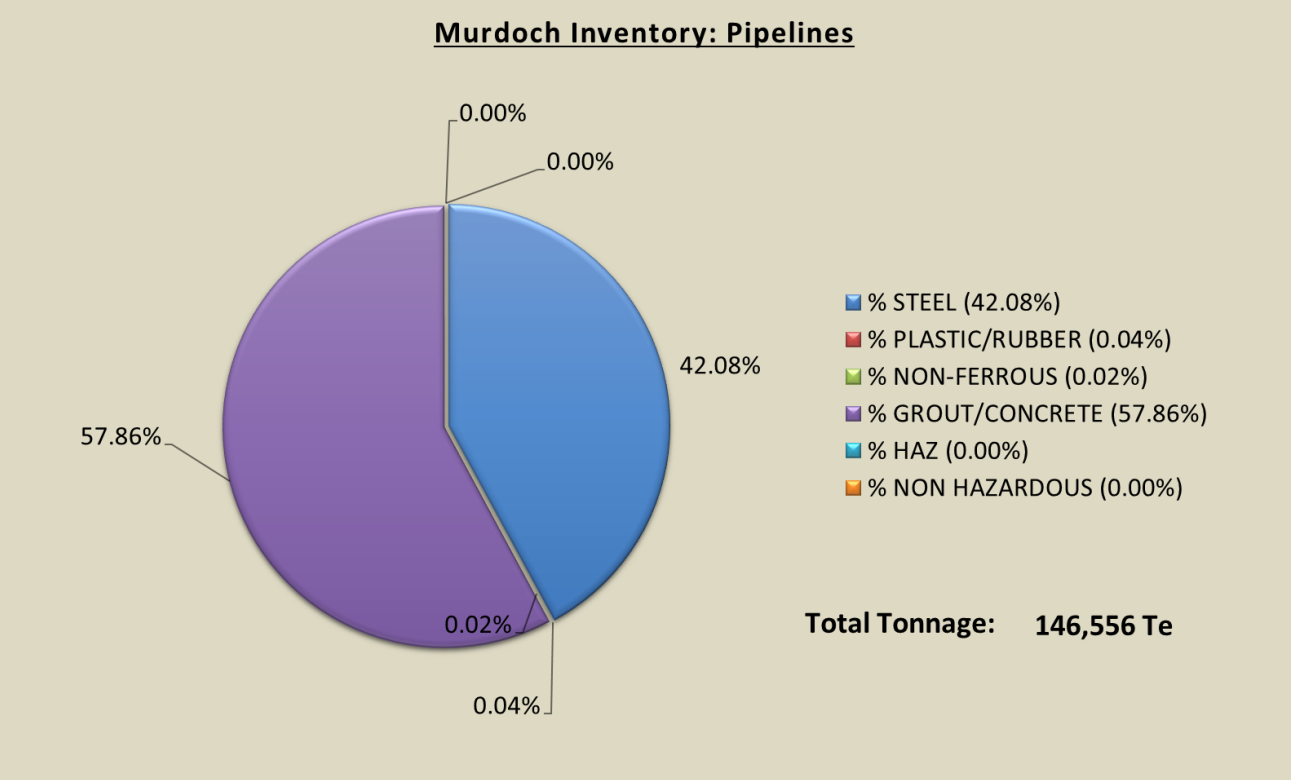



***Figure 2.8.2: Pie-chart of estimated pipeline inventory, excl. deposited rock***

# 3 Removal and disposal methods

Waste will be dealt with in accordance with the Waste Framework Directive [9]. The reuse of an installation or pipelines (or parts thereof) is first in the order of preferred decommissioning options. However, given the age of the installations and infrastructure it is unlikely that reuse opportunities will be realised. Waste generated during decommissioning will be segregated by type and periodically transported to shore in an auditable manner through licensed waste contractors. Transfrontier shipment of waste will not be required. Steel and other recyclable metal are estimated to account for the greatest proportion of the materials inventory. Refer to section 5.4 of the Environmental Appraisal [4] for further details concerning disposal of waste.

## 3.1 Topsides decommissioning

### 3.1.1 Murdoch MA

**Topsides description:** the Murdoch MA topside structure comprises accommodation on four levels as illustrated in Figure 3.1.1 with a mass ~835Te including the mass of the access bridge to Murdoch MC, which is ~37.2Te. The overall dimensions of the topsides at Level 1 are ~34m x 22m and the overall height between the roof level and LAT is ~39m. The bridge link between Murdoch MA and Murdoch MC is visible in Figure 2.1.1, Figure 2.1.2 and Figure 3.1.1. The bridge has a rectangular cross section 3.1m deep x 3.2m wide and is ~45m long. The helideck on MA is the only operational helideck on the Murdoch installation. The others on MC and MD are out of use.

**Level 1** contains the muster area or locker room, local control room, local equipment room, battery room and HVAC plant room. A generator room is provided on the north side of the accommodation module that houses a plant air compressor and the emergency (auxiliary) generator. The hydraulic power unit for the sub-sea umbilicals is also located on the north side of Level 1. Two ladders provide emergency egress from this level to the sea.

**Level 2** includes the galley and dining room, food stores and recreation areas, while outside a laydown area for food containers is provided.

**Level 3** incorporates the medical room, gym and sauna, laundry, store cupboards, offices, and cabins.

**Level 4** incorporates cabins and the helicopter administration area. The roof level has the potable and seawater header tanks for domestic services within the accommodation, the helicopter refuelling unit and the HVAC extract fans and ductwork.

**Removal methods:** the topsides along with the access bridge will be completely removed and returned to shore. Possible methods are described in Table 3.1.2.

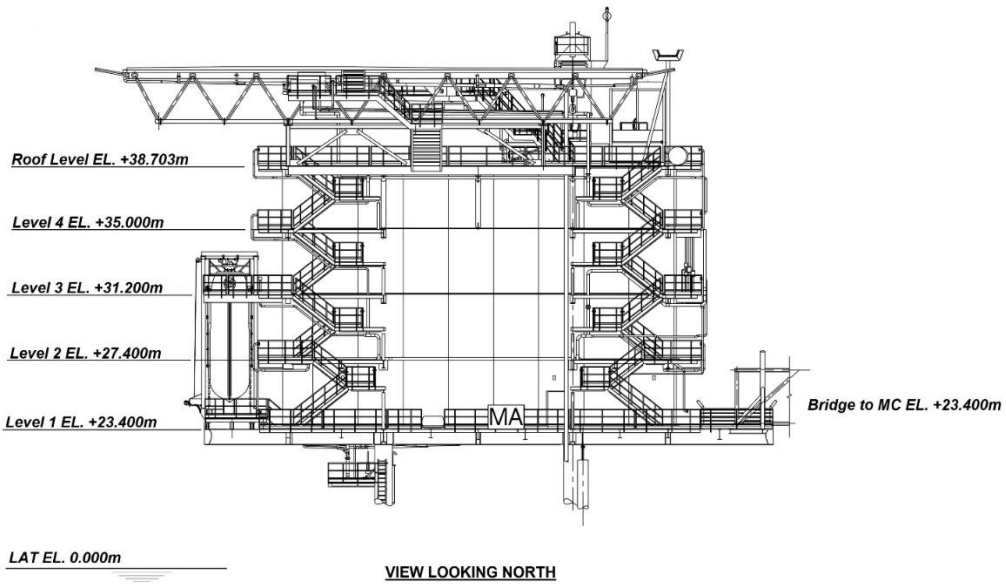



*Figure 3.1.1: View on Murdoch MA topsides looking north*

### 3.1.2 Murdoch MC

**Topsides description:** the Murdoch MC topsides was used as for accommodation before the Murdoch MA installation was installed. It comprises a Pigging platform, Main Deck, Mezzanine Deck and Cellar Deck as illustrated in Figure 3.1.2 with a mass ~4,393Te including the mass of the bridge to Murdoch MD, which is ~27.3Te. The overall dimensions of the Main Deck are ~56m x 39m and the overall height between Pigging Platform on the Weather Deck and LAT is ~50.7m. The bridge link to MD can be seen on the right of Figure 3.1.2. The bridge has a cross section 4.5m deep x 5m wide and is ~37m long. The bridge link to MA is not shown. The mass and dimensions for the bridge links from Murdoch MA is explained in the individual description for Murdoch MA and so shall not be repeated here.

**Removal methods:** the topsides and access bridges will be completely removed and returned to shore. Possible methods are described in Table 3.1.2.

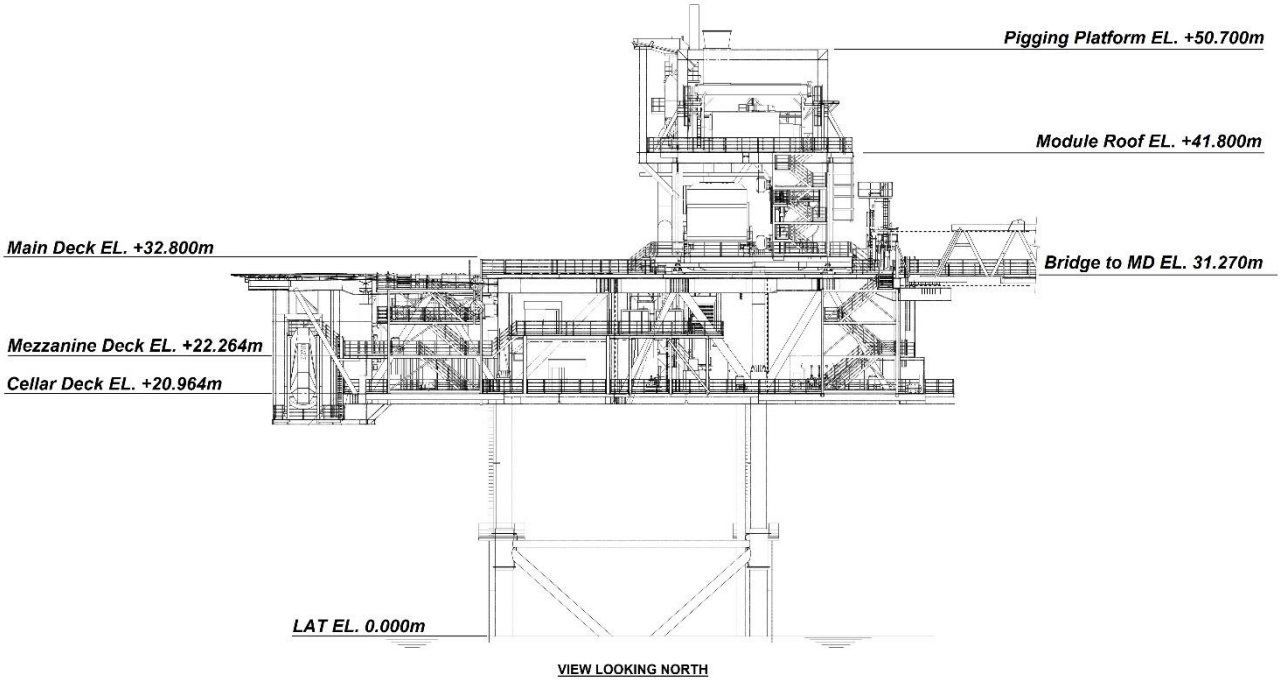



*Figure 3.1.2: View on Murdoch MC topsides looking north*

### 3.1.3 Murdoch MD

**Topsides description:** the Murdoch MD topside structure contains the wellheads comprises a Helideck, Main Deck and Cellar Deck as illustrated in Figure 3.1.3 and has a mass ~2,257Te. The overall dimensions of the Main Deck are ~44m x 31m and the overall height between the Helideck and LAT is ~39.6m. The bridge links between Murdoch MC and Murdoch MD are not shown here but are visible in 3.1.2. The mass and dimensions for the bridge links from Murdoch MC is explained in the individual description for Murdoch MC and so shall not be repeated here.

**Removal methods:** the topsides and access bridge will be completely removed and returned to shore. Possible methods are described in Table 3.1.2.

