



CNR International

DECOMMISSIONING PROJECT

Murchison Decommissioning Project Overview Stakeholder Engagement Workshop 14 March 2012

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1. Murchison Decommissioning Stakeholder Engagement Workshop

Canadian Natural Resources International (CNRI) are currently evaluating various methods for decommissioning the facilities in the Murchison Field, namely the Murchison platform itself, the drill cuttings pile beneath it, the pipelines and associated sub-sea infrastructure.

As part of the evaluation process, CNRI are seeking the views of stakeholders and interested parties to input into the environmental impact assessment and comparative assessment process. This briefing document has been prepared by CNRI to provide stakeholders with a high level overview of the project in advance of the Stakeholder Engagement Workshop to be held on the 14th March 2012. Those who are unable to attend the workshop are invited to contact CNRI (see Section 7 for details) to share their views through other routes.

This document reflects the options being considered by CNRI at this stage of the project in February 2012.

2. Murchison Field Overview

1.1 Murchison Field Layout and Infrastructure

The Murchison Field is located in UKCS Block 211/19 of the Northern North Sea, approximately 240 km northeast of the Shetland Islands and 2 km west of the UK/Norway median line (Figure 1). Water depth in the field is approximately 156m.

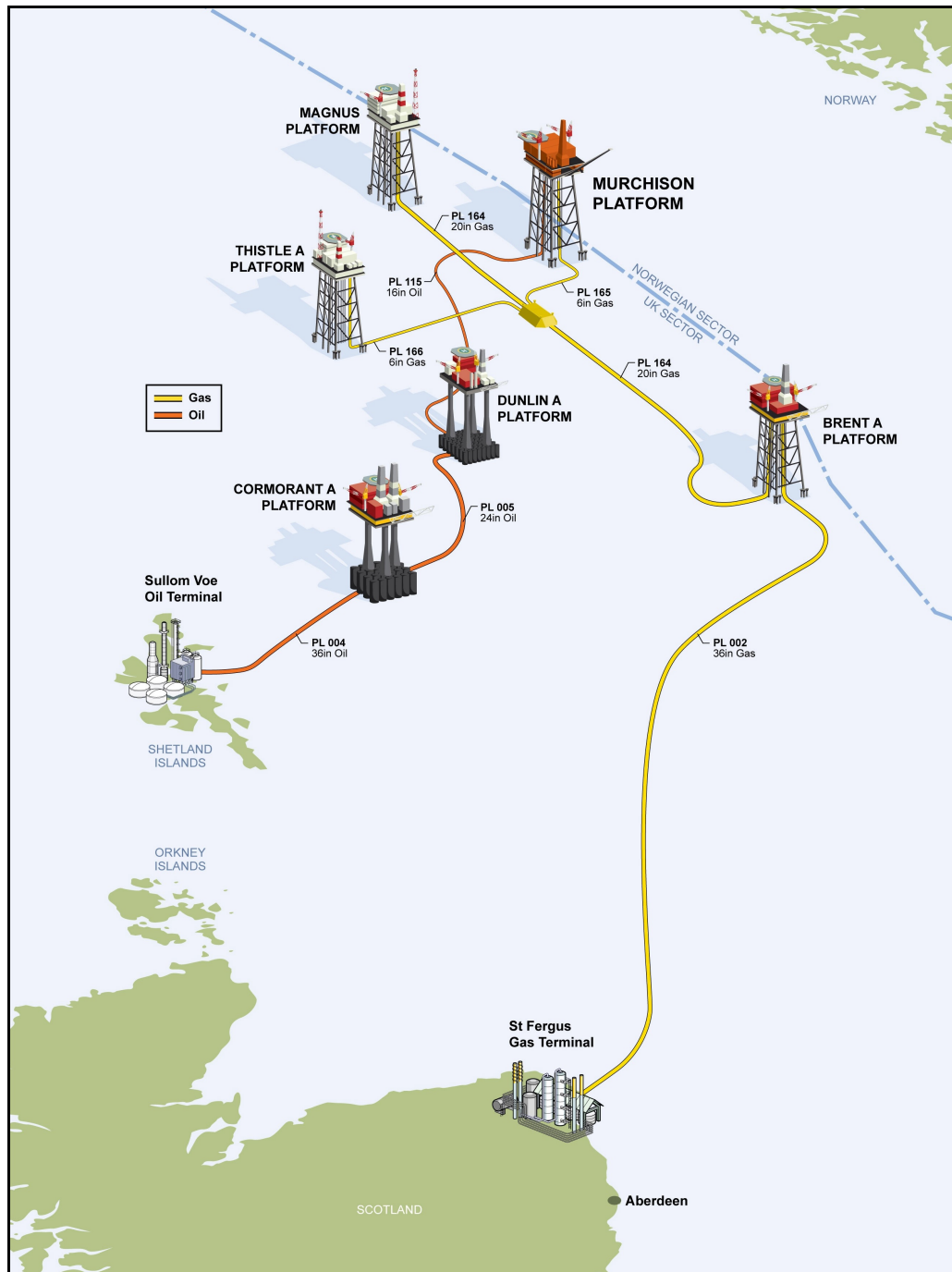


Figure 1: Location of the Murchison Field

1.2 Murchison Overview and History

Murchison is linked to the Dunlin Alpha platform (operated by Fairfield Energy Limited) by a 19 km, 16" oil export line (Figure 1). Produced oil from the Murchison Field is exported to the Sullom Voe Terminal in the Shetland Islands via the Dunlin Alpha platform, where Murchison oil combines with oil from Thistle and Dunlin Alpha and passes into a 24", pipeline to Cormorant Alpha. From Cormorant Alpha, the oil is transported to Sullom Voe via the 36" Brent System Main Oil Line.