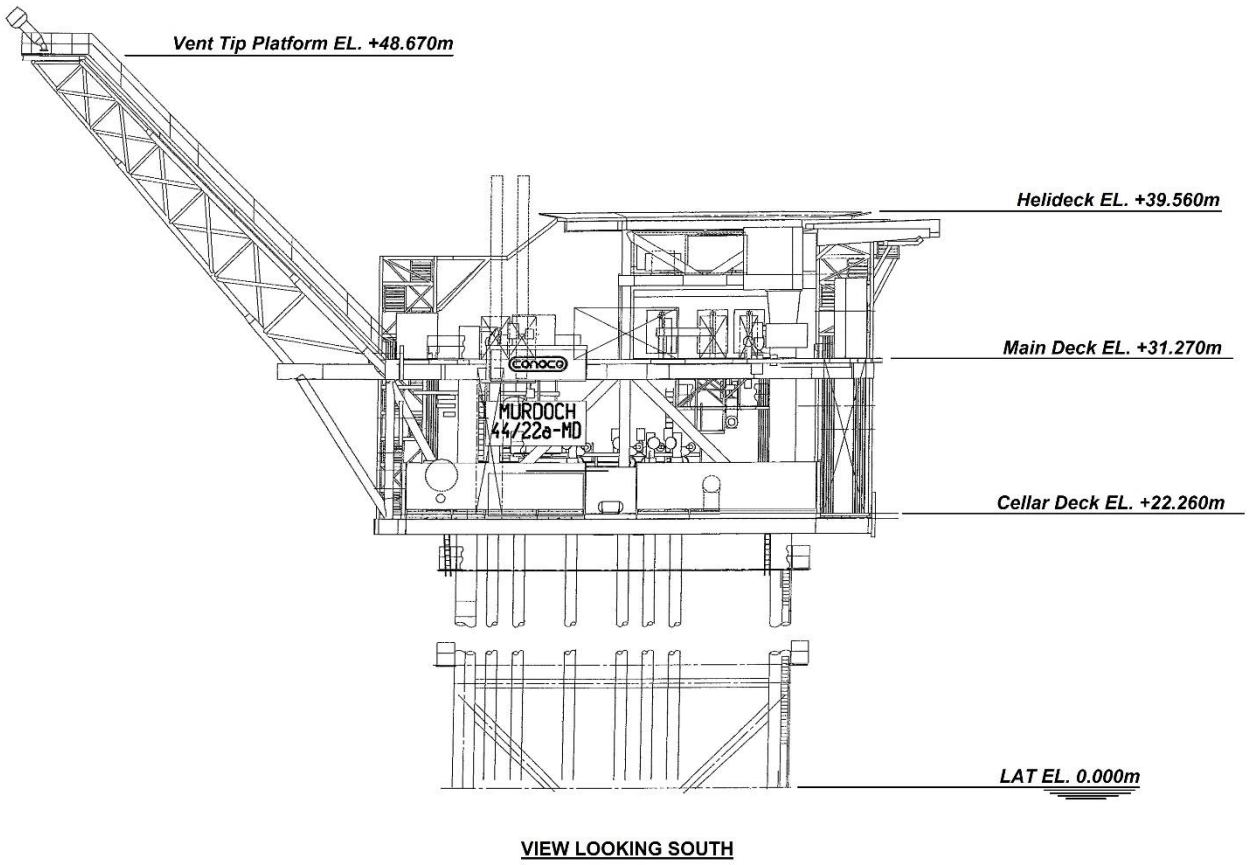



*Figure 3.1.3: View on Murdoch MD topsides looking south*

**Preparation / Cleaning:** The methods that will be used to flush, purge, and clean the topsides prior to removal to shore are summarised in Table 3.1.1.

**Table 3.1.1: Cleaning of Topsides for Removal**

| Waste Type | Composition of Waste | Disposal Route |
|---|---|---|
| Hydrocarbons | Process fluids | Vessels and pipework have already been flushed, nitrogen purged vented and made liquid free. |
| Produced solids | Sand, NORM | Any pipeline debris captured in filter packages, has been returned onshore for disposal. Any solids remaining in vessels will be removed and disposed of during the dismantlement of the Topsides onshore. |
| Diesel | Bunkered Diesel fuel | Bunkered diesel has already been drained and returned onshore for re-use or disposal. |
| Lubricating oils | Lubricants for equipment e.g. gearboxes, pumps, pedestal crane compressor skid | Lubricating oils have already been drained and returned onshore for re-use or disposal. |

### 3.1.4 Topsides removal methods

| Table 3.1.2: Topsides removal methods | |
|---|---|
| 1) Semi-Submersible Crane Vessel ☑; 2) Monohulled Crane Vessel ☑; 3) Shear Leg Vessel ☑; 4) Jack up Work barge ☑; 5) Piece small or large ☑; 6) Complete with jacket ☑. | |
| **Methods considered** | **Description** |
| Single lift removal by SSCV / MCV / SLV | Removal of topsides and jacket as a complete unit followed by recovery to shore for re-use, recycling, and disposal as appropriate |
| Single lift removal by SSCV / MCV / SLV | Removal of topsides as a single unit followed by recovery to shore for re-use, recycling, disposal as appropriate |
| Piece-small or piece large removal using attendant support vessel such as a JUWB | Removal of topsides in a series of smaller sub-units making use of the JUWB used for the well decommissioning activities, followed by recovery to shore for a programme of re-use, recycling or disposal as appropriate |
| **Proposed removal method and disposal route** | **Removal of topsides, jacket and interconnecting bridges individually followed by recovery to shore for reuse, recycling, and final disposal to landfill as appropriate. A final decision on the decommissioning method was made following a commercial tendering process and the removal contract has now been awarded. Removal will be carried out using an SSCV.** |

## 3.2 Jacket decommissioning

### 3.2.1 Murdoch MA

**Jacket description:** The Murdoch MA jacket is an unconventional shape. It is pinned to the seabed by four piles driven through and grouted to the four outer legs. The bottom part of the jacket, between –22m and –28.6m elevations is a conventional and square in plan with no incline. There are single pile sleeves at each corner. The top part of the jacket, above –5m elevation is also square in plan, without incline, and each face is narrower than the faces on the bottom part of the jacket. It is rotated in the horizontal plane by 45 degrees relative to the bottom part of the jacket, the middle part of the structure consists of eight vertical diagonals, which join the top and bottom sections. The jacket subsea horizontal levels are at -15m, -27m and -39.5m elevations (Figure 3.2.1).

The mass of the jacket is ~672Te excluding the section of piles penetrating more than 3m into the seabed and excluding any rigging that would be used for lifting operations. The legs will be cut at an appropriate elevation to allow the lifting aids to be installed, and the jackets will ideally each be removed in a single lift[6]. Assuming there would be no technical issues, the piles will be internally cut 3.0m below the mean seabed. Should any difficulties be encountered when accessing the piles internally such that an external excavation would be required, OPRED will be consulted prior to carrying out the external excavation. The jacket will be returned to shore for recycling.

**Removal methods:** the jacket along with mudmats will be completely removed and returned to shore. Possible methods are described in Table 3.2.1.

[6] The technique adopted for removal of the jacket will be subject to engineering feasibility and any commercial agreements; they are also subject to regulatory requirements.

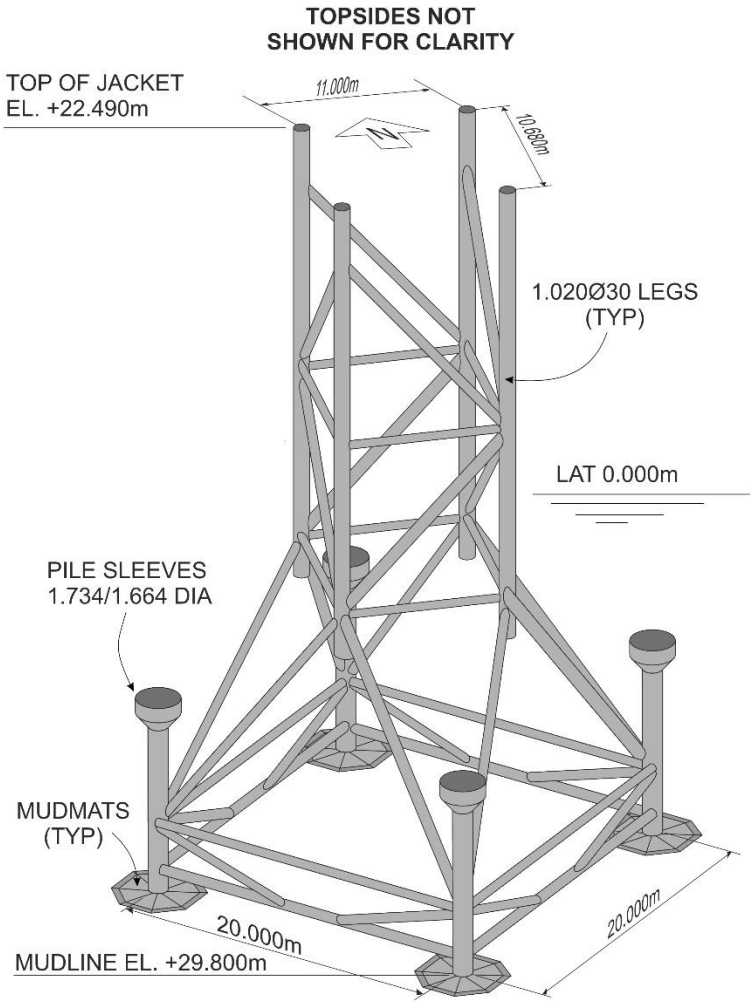



***Figure 3.2.1: Murdoch MA jacket 3D view***

### 3.2.2 Murdoch MC

**Jacket description:** The 4-legged jacket is a conventional four leg square jacket without incline to the faces. It has a single horizontal elevation at –12m, which consists of three members forming a cruciform. The jacket does not have any external pile sleeves and is piled. The jacket is secured by four leg piles of 1372mm diameter (54”), which protrude through the jacket legs at elevation +9.3m (relative to LAT) (Figure 3.2.2).

The mass of the jacket mass is ~1,218Te excluding the section of piles penetrating more than 3m into the seabed and excluding any rigging that would be used for lifting operations. The legs will be cut at an appropriate elevation to allow the lifting aids to be installed, and the jackets will ideally each be removed in a single lift[7]. As the piles are located inside the legs it is expected that difficulties would be encountered when carrying out an internal excavation, so it is likely that an external excavation would be required to access the piles for cutting. Should any difficulties be encountered when accessing the piles internally such that an external excavation would be required, OPRED will be consulted prior to carrying out the external excavation. The jacket will be returned to shore for recycling.

**Removal methods:** the jacket along with mudmats will be completely removed and returned to shore. Possible methods are described in Table 3.2.1.

[7] The technique adopted for removal of the jacket will be subject to engineering feasibility and any commercial agreements; they are also subject to regulatory requirements.

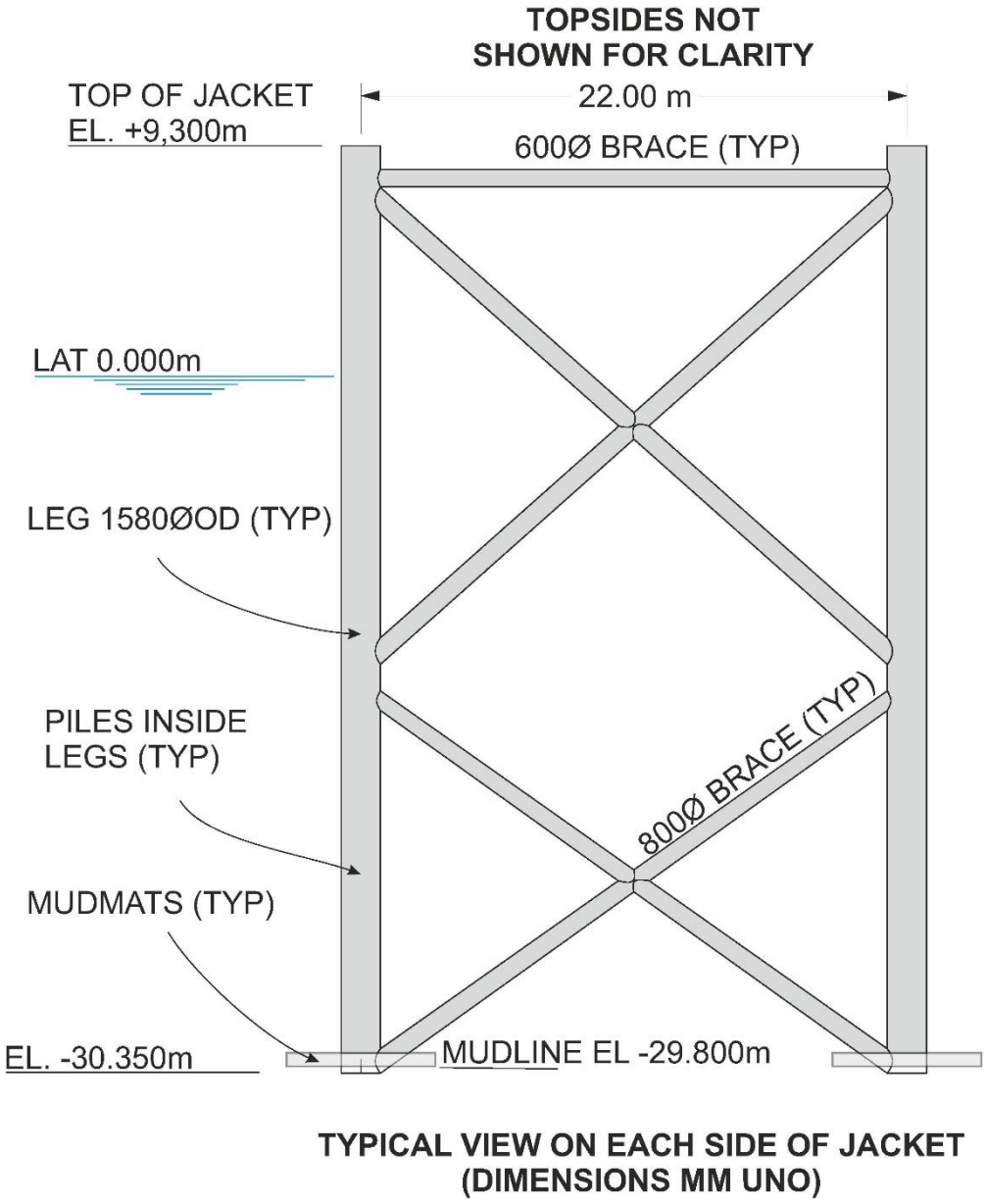



***Figure 3.2.2: Murdoch MC jacket typical side view***

### 3.2.3 Murdoch MD

**Jacket description:** The 4-legged jacket is a conventional four leg square jacket without incline to the faces. It is held in position by 8 vertical skirt piles, two per leg. The jacket has two horizontal levels at –14m and –28.3m. The jacket has double external pile sleeves at the four corners, which extend from the mudline to approximately –14m. The jacket has an external riser support frame on the north-east face of the jacket between legs A2 and B2 (Figure 3.2.3).