Murchison is also linked to the Northern Leg Gas Pipeline (NLGP) via a 2.6km, 6" gas import / export spur pipeline which connects to the NLGP SSIV (sub-sea isolation valve) and crossover Tee and a control umbilical from Murchison to the NLGP SSIV. Both the gas pipeline and umbilical are owned by the NLGP partners.

The Murchison Field was discovered in 1976 by Conoco (UK) Ltd., who subsequently developed the field, installing a drilling, accommodation and production platform supported by an 8 legged steel jacket comprising 33 platform well slots. First oil was achieved in 1980 and during the Murchison drilling programme 53 platform wells and a further 3 sub-sea wells were drilled.

CNRI and their co-venturer Wintershall Norge ASA (22.2% ownership) acquired the Murchison field from Kerr-McGee in 2002. Gas export from the Murchison Field ceased in September 2000 as recovery rates fell below the level required for platform fuel gas, and Murchison subsequently commenced importing gas to meet platform fuel requirements. In 2009, production levels had become economically marginal at approximately 4.7% of peak annual production, and the decision was taken to commence planning for field decommissioning. Discussions are being held with the Department of Energy and Climate Change (DECC) to agree an appropriate date for Cessation of Production (CoP).

CNRI has commenced the pre-planning stages for the decommissioning of the field. The purpose of this phase is to investigate feasible alternative uses and conduct comparative assessments for the key removal and disposal options for the Murchison infrastructure.

An important aspect of this work is the assessment of the actual and potential environmental impacts that might arise as a result of decommissioning activities. These will be fully examined in an Environmental Impact Assessment (EIA) and reported in an Environmental Statement (ES).

1.3 Murchison Facilities to be Decommissioned

The main facilities included in the Murchison decommissioning project are the Murchison topsides and jacket (

Figure 2) , the drill cuttings pile at Murchison, the oil export pipeline to Dunlin Alpha (PL115), four associated sub-sea wells, and tie-back pipeline bundles to the Murchison platform (Table 1 and Figure 1, Figure 2).