The mass of the jacket is ~2,090Te excluding the section of piles penetrating more than 3m into the seabed and excluding any rigging that would be used for lifting operations. The legs will be cut at an appropriate elevation to allow the lifting aids to be installed, and the jacket will ideally be removed in a single lift[8]. Assuming there would be no technical issues, the piles will be internally cut 3.0m below the mean seabed. Should any difficulties be encountered when accessing the piles internally such that an external excavation would be required, OPRED will be consulted prior to carrying out the external excavation. The jacket will be returned to shore for recycling.

[8] The technique adopted for removal of the jacket will be subject to engineering feasibility and any commercial agreements; they are also subject to regulatory requirements.

**Removal methods:** the jacket along with mud mats and all the risers will be completely removed and returned to shore. Possible methods are described in Table 3.2.1.

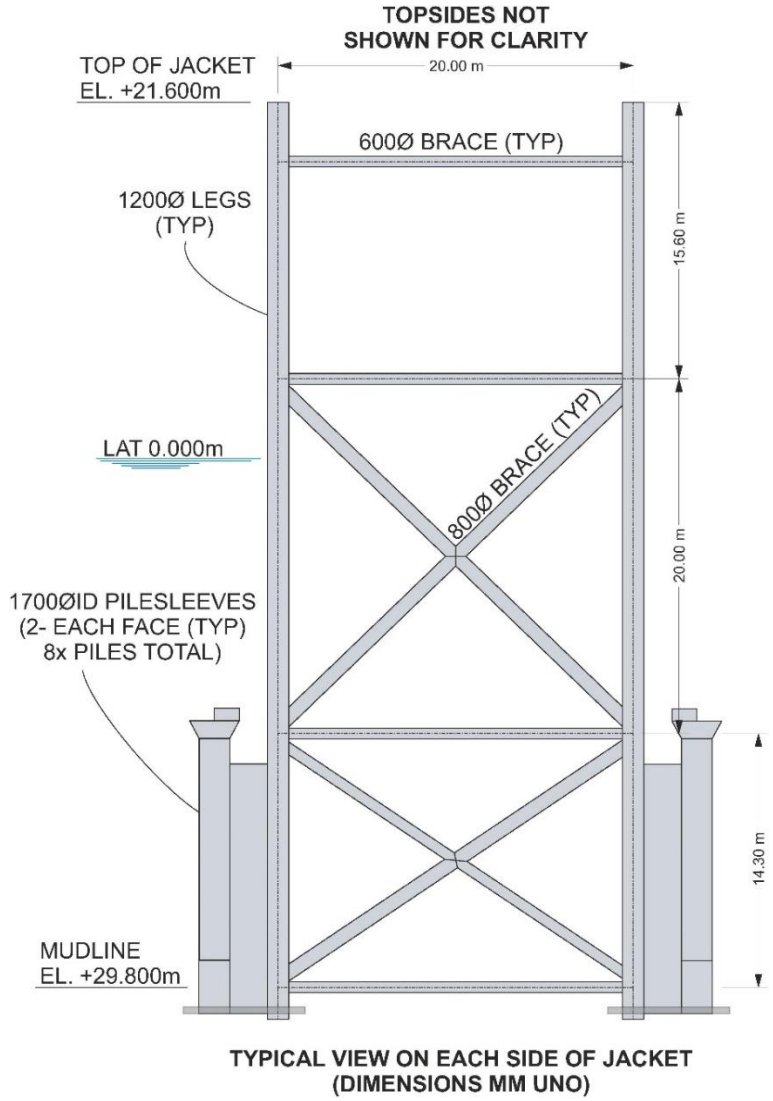



***Figure 3.2.3: Murdoch MD jacket typical side view***

## 3.2.4 Jacket removal methods

| Table 3.2.1: Jacket removal methods | |
|---|---|
| 1) Semi-Submersible Crane Vessel ☑; 2) Monohulled Crane Vessel ☑; 3) Shear Leg Vessel ☑; 4) Jack up Work barge ☑; 5) Piece small or large ☑; 6) Complete with topsides ☑. | |
| **Methods considered** | **Description** |
| Single lift removal along with topsides using SSCV. | Removal of the topsides and jacket as a complete unit followed by recovery to shore for re-use, recycling, and disposal as appropriate. |
| Single lift removal using SSCV. | Removal of the jacket as a single unit followed by recovery to shore for re-use, recycling, disposal as appropriate. |
| Offshore removal 'piece-small' for onshore disposal | Removal of jacket and dismantlement offshore followed by transportation to shore for disposal and recycling. |
| **Proposed removal method and disposal route** | **Removal of jacket as a single unit followed by recovery to shore for re-use, recycling, and final disposal to landfill as appropriate. A final decision on the decommissioning method was made following a commercial tendering process and the removal contract has now been awarded. Removal will be carried out using an SSCV.** |

## 3.3 Subsea installations

| Table 3.3.1: Subsea installations & stabilisation features | | | |
|---|---|---|---|
| **Subsea installations and stabilisation features** | **Number** | **Option** | **Disposal route** |
| Murdoch MD Template | 1 | Complete removal, piles cut to 3m below seabed | Return to shore for reuse or recycling |
| **NOTE:**<br>1. Contingency measures may be required to counter any potential difficulties that may be encountered when cutting the piles at the required depth; OPRED will be consulted. | | | |

## 3.4 Pipelines and stabilisation features

### 3.4.1 Decommissioning options

All exposed pipelines or pipespools on approach to Murdoch MD associated with the scope in this Decommissioning Programme will be completely removed up to the point of burial. That is, all pipelines buried under concrete mattresses that would otherwise be exposed will be removed.

Although PL929 is a candidate for reuse for CCUS, there is an implicit assumption that options for re-use of the pipelines have been exhausted prior to the facilities and infrastructure moving into the decommissioning phase and associated comparative assessment. Therefore, this option has been excluded. The three decommissioning options considered for the two pipelines in Table 3.4.1 are:

1) **Complete removal** – This would involve the complete removal of the pipelines by whatever means most practicable and acceptable from a technical perspective;
2) **Partial removal or remediation** – This would involve removing exposed or potentially unstable sections of pipelines. Remedial work may need to be carried out to make the remaining pipeline safe for leaving in situ. This option is relevant for those pipelines that have known exposures or spans. There will likely be a need to verify their status via future surveys;
3) **Leave *in situ*** – This would involve leaving the pipeline(s) *in situ* with no remedial works but possibly verifying their status via future surveys.

The mattresses and the underlying pipelines were also subject to a comparative assessment. The pipeline and mattress comparative assessments were combined to provide an overall recommendation. Please refer the comparative assessment [5] for PL929 burial profiles.

| Table 3.4.1: Pipeline or pipeline groups / decommissioning options | | | |
|---|---|---|---|
| **Pipelines Group** | **Condition of line / group (surface laid/trenched/buried/spanning)** | **Whole or part of pipeline/group** | **Decommissioning options considered** |
| **PIPELINE GROUP 1** | | | |
| PL929 | Trenched and buried in the seabed throughout its length albeit with a number of exposures and freespans expected except on approach at Murdoch MD where the pipeline is buried under deposited rock and concrete mattresses. Historically, the first 15km of pipeline from MLWM has not been surveyed since the pipeline was first installed but using the available data there one reportable span was observed at KP57.432 ~61m long in 2006 but it was not present in 2017. No surveys are directly comparable so any changes in lengths and numbers of exposures and spans are difficult to quantify. The indications are, however, that the length of exposures and | Whole 26" pipeline, except for short-exposed lengths of welded pipespools on approach to Murdoch MD. Refer Table 2.3.1. | 1, 2, 3 |

| Table 3.4.1: Pipeline or pipeline groups / decommissioning options | | | |
|---|---|---|---|
| **Pipelines Group** | **Condition of line / group (surface laid/trenched/buried/spanning)** | **Whole or part of pipeline/group** | **Decommissioning options considered** |
| | spans will likely be <5% of the total length of the pipeline. | | |
| PL930 | Trenched and buried in the seabed. The expectation is that the pipeline will exhibit a better burial profile than that for PL929 because the original as-built survey indicates a greater trench depth (≥1.0m) to top of pipe when it was first installed. This will need to be confirmed by survey. | Whole 4" pipeline except for short-exposed lengths of pipespools on approach to Murdoch MD. Refer Table 2.3.1. | 1, 2, 3 |

### 3.4.2 Outcomes of comparative assessment

All risers will be completely removed along with the Murdoch MD jacket. A comparative assessment of the decommissioning options was carried out in accordance with the OPRED decommissioning guidance notes [12]. Each decommissioning option was qualitatively assessed against Safety, Environment, Technical and Societal and Cost. Refer [5] for details. Pipeline burial profiles can be found in section 3 of the Comparative Assessment report.

The chosen option is 'leave *in situ*. The influence of existing infrastructure that had been removed could affect the mobility of the local seabed. In order to minimise the deposition of additional rock, and to minimise any potential increase in snagging hazards, for example, by removing intermediate exposures or spans, it was considered that leave *in situ* would be appropriate. The means that the pipelines would meantime remain as they are, and any reportable spans would remain recorded in FishSAFE. Use of historical pipeline survey data with future pipeline surveys would better inform the future strategy for monitoring the pipelines.

| Table 3.4.2: Outcomes of Comparative Assessment | | |
|---|---|---|
| **Pipeline or Group** | **Recommended option** | **Justification** |
| PL929 | Leave *in situ*. PL929 ~179.6km long between end of 200m long deposited rock and MLWM has been flushed and will be left buried *in* situ along with the pipeline stabilisation features at KP4.8 and KP20.0 (refer Figure 2.6.4 and Figure 2.6.3 and respectively).<br>Leave the, ~179.6km long carbon steel trunkline between end of deposited rock 200m long near the Murdoch 500m zone and MLWM *in situ.*<br>On approach to Murdoch MD remove all the associated mattresses and underlying piggybacked pipelines ~147m long up to point of burial at the deposited rock.<br>Therefore, except for the removal of the surface laid sections of pipeline on approach to Murdoch MD, the pipeline will be left *in situ* in its current state. | Albeit with several km of exposures the pipeline is stable for much of its length (refer Table 2.3.1). No recordable spans have been noted in more recent survey data although the survey data does not extend the full length of the pipeline. This will need to be confirmed by survey.<br>This approach will result in minimal seabed disturbance, minimises the deposition of additional rock in a sensitive area, lower energy use, and reduced risk to personnel and lower cost; all these aspects contribute to the proposed recommendation. |
| PL930 | Leave *in situ*. PL930 ~179.6km long between end of 200m long deposited rock and MLWM has been flushed and will be left buried *in situ* along with the pipeline stabilisation features at KP4.8 and KP20.0 (refer Figure 2.6.4 and Figure 2.6.3 respectively).<br>Refer recommended option for PL929 for section of PL930 piggybacked onto PL929 on approach to Murdoch MD.<br>If the mattresses where PL930 separates from PL929 at KP4.8 (Figure 2.6.4) KP180.409 (Figure 2.6.1) or where PL930 crosses over PL929 at KP20 | According to the as-built alignment sheets PL930 was trenched to ≥1.0m below seabed to the top of pipe, but for the purposes of the comparative assessment and given the bathymetry of the seabed, it was assumed that PL930 would exhibit the same burial characteristics as PL929, but this will need to be confirmed by survey.<br>This approach will result in minimal seabed disturbance, minimises the |

| Table 3.4.2: Outcomes of Comparative Assessment | | |
|---|---|---|
| **Pipeline or Group** | **Recommended option** | **Justification** |
| | (Figure 2.6.3) are covered in sediment and barely distinguishable from the surrounding seabed they will be left *in situ*. Otherwise, if the perimeter edge of any one mattress at the location is more than 50% exposed, they will all be completely removed along with the underlying surface laid flexible pipespools (~40m, ~80m, and 40m long respectively).<br>Therefore, except for the removal of the surface laid sections of pipeline on approach to Murdoch MD, the pipeline will be left *in situ* in its current state. | deposition of additional rock in a sensitive area, lower energy use, and reduced risk to personnel and lower cost; all these aspects contribute to the proposed recommendation. |
| **NOTES**<br>1. Each cut pipeline end at point of burial at or within deposited rock will be dealt with by the deposition of a small quantity of rock on top of or adjacent to existing rock. The amount used will be kept to a practical minimum, nominally up to ~25Te;<br>2. At the separation or pipeline crossover points, should the point of burial of the cut pipeline end be in the seabed, it will be excavated locally with small quantities of rock potentially used to ensure that the remaining pipeline end(s) are buried;<br>3. The pipeline will be subject to inspection and monitoring to a schedule agreed with OPRED;<br>4. The deposition of rock will be covered by a deposit consent. | | |

### 3.4.3 Pipeline protection structures & stabilisation features

There are no pipeline protection structures that form part of the PL929 and PL930 pipelines and infrastructure.

### 3.4.4 Pipeline protection & stabilisation features

| Table 3.4.3: Pipeline protection & stabilisation features (PL929 & PL930) | | | |
|---|---|---|---|
| **Protection or stabilisation features** | **Number (UNO)** | **Description** | **Disposal route (if applicable)** |
| **INSIDE MURDOCH 500M ZONE** | | | |
| Concrete mattresses | 4 | Murdoch MD Approach (PL929 & PL930), 6m x 4m x 0.15m Linklok concrete mattresses. Refer Figure 2.5.1. | Remove to shore for re-use, recycling, or disposal. |
| | 4 | Murdoch MD Approach (PL929 & PL930), 6m x 4m x 0.15m. Linklok concrete mattresses. Refer Figure 2.5.1. | |
| | 1 | Murdoch MD Approach (PL929 & PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.5.1. | |
| | 13 | ~KP180.409 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.1, Figure 2.5.1. | Leave buried mattresses *in situ* otherwise remove to shore for re-use, recycling, or disposal. |
| Deposited rock | 1,855Te | Between KP180.302 and KP180.352 over PL930 at separation. Refer Figure 2.5.1 and Figure 2.6.1. | Leave *in situ*. |
| | 3,180Te | Between KP180.631 and KP180.831. Refer Figure 2.5.1 and Figure 2.6.1. | |
| **OUTSIDE MURDOCH 500M ZONE** | | | |
| Concrete mattresses | 6 | ~KP129.1 PL253 Esmond pipeline crossing (PL929), 10m x 6m x 0.15m Linklok mattresses. Refer Figure 2.6.2. | Leave *in situ*. |

| Table 3.4.3: Pipeline protection & stabilisation features (PL929 & PL930) | | | |
|---|---|---|---|
| **Protection or stabilisation features** | **Number (UNO)** | **Description** | **Disposal route (if applicable)** |
| | 6 | ~KP129.1. PL253 Esmond pipeline crossing (PL930), 10m x 6m x 0.15m Linklok mattresses. Refer Figure 2.6.2. | |
| | 4 | ~KP20.0 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | Leave *in situ*. |
| | 1 | ~KP20.0 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | |
| | 24 | ~KP20.0 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | |
| | 1 | ~KP20.0 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | |
| | 4 | ~KP20.0 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.3. | |
| | 1 | ~KP4.8 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | Leave *in situ*. |
| | 4 | ~KP4.8 (PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | |
| | 4 | ~KP4.8 (PL929 & PL930), 12m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | |
| | 10 | ~KP4.8 (PL930), 6m x 4m x 0.15m. Linklok concrete mattress. Refer Figure 2.6.4. | |
| Grout bags (25kg) | 500 | At separation point at KP20. Refer Figure 2.6.3 | Leave *in situ*. |
| Deposited rock | 26,847Te | Between KP128.96 and KP129.320, PL253 Esmond pipeline crossings. Refer Figure 2.6.2. | Leave *in situ*. |

**NOTES:**

1. Origin of pipeline KP taken at MLWM and ends at base of PL929 riser at Murdoch MD;
2. No quantities of grout bags are stated on drawings or survey reports;
3. Mass of deposited rock is estimated, based on the estimated volume and profile;
4. Quantity of deposited rock *excludes* rock potentially used to protect and stabilise pipeline crossings installed *after* PL929 and PL930.

## 3.5 Wells

| Table 3.5.1: Well decommissioning |
|---|
| The Murdoch MD wells listed in Section 2.7, Table 2.7.1 have already been partly or fully decommissioned. The remainder – conductor removal, will be completed as part of the installation removal operations. |

## 3.6 Waste streams

The Able UK Seaton Port in Hartlepool is the decommissioning facility that has been selected and will manage all wastes. ABLE offers speciality services in the decommissioning and recycling of end-of-life vessels and marine structures. This is part due to the unique offer to undertake the work at the large scale, specialised ABLE Seaton Port Facility in Hartlepool, North-East of England. Chrysaor have used the organisation for previous decommissioning activities including the LOGGS complex structures.

| Table 3.6.1: Waste stream management method | |
|---|---|
| **Waste stream** | **Removal and disposal method** |
| **Bulk liquids** | Residual hydrocarbons have already been removed from topsides. Further cleaning and decontamination will take place onshore prior to re-use or recycling. |
| **Marine growth** | Where necessary and practicable, to allow access some marine growth will be removed offshore. The remainder will be brought to shore and disposed of according to guidelines and company policies and under appropriate permit. |
| **NORM** | Tests for NORM have been undertaken offshore by the Radiation Protection Supervisor. and recorded. Any NORM encountered onshore will be dealt with and disposed of in accordance with guidelines and company policies and under appropriate permit. |
| **Asbestos** | Given the age of the installations asbestos can be expected and will be dealt with and disposed of in accordance with guidelines and company policies. |
| **Chromium VI** | Given the age of the platforms Chromium VI paints may have been used for corrosion protection. Checks will be done to confirm whether Chromium IV is present on the platform using the correct PPE taking account of COSHH Regulations 2002. The material will be disposed of according to guidelines and company policies and under appropriate permit. |
| **Other hazardous wastes** | Other hazardous waste will be recovered to shore and disposed of according to guidelines and company policies and under appropriate permit. |
| **Onshore dismantling sites** | Appropriate licensed sites will be selected. The dismantling site must demonstrate proven disposal track record and waste stream management throughout the deconstruction process and demonstrate their ability to deliver re-use and recycling options. |

| Table 3.6.2: Inventory disposition | | | | |
|---|---|---|---|---|
| **Asset** | **Inventory** | **Total (Te)** | **Planned materials to shore (Te)** | **Planned materials decommissioned *in situ* (Te)** |
| **Murdoch MA** | Installation | 1,848 | 1,508 | 340 |
| **Murdoch MC** | Installation | 6,085 | 5,611 | 474 |
| **Murdoch MD** | Installation | 5,164 | 4,346 | 818 |
| | Template | 418 | 142 | 276 |
| | Pipelines | 146,556 | 209 | 146,347 |
| | Deposited rock | 50,350 | - | 50,350 |

# 4 Environmental Appraisal overview

## 4.1 Environmental sensitivities (summary)

| Table 4.1.1: Environmental sensitivities | |
|---|---|
| **Environmental Receptor** | **Main Features** |
| Conservation interests | **Protected habitats:**<br>The majority of the CMS infrastructure is located within the Dogger Bank Special Area of Conservation (SAC) and the Southern North Sea SAC, while the export pipelines also pass-through Inner Dowsing and Race Bank SAC, Greater Wash Special Protection Area (SPA).<br>The Dogger Bank SAC is the largest sandbank in UK waters and is designated for the Annex I feature '*Sandbanks which are slightly covered by seawater all the time*'. The Conservation Objectives for the site are to ensure that the features are to be in favourable condition thus ensuring site integrity in the long term and contribution to Favourable Conservation Status (FCS). This contribution would be achieved by maintaining or restoring, subject to natural change:<br>• The extent and distribution of the qualifying habitat in the site;<br>• The structure and function of the qualifying habitat in the site; and<br>• The supporting processes on which the qualifying habitat relies.<br>The Southern North Sea SAC has been identified as an area of importance for the Annex II species the harbour porpoise. This site includes key winter and summer habitat for this species. The Conservation Objectives of the site are to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:<br>• Harbour porpoise is a viable component of the site;<br>• There is no significant disturbance of the species; and<br>• The condition of supporting habitats and processes, and the availability of prey is maintained.<br>The Inner Dowsing, Race Bank and North Ridge SAC is designated for 'Sandbanks slightly covered by water at all times' and for 'Reefs'. The area encompasses a wide range of sandbank types which host a diverse variety of species, and biogenic reef formed by the Ross worm, *Sabellaria spinulosa*. Both the Humber Estuary SPA and the Greater Wash SPA are designated for a number of breeding and non-breeding bird species. The Humber Estuary SPA is additionally designated for the presence of waterbird assemblages.<br>**Protected species:**<br>Annex II species likely to be sighted within the area of the proposed decommissioning activities include harbour porpoise, grey seals and harbour seals.<br>Cod *Gadus morhua* are OSPAR listed threatened and/or declining species and are known to use the CMS for spawning and |

| Table 4.1.1: Environmental sensitivities | |
|---|---|
| **Environmental Receptor** | **Main Features** |
| | as a nursery. Survey footage identified three fish belonging to the family Gadidae, which cod are part of, however the species was not identified.<br>The ocean quahog (*Arctica islandica)* is among the longest-lived and slowest growing marine bivalves and is on the OSPAR list of threatened and/or declining species and habitats in the North Sea. It is also a Feature of Conservation Importance (FOCI) for which Marine Conservation Zones can be designated. One *A. islandica* individual was identified in a 2015 survey. A single juvenile individual was identified at in 2020. Bivalve siphons were observed in the 2020 survey throughout the CMS area however it is not possible to identify the species from the siphon alone therefore this cannot confirm the presence of more *A. islandica*.<br>*S.spinulosa* is a small, tube-building polychaete worm and is also on the OSPAR list of threatened and/or declining species and habitats in the North Sea. 21 individuals of *S. spinulosa* were identified from samples taken at the Murdoch Hub, however none were observed in seabed imagery. A 968m stretch of *S. spinulosa* reef was observed during a 2006 survey of the PL929/PL930 between KP31.390 and KP32.358.<br>Faunal burrows were observed throughout the area surveyed in 2020. However, only one site at Kelvin TM displayed burrows at a density sufficient to register on the Marine Nature Conservation Review SACFOR scale as showing a level of similarity to the OSPAR habitat '*seapens and burrowing megafauna community'*. Despite this, the burrows observed cannot be confidently attributed to any of the 'megafauna' species associated with this OSPAR habitat. Instead, the burrows observed at Kelvin TM and within the CMS area more likely relate to a number of species characteristic of the Dogger Bank community, including sand eels. Therefore, this habitat is not thought to be present within the CMS area. |
| Seabed and benthos | The seabed near the CMS infrastructure is predominantly composed of EUNIS biotope A5.23 or A5.24: Infralittoral fine sand or Infralittoral muddy sand and A5.25 or A5.26: Circalittoral fine sand or Circalittoral muddy sand. The mean particle size across the CMS was consistent with the SNS UKOOA mean particle size of 243µm (fine sand). The seabed sediments remain relatively consistent along the pipelines to shore. The PL929/PL930 travelling to shore pass through a band of A5.15: Deep circalittoral coarse sediment. This is followed by an area of A5.14 Circalittoral coarse sediment, small outcrops of A5.25 or A5.26 Circalittoral fine sand or Circalittoral muddy sand may be encountered for a stretch. Finally, the pipelines pass through a thin section of A5.13 Infralittoral coarse sediment just prior to landfall.<br>Total Hydrocarbon (THC) concentrations were below the Significant Environmental Impact (SEI) threshold across the CMS, and there is no evidence of drilling related hydrocarbon contamination. Reported Polycyclic Aromatic Hydrocarbon (PAH) concentrations were in line with levels typical of the wider SNS. Polychlorinated biphenyl (PCB) levels were below Limit of Detection (LOD). All detectable concentrations of heavy metals were above their respective OSPAR (2005) Background Concentrations. However, this is to be expected due to the heavily industrialised nature of the SNS. Organotin concentrations were below LOD, except at a single station at the Murdoch Hub.<br>*Spatangoida* (juveniles; the order of heart urchins) and *Spipohanes bombyx*, a polychaete, featured across the CMS. Juvenile *Spatangoida* dominated the benthos by number at almost every location however, when assessing the adult-only |

| Table 4.1.1: Environmental sensitivities | |
|---|---|
| **Environmental Receptor** | **Main Features** |
| | populations, the dominant taxa were more variable across the CMS though generally were polychaetes. Only at Katy KT was the infaunal community dominated by molluscs. |
| Fish | The CMS is located within an area of high intensity spawning for plaice and sandeel. The following species are also known to use the area for spawning: cod, herring, mackerel, *Nephrops*, sole, sprat, and whiting. Additionally, the following species use the area as nursery grounds: anglerfish, blue whiting, cod, European hake, herring, ling, mackerel, *Nephrops*, sandeel, spurdog, sprat, and tope shark. Whiting use the area as a high intensity nursery.<br>The probability of juvenile fish aggregations occurring is the CMS is low for: plaice, sole, hake, anglerfish, blue whiting, Norway pout, mackerel, haddock, and cod. The probability of juvenile herring, horse mackerel, sprat, and whiting being present in the CMS area is low-moderate. |
| Commercial fishing | The CMS area is located in International Council for the Exploration of the Seas (ICES) statistical rectangle 37F2. The associated PL929 and PL930 pass through rectangles 37F1, 36F1, 36F0, and 35F0. Fisheries landings vary throughout the project area. At the CMS area in 2019, the catch was mostly demersal and was relatively low compared to other rectangles. Closer to shore shellfish make up the majority of landings the value of which was very high; in rectangles 36F1, 36F0 and 35F0 closest to shore the value of catch was >£1,000,000 every year from 2015 onwards.<br>Commercial fishing effort was also highest in rectangle 36F0 (2,344 days in 2019). This effort is consistently high across all months excluding January, February, November, and December when effort is moderate. Effort is much lower around the CMS (rectangle 37F2). Fishing effort in other rectangles is comparatively low (<100 days per month). |
| Marine mammals | Harbour porpoise, minke whale, white-beaked dolphin, and long-finned pilot whale have all been observed within the vicinity of the project. For all species but harbour porpoise, they are found in relatively low numbers in the CMS or have low abundance estimates. Harbour porpoise are common in the SNS and frequent the area throughout much of the year. They are thought to be found in the area at a density of 0.888 animals/km$^2$ which is relatively high compared to other areas of the North Sea. All of the cetacean species are both European Protected Species (EPS) and are covered by the UK Biodiversity Action Plan (UK BAP).<br>Both grey and harbour seal densities are relatively low offshore in the CMS area. However, where the PL929 and PL930 arrive at the shore seal density is much higher, particularly for grey seals. Grey seals use the Humber Estuary SAC in autumn to form large breeding colonies. Comparatively, harbour seals use the Wash and North Norfolk Coast SAC (~27 km south of the TGT) for breeding and hauling-out. Both pinniped species are Annex II listed. |
| Seabirds | The following species are present in the CMS area across the majority of the year: northern fulmar, northern gannet, great black-backed gull, black-headed gull, common gull, herring gull, Atlantic puffin, black-legged kittiwake, common guillemot, razorbill, little auk, and lesser black-backed gull.<br>Seabird sensitivity to oil (according to the Seabird Oil Sensitivity Index) is low throughout the year and highest in July and between November and January (Blocks 44/21, 44/22, 44/23, 44/17, 44/18, 44/19). Block 48/2, approximately half-way along the PL929 and PL930, is high, very high, or extremely high every month of the year. In the Blocks nearest to the coast |