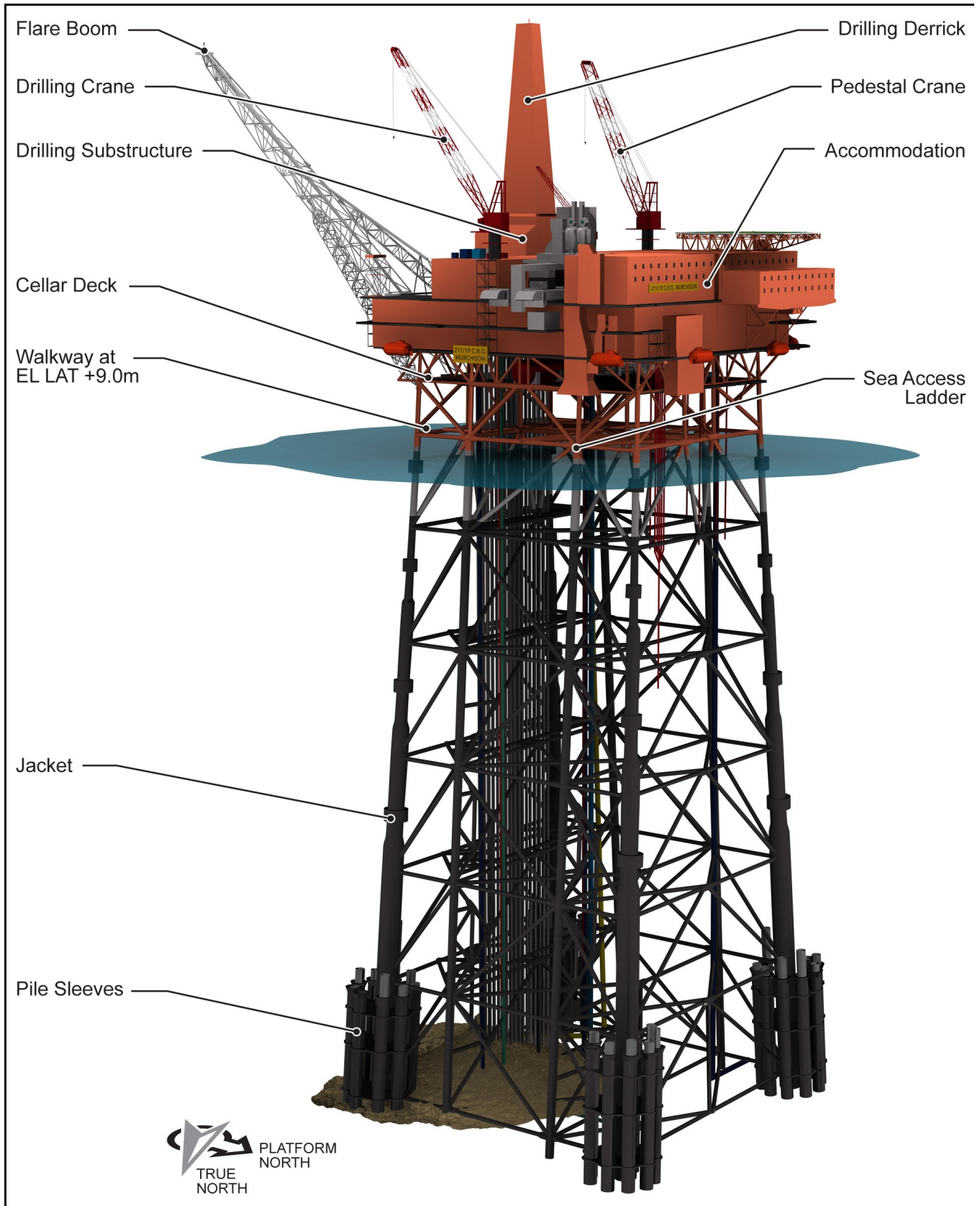


Figure 2: Overview of the Murchison Platform

Table 1: Overview of facilities to be decommissioned.

Facility	Components of the Facility to be Decommissioned
Topsides	Modules and associated topside equipment Module Support Frame (MSF)
Jacket and footings	188 m high steel jacket structure 33 conductors 32 piles
Pipelines	19.1 km 16" oil export pipeline and associated tie-in spools (PL115) 0.78 km pipeline bundle (PL123) 1.99 km pipeline bundle (PL124) 1.23 km pipeline bundle (PL125)
Subsea wells and protection structures	Well 211/19-2 – live well still to be abandoned - guide base, xmas tree, and protection structure in place. Well 211/19-3 – well abandoned - survey indicated no remaining infrastructure (Atkins, 2011) Well 211/19-4 – well abandoned - guide base and protection structure laid to side Well 211/19-6 – well abandoned - survey indicated no remaining infrastructure (ISS, 2011)
Other seabed materials	Drill cuttings pile at the base of the jacket Debris at the base of the jacket and in the surrounding 500 m zone, and along the routes of the pipelines and umbilical Other materials (e.g. pipeline protection mattresses, rock dump, grout mats, pipeline crossings, frond mattresses)

The main elements of the Murchison Field decommissioning project are:

- the engineering down and cleaning of the Murchison topside facilities;
- the removal and subsequent recovery to shore of the topsides and jacket;
- the decommissioning of subsea pipelines and umbilicals;
- the management and consideration of the Murchison drill cuttings pile.

The 33 platform wells and four subsea wells will be plugged and abandoned in accordance with a well abandonment programme as Murchison nears the end of field life.

1.4 Murchison Topsides Facilities

The Murchison topside comprises 17 modules, arranged on two levels, with a combined weight of 24,584 tonnes. The modules provide facilities and equipment for drilling production, processing, power generation, export and accommodation. There is a cellar deck below the first module level and there are walkways at elevation LAT +9.0m below the cellar deck. A helicopter landing platform is located above the accommodation modules. A single drilling derrick and a 109 m long flare boom are located on the south face of the platform; one drilling and one pedestal crane are located on the roof level. Figure 3 shows the general arrangement of the modules and other facilities on the topsides.

The Murchison topsides were installed in the late 1970s using semi-submersible crane vessels (SSCV). The Module Support Frame (MSF) was installed first, in two sections, with each section having eight stabbing cones which acted as guides to locate the MSF sections, which were then welded in position.