| Table 4.1.1: Environmental sensitivities | |
|---|---|
| **Environmental Receptor** | **Main Features** |
| | (47/17, 47/18) sensitivity is highest between October and December, and in March. |
| Onshore communities | An onshore decontamination and dismantlement facility will be UK based and will be one that is deemed able to comply with all relevant permitting and legislative requirements. |
| Other users of the sea | The CMS is located in a mature area of the SNS with extensive oil and gas development. There are ten oil and gas surface structures within 50 km of the project, the nearest being 20.1 km away. Shipping in the project area is variable; closest to shore Blocks 47/18, 47/19, 47/20, 47/15, experience very high shipping activity, due to their proximity to the Humber Estuary. In the CMS area shipping is moderate (in Blocks 44/22 and 44/23) to high (Blocks 44/17, 44/18 and 44/19).<br>Two telecom cables come within 1km of the Murdoch platform (Tampnet cable and MCCS). The PL929 and PL930 do not cross any third-party telecom cables. However, as there is much renewable energy activity in the area, the pipelines to shore do cross the Hornsea 1 active export cable. Furthermore, the PL929 and PL930 pass through the Hornsea 2 area for ~25 km, and through the Triton Knoll windfarm area which is currently under construction. The Race Bank windfarm (and proposed extension), and the Lincs windfarm are also both located within 15 km of the PL929/PL930.<br>Blocks 47/18, 47/19, 47/20, 47/15, 43/29, 43/30, and 44/26 are of concern to the Ministry of Defence (MoD) as they lie within training ranges. Additionally, Block 47/17, in which the PL929 and PL930 terminate at the shore, has been excluded from consideration of granting development licenses at the request of the MoD.<br>There are seven non-dangerous wrecks within 20 km of Murdoch. There is a single dangerous wreck 18 km from Murdoch. There are no designated historical wrecks recorded in the area. |
| Atmosphere | Energy will be used during decommissioning activities, and this will result in atmospheric emissions. Once decommissioning has been completed, pipeline surveys will likely be required in future, incurring further use of energy use and the resulting emissions. |

## 4.2 Potential environmental impacts and their management

### 4.2.1 Environmental impact assessment summary

The potential environmental impacts associated with the decommissioning activities have been assessed and it is concluded that the proposed decommissioning of the infrastructure can be completed without causing significant adverse impact to the environment. The EA assesses the potential environmental impacts by identifying interactions between the proposed decommissioning activities and the associated environmental receptors. It also describes the proposed mitigation measures designed to avoid or reduce the identified potential environmental impacts and how these will be managed in accordance with Chrysaor's Environmental Management System (EMS) while considering responses from stakeholders. It is expected that CDP1b, CDP2 and CDP3 will be addressed as a campaign of decommissioning work, so much of the following information is explained in these terms.

**Table 4.2.1: Environmental Impact Management**

| Activity | Main Impacts | Management |
|---|---|---|
| Vessel activity during installation and pipeline decommissioning activities | Atmospheric emissions | The majority of atmospheric emissions for the decommissioning of CDP1b, CDP2 [3] and CDP3 [2] combined relate to vessel use or are associated with the recycling of material returned to shore. The worst-case estimated $CO_2$ emissions to be generated by the selected decommissioning options are 339,358 Te, this equates to 2.6% of the total UKCS emissions in 2018 (13,200,000 Te) and includes any theoretical emissions associated with the remanufacture of infrastructure remaining *in situ*. Almost all future emissions (from project operations and vessels) will cease once decommissioning has been completed.<br>All combustion plant including engines and generators on the vessels will be well maintained and correctly operated to ensure that they are working efficiently to minimise energy use and gaseous emissions.<br>Vessel operations will be minimised where practical. |
| Decommissioning of installations and pipelines | Seabed disturbance | There is potential for decommissioning activities to generate disturbance to the seabed; including the decommissioning of pipelines *in situ* and any associated remediation, and the removal of substructures.<br>Seabed impacts may range in duration from short-term impacts, such as temporary sediment suspension or smothering, to permanent impacts, such as the introduction of new substrate or any consequential habitat or community level changes which may transpire.<br>The proposed decommissioning activities associated with CDP1b, CDP2 [3] and CDP3 [2] combined may impact an area of 0.093 $km^2$ SNS habitat. Much of this activity is due to take place within the Dogger Bank SAC (0.0697 $km^2$) which is designated for the presence of Annex I '*Sandbanks which are slightly covered by sea water all the time'*. While the activities may result in the mortality of some individuals, many of the taxa within the CMS area are relatively resilient; |

| Table 4.2.1: Environmental Impact Management | | |
|---|---|---|
| **Activity** | **Main Impacts** | **Management** |
| | | sandy communities are comparatively quick to recover from disturbance. Furthermore, *S. spinulosa*, and Arctica islandica individuals (albeit in low numbers are the only sensitive species of conservation interest is unlikely to be directly affected by the project activities within the CMS or associated with contingency activities along the PL929/PL930. With regards to the sediment and benthic features within the Dogger Bank SAC, the CMS activities are unlikely to affect the natural physical processes of the area. Pipelines being decommissioned *in situ* are also unlikely to have an impact on these processes and their gradual degradation over time will have a negligible impact on the surrounding sediments.<br>Chrysaor are committed to leaving a clear, safe seabed in the wake of the decommissioning activities. The clear seabed will be validated by a verification survey over the installation sites and pipeline corridors. Non-intrusive verification techniques will be considered in the first instance, but where these are deemed inconclusive by the NFFO, seabed clearance is likely to require conventional overtrawl survey methods. The methods used will be discussed and finalised with OPRED. |
| Decommissioning of pipelines *in situ* | Physical presence of infrastructure decommissioned *in situ* | The preferred option from the CA is to decommission the pipelines PL929 & PL930 *in situ*, with some sections of some pipelines qualifying for partial removal. The physical presence of infrastructure decommissioned *in situ* has the potential to impact other sea users.<br>The potential impacts identified to commercial fisheries were limited to the potential for legacy impacts such as the snagging of fishing gears on flowlines decommissioned *in situ*, and any snagging risk due to existing seabed depressions. Two pipelines qualified for partial removal and the sections to be removed coincide with areas which have higher levels of exposure. The PL929/PL930 to shore have the highest level of exposure and the PL929 is the only pipeline along which reportable spans are located. Of the two reportable spans, one is within 100 m of the Murdoch Hub, and neither are located near areas of high intensity trawling. Owing to the nature of the seabed and physical processes in the CMS, depressions are likely to become backfilled over time and the incidence of a snagging event is highly unlikely.<br>Pipelines and stabilisation features decommissioned *in situ* will continue to be shown on Navigational charts.<br>A clear seabed verification survey (using non-intrusive techniques in the first instance) will be undertaken following the decommissioning works.<br>The presence of stabilisation features remaining *in situ* will not compromise the integrity of the environmental feature of the seabed in the area. |
| Vessel activity during | Physical presence of vessels | The presence of a small number of vessels for decommissioning activities associated with CDP1b |

| Table 4.2.1: Environmental Impact Management | | |
|---|---|---|
| **Activity** | **Main Impacts** | **Management** |
| installation and pipeline decommissioning operations | in relation to other sea users | [2], CDP2 [3] and CDP3 will be short-term in the context of the life of the CMS fields. Activity will occur using similar vessels to those currently deployed for oil and gas installation, operation, and decommissioning activities across the SNS. Furthermore, most of the decommissioning works will be carried out within the 500 m zones, thereby using the area around existing infrastructure, and not occupying 'new' areas. Vessel presence will be spatially and temporally restricted so exclusion will only be short-term.<br>The decommissioning of the CMS area is estimated to require eight different vessel types. They would not all be on location at the same time. For the overall campaign covering CDP1b [2], CDP2 [3] and CDP3 the vessel activities are expected to over approximately 804 days; most of these days are attributed to the removal of the surface installations. Overall levels of vessel activity attributed to the decommissioning are likely to be similar to those experienced under typical conditions. The nearshore activities associated with this project are very likely to be limited in duration and limited to passing vessels.<br>Other sea users will be notified in advance of planned activities through the appropriate mechanisms, meaning those stakeholders will have time to make any necessary alternative arrangements during the finite period of operations. |
| Underwater activities during decommissioning operations | Underwater noise | A noise assessment has been completed to determine the likely impact of noise generated by the proposed operations on marine mammals in the surrounding area. On the basis of the expected noise emissions, there is no requirement to adopt additional mitigation to limited potential for impact. However, there are control measures built into the project that will ensure noise emissions are not greater than would be required to execute the decommissioning activities. For example, machinery and equipment will be well-maintained and the number of vessels will be minimised as far as possible.<br>Given the location of the project within the Southern North Sea SAC, the generation of underwater noise is also a concern, particularly with regards to Annex II harbour porpoise for which the site is designated. Noise emissions are expected to be sufficiently low that injury will not occur from any of the activities. With regards to disturbance, potential zones of avoidance around vessels or cutting activities are not predicted to extend beyond approximately 100m. Furthermore, the levels of noise generated by project activities are unlikely to be detectable above background levels.<br>There is no intention to use underwater explosives during these activities. In the extremely unlikely event that the requirement changes, project-specific noise modelling may be undertaken to inform the risk of injury in the impact assessment and mitigation requirements. The requirement will be discussed with OPRED Environmental Management Team. |

| Table 4.2.1: Environmental Impact Management | | |
|---|---|---|
| **Activity** | **Main Impacts** | **Management** |
| Vessel activity during installation and pipeline decommissioning operations | Discharges to sea | Discharges from vessels are regulated activities that are managed on an ongoing basis through existing legislation and compliance controls.<br>All subsea infrastructure in the CMS area has been drained and flushed at CoP. This is a pre-decommissioning activity which has been permitted as appropriate, and therefore, falls outside the scope of the EA. Any discharges from infrastructure occurring during decommissioning activities will similarly be assessed in more detail as part of the environmental permitting process (e.g. through Master Application Templates/Subsidiary Application Templates). Controls will be in place, as relevant, through the Offshore Chemical Regulations and the Oil Pollution Prevention and Control regulations.<br>The pipelines have already been flushed and cleaned. |
| Vessel activity during installation and pipeline decommissioning operations; manufacture of materials required to carry out the decommissioning activities | Resource Use | Generally, resource use from the proposed activities will require limited raw materials and be largely restricted to fuel use. Any opportunities for increasing fuel efficiency and reducing use of resources will be identified and implemented by Chrysaor where possible.<br>The estimated total energy usage for the project is 3,635,554 GJ. This number accounts for all operations, material recycling, and the resource loss associated with decommissioning items *in situ*. This is considered low compared to the resources generated during the production phase of the project. |
| Waste management | Waste | The onshore treatment of waste from the CMS decommissioning activities will be undertaken according to the principles of the waste hierarchy, a conceptual framework which ranks the options for dealing with waste in terms of sustainability.<br>Wastes will be treated using the principles of the waste hierarchy, focusing on the reuse and recycling of wastes where possible. Raw materials will be returned to shore with the expectation to recycle the majority of the returned non-hazardous material. Other non-hazardous waste which cannot be reused or recycled will be disposed of to a landfill site. Facilities requiring removal as part of the CMS DPs will be transferred to shore by a heavy lift vessel for decontamination, dismantlement, disposal, recycling or reuse. Typically, around 95% of the materials from decommissioning projects can be recycled. Hazardous waste resulting from the dismantling of the CMS facilities will be pre-treated to reduce hazardous properties or render it non-hazardous prior to recycling or disposing of it to a landfill site.<br>The recycling and disposal of wastes are covered by Chrysaor's Waste Management Strategy, which is compliant with relevant regulations relating to the handling of waste offshore, transfer of controlled, hazardous (special) waste, and TFSW (Trans-Frontier Shipment of Waste). The Waste Management Strategy is guided by Chrysaor's HSE Policy. Only licenced contractors who can |

| Table 4.2.1: Environmental Impact Management | | |
|---|---|---|
| **Activity** | **Main Impacts** | **Management** |
| | | demonstrate they are capable of handling and processing the material to be brought ashore will be considered for onshore activities. |
| Removal of surface installations | Disturbance or destruction of seabird nests | In recent years, there has been an increase in the number of seabirds utilising offshore installations for nesting. Opportunistic species such as kittiwake and herring gull are utilising artificial nest locations and successfully rearing chicks. In some instances, colonies of several hundred birds have established and return each year. Although for most offshore platforms, the number of breeding birds remains very low.<br>All nesting birds and nesting activities are protected from damage by conservation legislation. Under the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 – (OMR 17), it is an offence to:<br>• take, damage, or destroy the nest of any wild bird while that nest is in use or being built, or<br>• take or destroy an egg of any wild bird.<br>This legislation is relevant to installations more than 12 nautical miles from the coast, applies to all species of bird and applies irrespective of the number of nests found. i.e. there is no de-minimus.<br>The preferred practice is to avoid disturbance by undertaking works out with the breeding season. However, this is not always practicable. Chrysaor has been undertaking surveys to determine the presence (and if so type) of birds nesting on our platforms. We are committed to deterring birds from their installations out with the breeding season to mitigate against nesting birds on the platform. Chrysaor may employ a range of non-lethal deterrents to prevent birds nesting if required. These methods will continue throughout the duration of decommissioning. Chrysaor carried out surveys in April / May 2021 and repeat surveys are planned for the early breeding season (during Q2).<br>Should these measures not prove successful, Chrysaor will engage with OPRED to agree any further licensing requirements, as appropriate. This process will form part of future licensing applications for subsequent offshore applications and as such is not assessed here further. |
| Vessel activity during installation and pipeline decommissioning operations | Physical presence of vessels in the field | The most likely origin of an accidental event would be from an unplanned instantaneous diesel release from the largest vessel employed in the decommissioning activities. This is expected to be an HLV with a maximum fuel capacity of approximately 1,569$m^3$. The fuel inventory of the HLV vessel is likely to be split between a number of separate fuel tanks, significantly reducing the likelihood of an instantaneous release of the full inventory. Any spills from vessels in transit or participating in decommissioning activities are covered by separate Shipboard Oil Pollution |

| Table 4.2.1: Environmental Impact Management | | |
|---|---|---|
| **Activity** | **Main Impacts** | **Management** |
| | | Emergency Plans (SOPEPs). Chrysaor will support response of any vessel-based loss of fuel containment through the vessel owner's SOPEP.<br>There is a very low likelihood of vessel-to-vessel collision occurrence, an estimated one collision in 685 years which is in line with the areas' baseline collision risk.<br>Chrysaor maintains manned bridges, navigational aids and monitoring of safety zones. Only project vessels will be present when activity taking is place within 500 m safety exclusion zones. Other vessels will not be present within the 500 m zone at any time prior to well decommissioning.<br>OPRED will be notified of any dropped objects, noting that dropped object procedures are industry-standard and will be used. All unplanned losses in the marine environment will be attempted to be remediated, and notifications to other mariners will be sent out. The post-decommissioning Clear Seabed Verification Survey will aid in the identification of in-field dropped objects. |

# 5 Interested party consultation

## 5.1 Consultation summary

| Table 5.1.1: Summary of stakeholder comments | | |
|---|---|---|
| **Stakeholder** | **Comment** | **Response** |
| **INFORMAL CONSULTATIONS** | | |
| **NFFO** | | |
| **NIFPO** | | |
| **SFF** | | |
| **GMG** | | |
| **STATUTORY CONSULTATIONS** | | |
| **NFFO** | | |
| **NIFPO** | | |
| **SFF** | | |
| **GMG** | | |
| **Public** | | |

# 6 Programme management

## 6.1 Project management and verification

Chrysaor has established a UK Decommissioning organisation as a department to manage and execute decommissioning projects. Chrysaor's existing processes for Operations, Planning, Project Management, Procurement, Health Safety and Environment, will be used and tailored to meet the specific requirements of decommissioning projects. Chrysaor will manage all permitting, licences, authorisations, notices, consents and consultations.

Any changes to this decommissioning document will be discussed and agreed with OPRED.

## 6.2 Post-decommissioning debris clearance and verification

A post decommissioning debris survey will be carried out within all 500m safety zones. Discussions are underway with OPRED regarding the level of appropriate coverage for pipeline corridor survey along each existing pipeline route. Oil and gas debris will be recovered for onshore disposal or recycling in line with existing disposal methods.

Verification of seabed state will be obtained. Whilst the worst-case seabed disturbance from overtrawl has been assessed, it is recognised that some of the decommissioning activities is occurring in the Dogger Bank SAC, therefore different methods of determining debris clearance and snag risk may be required. The methods used will therefore be discussed and finalised with OPRED. This will be followed by a statement of clearance to all relevant governmental departments and statutory consultees.

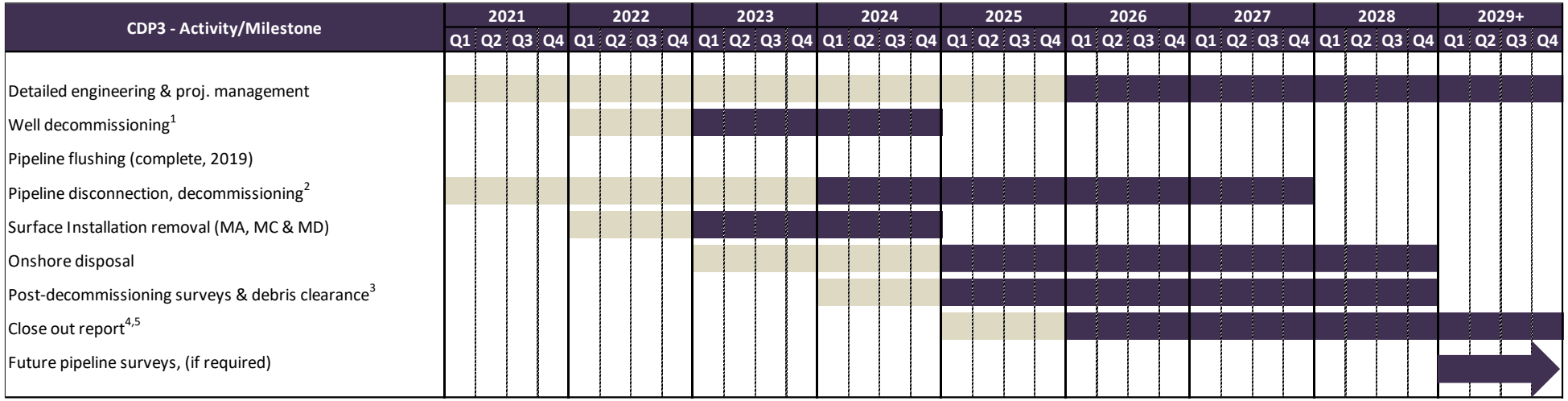
Oil and gas debris activity and verification along the remaining pipeline corridor of the infield pipeline sections not subject to actual decommissioning works will be carried out in accordance with OPRED guidance in operation at the time those activities commence. This activity will reflect the environmental setting of the Dogger Bank SAC.

The outcomes of the clear seabed verification activities in the 500m zones and the alternative survey methods of the pipelines will be reported in the Close Out Report and sent to the Seabed Data Centre (Offshore Installations) at the Hydrographic Office.

## 6.3 Schedule

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

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




**Notes / Key**

Earliest potential activity

Activity window to allow commercial flexibility associated with decommissioning activities

1. Two wells (44/22a-D6 & 44/22a-D9) have been fully decommissioned (AB3) while the remainder have been partially decommissioned (AB2). The intention is that the conductors are removed in the same campaign as removal of the MD installation;
2. The pipelines have been disconnected at Murdoch as agreed in a Preparatory Works request to OPRED on 12 Feb 2021. Pipeline decommissioning may be carried out as part of a wider subsea decommissioning campaign associated with CDP2;
3. Post decommissioning debris clearance within Murdoch 500m zone will be timed to coincide with execution of the scope of work associated with CDP2;
4. The close out report will be prepared on completion of offshore activities. It will contain results of environmental suveys, debris survey (identification/removal) and clear seabed verification survey;
5. The close out report will explain the strategy based on risk assessments and results of post decommissioning surveys.

***Figure 6.3.1: Gantt chart of project plan***

## 6.4 Costs

Decommissioning costs will be provided separately to OPRED and OGA.

## 6.5 Close out

In accordance with OPRED guidelines, a close out report covering the completion of the offshore decommissioning scope of these Decommissioning Programmes will be submitted at time agreed by OPRED. The close out report will contain debris removal and verification of seabed clearance, the first post decommissioning environmental survey and explanation of any variations to the approved Decommissioning Programmes.

## 6.6 Post decommissioning monitoring and evaluation

After decommissioning activities have been concluded, pipeline status surveys and environmental surveys will be completed with the findings being sent to OPRED in the Close Out report. The frequency and scope of future surveys will be agreed with OPRED and supported by a risk assessment. Residual liability will remain with the Section 29 holders identified in Table 1.4.5. Unless agreed otherwise in advance with OPRED, Chrysaor will remain the focal point for such matters, such as any change in ownership, for example.

A post decommissioning environmental seabed survey will be carried out once the offshore decommissioning work scope covered by this decommissioning document has been completed. The survey will include seabed sampling to monitor levels of hydrocarbons, heavy metals, and other contaminants to allow for a comparison with the results of the pre-decommissioning survey. Results of this survey will be available once the decommissioning document work scope is complete.

**PIPELINE RISK BASED MONITORING PROGRAMME**

All pipeline systems covered within this Decommissioning Document scope will be subject to survey. The post decommissioning pipeline (and associated stabilisation features) monitoring programme, to be agreed with OPRED, will:

- Begin with an initial baseline survey covering the full length of each pipeline;
- Be followed by a risk-based assessment for each pipeline (and associated stabilisation materials) which will inform the minimum agreed extent and frequency of future surveying. This will take account of pipeline burial, exposure and spanning data derived from the initial baseline survey, all available historical survey information and fisheries impact assessment;
- Provide a report of each required survey (with analysis of the findings, the impact on the risk-based assessment and identification of the proposed timing of the next survey in accordance with the agreed RBA approach), for discussion and agreement of OPRED;
- Include provision for remediation in the framework where such a requirement is identified. Appropriate remediation will be discussed and agreed with OPRED;
- Where remediation has been undertaken, a follow up survey of the remediated section(s) will be required;
- In the event of a reported snagging incident on any section of a pipeline, the requirement for any additional survey and/or remediation, will be discussed and agreed with OPRED;
- Will include a further fisheries impact assessment following completion of the agreed survey programme;
- Monitoring will become reactive following completion of the agreed survey programme and OPRED agreement of the analysis of the outcomes;
- Require pipeline information to be recorded on Navigation charts and FishSAFE.

The monitoring programme will also include discussion with OPRED of the long-term pipeline degradation and potential risk to other users of the sea following conclusion of the planned survey programme.

# 7 Supporting documents


[1] Chrysaor (2020) CDP1a Decommissioning Programme for Caister installation CDP1a, COP-SNS-C-CM-X-PM-12-00001;

[2] Chrysaor (2020) CDP1b Decommissioning Programmes for Caister pipelines, CYR-SNS-C-CM-X-PM-12-00001;

[3] Chrysaor 2020) CDP2 Decommissioning Programmes for Caister-Murdoch System Installations and Associated Pipelines, CYR-SNS-C-CM-X-PM-12-00002;

[4] Chrysaor (2020) Environmental Appraisal Caister-Murdoch System, CYR-SNS-C-XX-X-HS-02-00003;

[5] Chrysaor (2020) Comparative Assessment for Pipelines in the Caister-Murdoch System, CYR-SNS-C-XX-X-HS-02-00001;

[6] ConocoPhillips (2017). Commercial Fisheries Baseline Characterisation: LOGGS South, LOGGS North and CMS Areas. Report No. BMM-SNS-P-XX-S-HS-02-00001;

[7] DNO (2019) Ketch Decommissioning Programmes, Final July 2019. Weblink last accessed 18 Oct 2020: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/826988/Ketch_Decommissioning_Programme_BEIS_Final_July_2019.pdf

[8] DNO (2019) Schooner Decommissioning Programmes, Final July 2019. Weblink last accessed 18 Oct 2020: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/826989/Schooner_Decommissioning_Programme_BEIS_Final_July_2019.pdf

[9] EU (2008) Directive 2008/98/EC on waste (Waste Directive) Weblink last accessed 27 Jan 2021: http://data.europa.eu/eli/dir/2008/98/2018-07-05

[10] Gardline (2015). SNS Decommissioning Survey Caister Murdoch System (Murdoch Hub and Caister CM). Habitat Assessment Report. August 2015. Final. Report No. 10554.1, CPUK/INT/PR-258;

[11] Gardline (2015). SNS Decommissioning Survey Caister Murdoch System (Murdoch Hub and Caister CM). Pre-decommissioning Survey Report. August 2015. Final. Report No. 10554.2, CPUK/INT/PR-258;

[12] OPRED (2018) Offshore Oil and Gas Decommissioning Guidance Notes. Weblink last accessed 28 Oct 2020: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760560/Decom_Guidance_Notes_November_2018.pdf

# Appendix 1 Pipeline Crossing Schematics

## Appendix 1.1 Pipeline crossings outside Murdoch 500m Zone

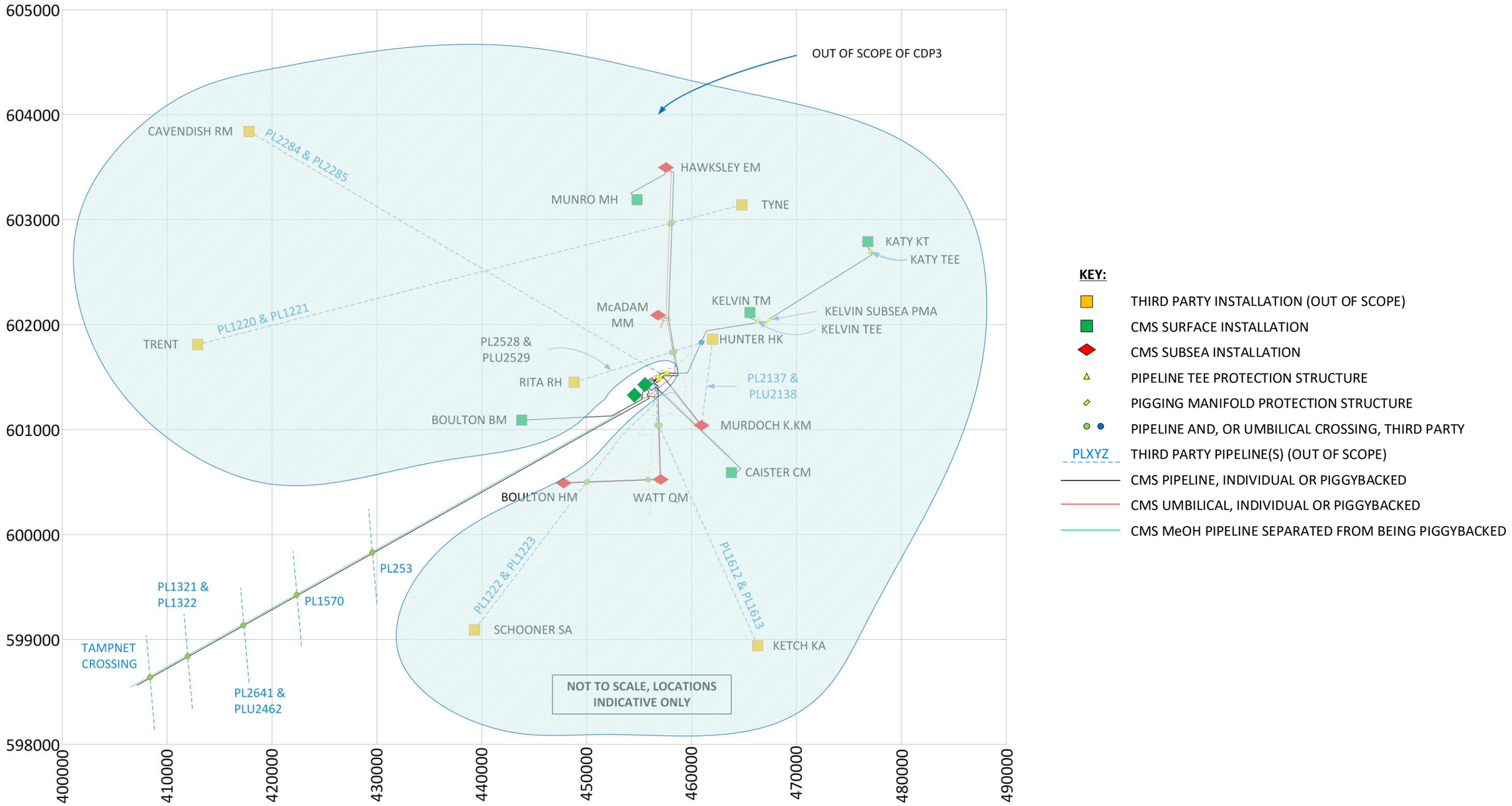



***Figure A1.1.1: Schematic of pipeline crossings outside Murdoch 500m zone[9]***

[9] Murdoch MC not shown, area near Murdoch complex indicative only. Refer Figure 2.5.1.

# Appendix 2 Decommissioning onshore pipelines

## Appendix 2.1 Outline approach

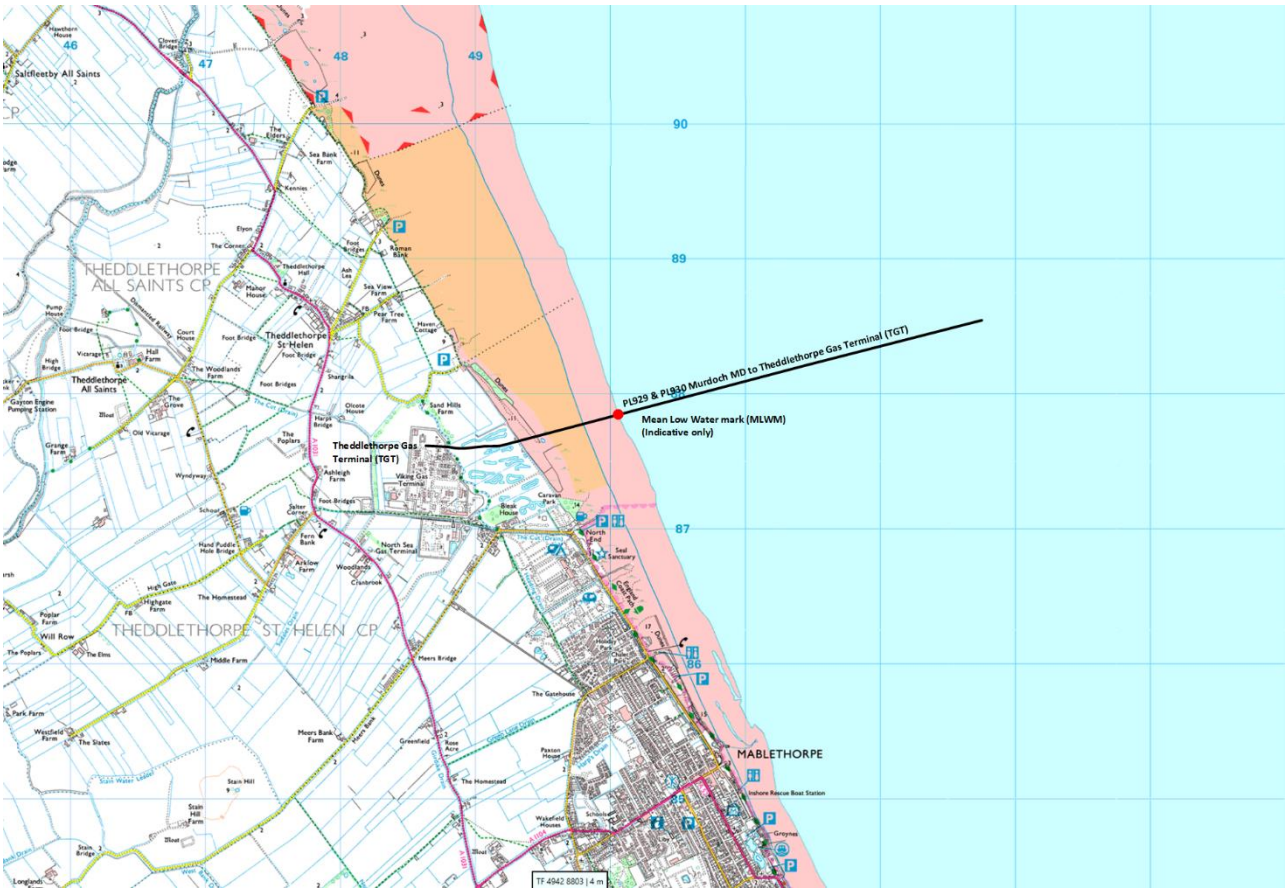



***Figure A2.1.1: PL929 Theddlethorpe approach (indicative only)***

The onshore pipelines will be decommissioned in accordance with the Pipelines Act 1962, Regulations 25, the Pipelines Safety Regulations 1996, and the BSI Code of Practice for steel pipelines on land PD 8010-1:2015+A1:2016.

The pipelines will be flushed clean of hydrocarbons and toxic materials, then disconnected and sealed. The abandonment plan for the onshore sections of the pipelines out to the MLWM has not been fully defined. Where the pipelines are to be decommissioned *in situ*, they may be filled with a suitable filler and left buried. A record will be kept of all *in situ* pipelines indicating their contents, location, size, and depth of burial.

The option to use a suitable filler material for the onshore abandoned *in situ* pipeline sections would be based on an option selection assessment, as well as comprehensive stakeholder engagement.

Structural degradation of the pipelines will be a long-term process caused by corrosion and the eventual collapse of the pipelines under their own weight, the weight of the pipeline coating material and that of the overlying soil or substrate. It is anticipated that failure of the pipelines due to through-wall degradation would only begin to occur after many decades (i.e. 60 to 100 years) and is expected to take several hundred years to fully degrade.

During this process, degradation products derived from the exterior and interior of the pipe will breakdown and potentially become bioavailable in the immediate vicinity. Pathways from the pipelines to the receptors would be via the interstitial spaces in substrate.

The release of degradation products is expected to occur at a slow rate and therefore expected to have a minimal impact on the surrounding environment. The area that could be biologically impacted would likely be limited to a few metres on either side of the pipeline.

The primary degradation products will originate from the following pipeline components:

- Pipeline scale;
- Steel;
- Sacrificial anodes;
- Coal tar enamel coating;
- Concrete coating; and
- Plastic coating.

Complete failure of water filled buried pipelines has a potential for subsidence of the overlying substrate.

# Appendix 3 Public & consultee correspondence

## Appendix 3.1 Public Notices

The Public Notices and correspondence with the Statutory Consultees will be added on completion of the Statutory Consultation.

# Appendix 4 Pre-works approval communications

## Appendix 4.1 Chrysaor to OPRED (6-pages)

CHRYSAOR

Chrysaor Production (U.K.) Limited
Rubislaw House
Anderson Drive
Aberdeen
AB15 6FZ

Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)
Department for Business, Energy and Industrial Strategy (BEIS)
Offshore Decommissioning Unit
AB1 Building
Wing C, 3rd Floor
48 Huntly Street
Aberdeen
AB10 1SH

7th January 2021

Dear Ms Livingston

**Request to undertake additional disconnection works in 2021 prior to Decommissioning Programme Approval**

Chrysaor Production (U.K.) Limited requests permission to undertake certain works at the Murdoch Complex in the CMS Area of the Southern North Sea (SNS) ahead of the approval of the associated Decommissioning Programmes.

The MD platform was installed in 1992 as a manned production facility and gathering system, initially for the Caister field. A compression platform, Murdoch MC, was added in 1996 and an accommodation platform, Murdoch MA, in 2002 to complete the complex as a collection hub for the Normally Unattended Installations (NUI's) in the surrounding area. At Murdoch, received gas was compressed and exported to TGT via an 188km 26" gas pipeline. At TGT, the gas was processed, sold and exported to the National Transmission System (NTS).

The works required to be undertaken are:

1. Subsea pipeline disconnections at the base of the MD and MA jackets of the Murdoch Complex including 3rd party disconnections

These scopes will be a part of the DSV campaign to be conducted between May and October in 2021 to support the removal of the Murdoch Complex in 2022.

The Decommissioning Programmes associated with the pipeline disconnections are CDP1b, CDP2 and CDP3. These decommissioning programmes will be submitted to OPRED in Q1 2021 for review prior to consultation. Approval of CDP3 (Murdoch Complex & Associated Trunklines) is anticipated by the end of 2021 and the CDP1b (Caister CM Associated Pipelines) and CDP2 (Boulton BM, Katy KT, Kelvin TM, Munro MH platforms and Associated Pipelines including CMSIII manifolds and Associated Pipelines) are expected to be approved in 2021/ 2022.

1

The detailed scope of work planned at each location in support of decommissioning, for which we request OPRED approval, is as follows:

1. **Murdoch Platform Disconnection**

   To prepare for Murdoch MD, MC, MA removal in 2022, the pipelines at Murdoch MD and umbilicals at MA are required to be disconnected to facilitate enough clearance for the removals contractor to take the platforms away. All the pipelines to Murdoch have been flushed clean and filled with inhibited seawater.

   The disconnection methodology is to use a diamond-wire saw (DWS), to cut the gas and methanol spool pieces at a minimum of 5m lateral distance from the platform. Thereafter where a closing span exists at the riser base, a further length will be removed up to the point where the pipeline touches down on the seabed. Shears will be used to cut the outboard end of the pipeline at the touchdown point. The disconnection philosophy at this stage, is to minimise pipeline intervention required proximal to the platform. To achieve this the minimum length of pipeline will be disconnected to achieve sufficient clearance for platform removal. The outboard cut will terminate at a point where the pipeline is buried beneath stabilisation material. Mattress removal will only take place where they obstruct the clearance necessary for the removal criteria. Minimum excavation will be required to expose pipelines as they have been surface-laid at the approaches. Seabed mobility may however have buried the pipelines thus requiring minor unburial to expose the section to the point where it is buried beneath stabilisation material. A ROV dredger will be on board the vessel to facilitate unburial, if necessary.

   The pipeline ends at Murdoch MD and MA will not be buried at this stage, as the assessment of the decommissioning of the pipeline ends will be communicated within the comparative assessment and agreed between stakeholders during the decommissioning approval process. The comparative assessment will be submitted to BEIS for initial review in early 2021. Any future remediation of the pipeline ends required to reach an agreed decommissioning as-left state will be undertaken as part of the post removal activities.

   The 500m zone will be retained until there are no foreseeable snagging risks to fishermen.

13 pipelines 5 gas pipelines, 5 methanol pipelines and 3 umbilicals) are proposed to be disconnected:

| Pipeline Number | Pipeline Description | Removal Length (minimum) | Removed Items* |
|---|---|---|---|
| **PL1436** | Boulton BM to Murdoch MD 10" Gas Line | 3m (Note1) | No mattresses, several grout bags |
| **PL1437** | Murdoch MD 3" MeOH Line to Boulton BM | 3m (Note1) | No mattresses, several grout bags |
| **PL929** | Murdoch MD to TGT 26" Gas Line | 3m (Note2) | No mattresses, several grout bags |
| **PL930** | TGT to Murdoch MD 4" MeOH Line | 3m (Note2) | No mattresses, several grout bags |
| **PL935** | Caister CM to Murdoch MD 16" Gas Line | 3m (Note2) | Several mattresses, several grout bags |
| **PL936** | Murdoch MD to Caister CM 3" MeOH Line | 3m (Note2) | Several mattresses, several grout bags |
| **PL1922** | Hawksley EM to Murdoch MD 12"Gas Line via McAdam MM and Northern Lobe Pigging Skid (PSNL) | 11m | No mattresses, several grout bags |
| **PL1925** | Murdoch MD to Hawksley EM 3" MeOH Line via McAdam MM and Northern Lobe Pigging Skid (PSNL) | 11m | No mattresses, several grout bags |
| **PL1924** | Boulton H HM to Murdoch MD 10"Gas Line via Southern Lobe Pigging Skid (PSSL) via Watt QM | 12m | No mattresses, several grout bags |
| **PL1927** | Murdoch MD to Boulton H HM 3" MeOH Line via Southern Lobe Pigging Skid (PSSL) via Watt QM | 12m | No mattresses, several grout bags |
| **PLU4890 (UM8)** | Murdoch MA to Murdoch K KM | 8m | No mattresses, several grout bags |
| **PLU4686 (UM7)** | Murdoch MA to McAdam MM | 8m | No mattresses, several grout bags |
| **PLU4889 (UM5)** | Murdoch MA to Watt QM | 8m | No mattresses, several grout bags |

**Removed items are approximate based on as-left information, actual conditions may differ when executing the works.*
*Note 1 - - Minimum separation of 3m disconnection length in 2021 for these lines due to access restrictions as they run under the MD platform which causes access issues, so it is proposed we carry out recommended disconnection to this line in 2022*
*Note 2 - Minimum separation of 3m disconnection length in 2021 for these lines due to access restrictions as they run under the helideck, which causes access issues with getting the vessel in close with necessary tooling etc so it is proposed we carry out recommended disconnection to this line in 2022.*

Where safe to do so, all grout bags and mattresses moved to enable access will be recovered for onshore disposal. All cut sections of the pipelines will be recovered to deck for onshore disposal.

To achieve cost efficiencies during the SNS subsea campaign, Chrysaor has invited the 3rd parties that are connected to the complex to participate in the subsea disconnection scope. The 3rd party pipelines that may also be

included in the scope are DNO operated Schooner and Ketch pipelines and Ineos operated Cavendish to Murdoch cable.

The CMS infrastructure is illustrated in Fig 1. Chysoar-operated assets are highlighted in green and the pipeline disconnections for which approval is sought ahead of decommissioning programme approval will be performed at the base of the MD and MA jackets at the Murdoch Complex.

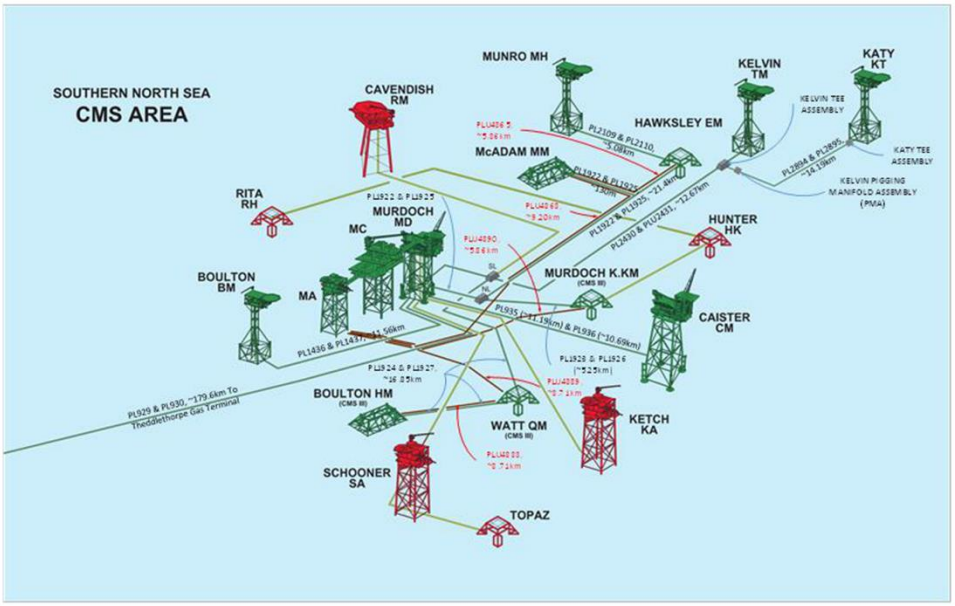



***Figure 1 - CMS Gas Operation Schematic (Chrysaor operated assets coloured green)***

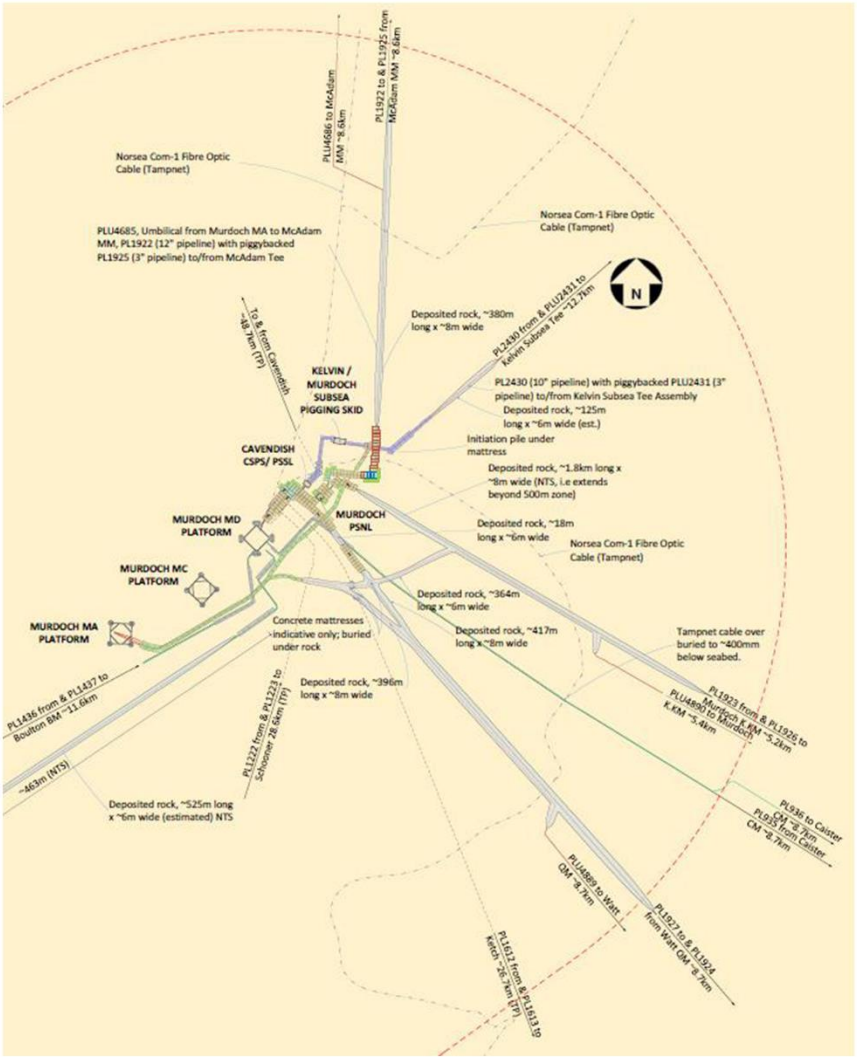



***Figure 2 – Schematic of pipelines and current view of stabilization features around Murdoch based on as-left information***

**Environmental Permit and Consent Applications**
A Decommissioning (DCA) Master Application Template (MAT) and supporting Environmental Impact Assessments (EIA) will be submitted detailing the proposed discharge of pipeline contents upon subsea pipeline disconnects and the temporary deposits, removals and seabed disturbance during the proposed subsea pipeline disconnects and spool-piece removals.

The DCA MATs will likely be supported by the following Subsidiary Application Templates (SATs):

- Oil Discharge Permits for the discharge of pipeline flush fluids containing hydrocarbons at a concentration below 30mg/l OIW;
- Marine Licence for the seabed disturbance from dredging activities and the temporary deposits of heavy duty debris baskets for recovery of mattresses/grout sacks and pipeline spool-pieces.

Pipeline Works Authorisation (PWA) variation applications will be submitted to OGA to request consent for these operations.

Chrysaor confirms that the request will not compromise or prejudice feasible decommissioning options for the remaining infrastructure. A copy of the PWR and reference of the work executed will be an appendix to the Decommissioning Programmes.

We request your permission to undertake these works ahead of the Decommissioning Programme approval to avoid the additional expenditure associated with delaying this activity.

Yours sincerely

CM

Catharine Marston
Decommissioning Integration Lead

***T**: +44 (0)7809 781 392 **E**:* cathy.marston@chrysaor.com

6

## Appendix 4.2 OPRED to Chrysaor (2-pages)

Offshore Petroleum Regulator
for Environment & Decommissioning

Offshore Petroleum Regulator for
Environment & Decommissioning

Department for Business, Energy &
Industrial Strategy
AB1 Building
Crimon Place
Aberdeen
AB10 1BJ
T: 01224 254042
E: kim.wood@beis.gov.uk
www.gov.uk/beis

Catharine Marston
Chrysaor Production (U.K.) Limited
Rubislaw House
Anderson Drive
Aberdeen
AB15 6FZ

12 February 2021

Dear Mrs Marston

**RE: Request to undertake preparatory works in 2021 prior to the CDP1b, CDP2 and CDP3 Decommissioning Programme Approvals**

I write in reply to your email of 6 January 2021, enclosing a letter dated 7 January 2021 *(sic),* containing an updated request to carry out various preparatory works prior to the approval of the CDP1b, CDP2, CDP3 decommissioning programmes.

Chrysaor proposes various subsea pipeline disconnection works at the base of the MD and MA jackets of the Murdoch complex. Thirteen pipelines (5 methanol, 5 gas and 3 umbilicals) are proposed to be disconnected by diamond-wire saw at the Murdoch MA and MD platforms. The proposed cuts will be made at a minimum lateral distance of 5m from the platforms to allow sufficient minimum clearance for the subsequent platform removals in 2022. The pipeline sections noted below will be removed; if possible, with the outboard cut terminating at a point where the pipeline is buried beneath stabilisation material.

- PL1436 - 3m section from Boulton BM to Murdoch MD
- PL1437 - 3m section from Murdoch MD to Boulton BM
- PL929 - 3m section from Murdoch MD to TGT 26" Gas Line
- PL930 - 3m section from TGT 26" Gas Line to Murdoch MD
- PL935 - 3m section from Caister CM to Murdoch MD
- PL936 - 3m section from Murdoch MD to Caister CM
- PL1922 - 11m section from Hawksley EM to Murdoch MD
- PL1925 - 11m section from Murdoch MD to Hawksley EM
- PL1924 - 12m section from Boulton H HM to Murdoch MD
- PL1927 - 12m section from Murdoch MD to Boulton H HM
- PLU4890 - 8m section from Murdoch MA to Murdoch K KM
- PLU4686 - 8m section from Murdoch K KM to Murdoch MA
- PLU4889 - 8m section from Murdoch MA to Watt QM

The proposal also notes that if any closing span exists at a riser base, a further length of pipeline may be removed up to the point where the pipeline touches down on the seabed. This specific activity may be undertaken in this disconnection campaign, or at a later phase, depending upon whether the platform is obstructing access.

Offshore Petroleum Regulator
for Environment & Decommissioning

In addition, the proposal also notes that the pipeline ends at the Murdoch MD and MA platforms will not be buried during this pipeline disconnection stage. The decommissioning of these pipeline ends will be assessed in the Comparative Assessment, accompanying the future associated Decommissioning Programmes, and agreed with OPRED as part of the decommissioning approval process.

We have considered Chrysaor's proposals, outlined in your updated letter of 7 January 2021, for the above-named pipelines, and conclude that they will not prejudice or compromise feasible decommissioning options and as such we are content to agree the proposals.

However, you are reminded that pipeline PL929, the 26" pipeline from Murdoch MD to Theddlethorpe Gas Terminal (TGT) has been identified for potential re-use and we are aware that the Oil & Gas Authority (OGA) has been discussing this aspect with Chrysaor. Agreement to the disconnection of PL929 as part of this preparatory works request is given only on the basis that PL929 is disconnected and left in such a manner that this does not preclude potential re-use options.

With regards to the PWA and MCAA applications associated with these proposals, Chrysaor must make it clear in these submissions that the only reason that some of the pipelines are being removed in two separate phases is because the platform obstructs access to some of the sections of pipelines attached to it. You are also reminded that PWA applications should be submitted well in advance of proposed work start dates, and clearly state, where applicable, whether third parties are aligned to avoid any delay in approval. Please ensure that start dates are aligned across the supporting applications.

This approval is given only in respect of the disconnections of the Chrysaor owned pipelines noted above, agreement to any associated INEOS or DNO owned pipeline disconnections will require separate approval agreed by the relevant team within OPRED-ODU.

This is the third version of this preparatory works request at the Murdoch Complex; the three iterations (1 October 2020, 1 December 2020 and 7 January 2021) have involved multiple changes to pipeline disconnection lengths, some quite considerable. Triple handling of a request is not helpful to ODU nor its internal and external consultees. This has caused unnecessary, additional workload which is time-consuming and inefficient for all involved. Chrysaor must ensure that any future preparatory works proposals are at a sufficient stage of maturity before submission to avoid this happening again.

I also draw your attention to ensuring that appropriate time is allowed for the review and approval process of decommissioning programmes. Timings for approvals are dependent on the quality and nature of information provided, but also the additional assessments that may be required due to environmental considerations.

Yours sincerely

Fiona Livingston
Senior Decommissioning Manager
Offshore Decommissioning Unit

# Appendix 5 Letters of Support