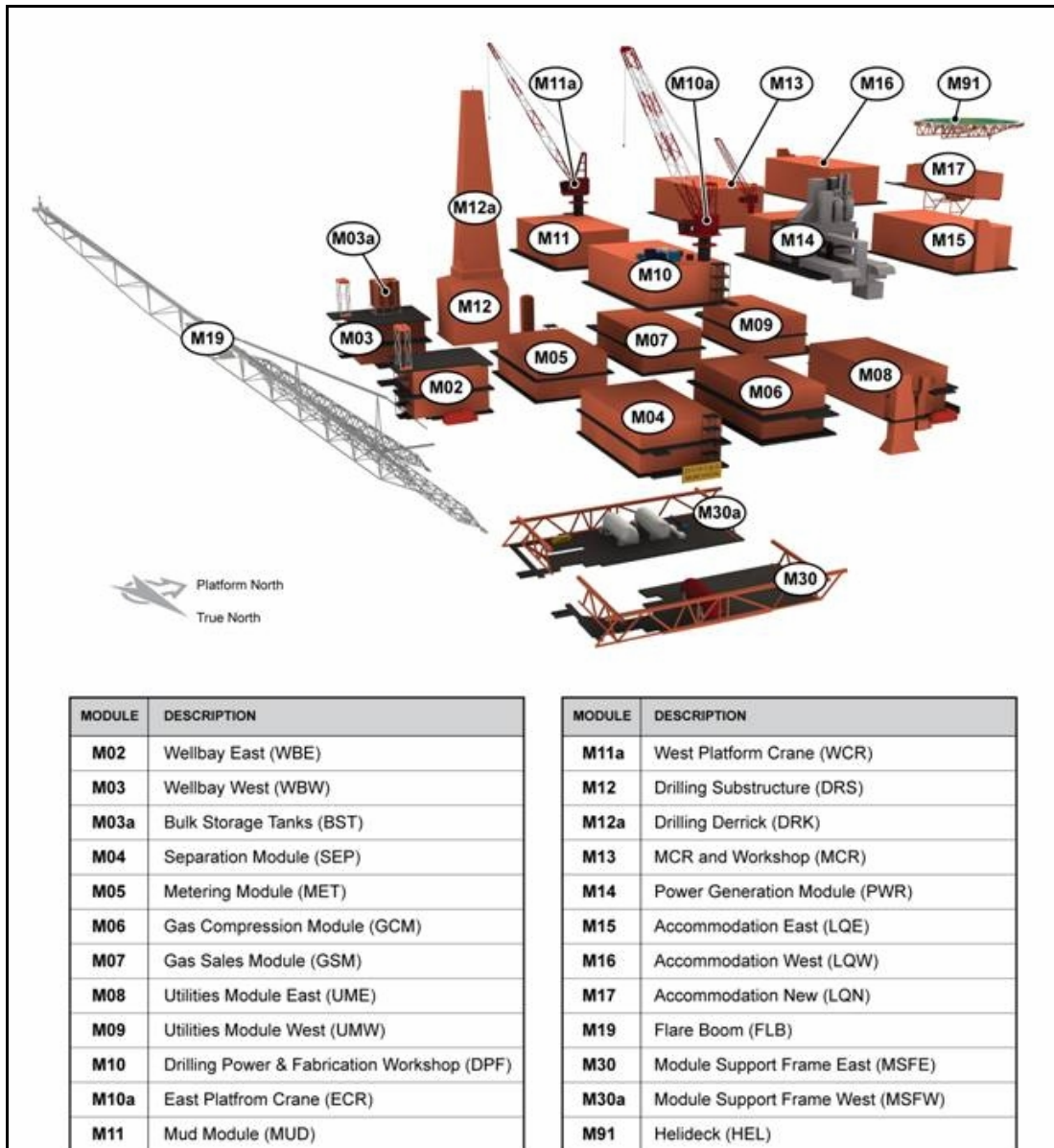


Figure 3: Arrangement of modules on the Murchison topsides

1.5 Murchison Jacket

The Murchison platform comprises a welded, tubular steel, eight-legged jacket structure (Figure 4). Each of the four main legs, situated one at each corner, is secured to the seabed with pile clusters. Each cluster comprises eight piles (2164 mm diameter x 66 mm wall thickness) approximately 80 m long of which 50 m is driven into the seabed. The pile

clusters are attached to the jacket via a grout mix through pile sleeves which are approximately 25 m long. The steel jacket weighs a total of 24,640 tonnes (including the steel jacket, piles, grout, anodes, hardwood and marine growth) and is 188 m high from the seabed to the top of the MSF.

The total weight of the Murchison jacket in air, excluding conductors, is >10,000 tonnes and as such it falls within the category of steel structures for which derogation may be sought from the general rule of “complete removal” under OSPAR 98/3. In such circumstances, OSPAR suggests that partial removal, leaving the “footings” of the jacket on the seabed, **may** be acceptable **if** a comparative assessment (Section 3) indicates that this would provide significant safety or environmental benefits in comparison with total removal [**our emphasis**].

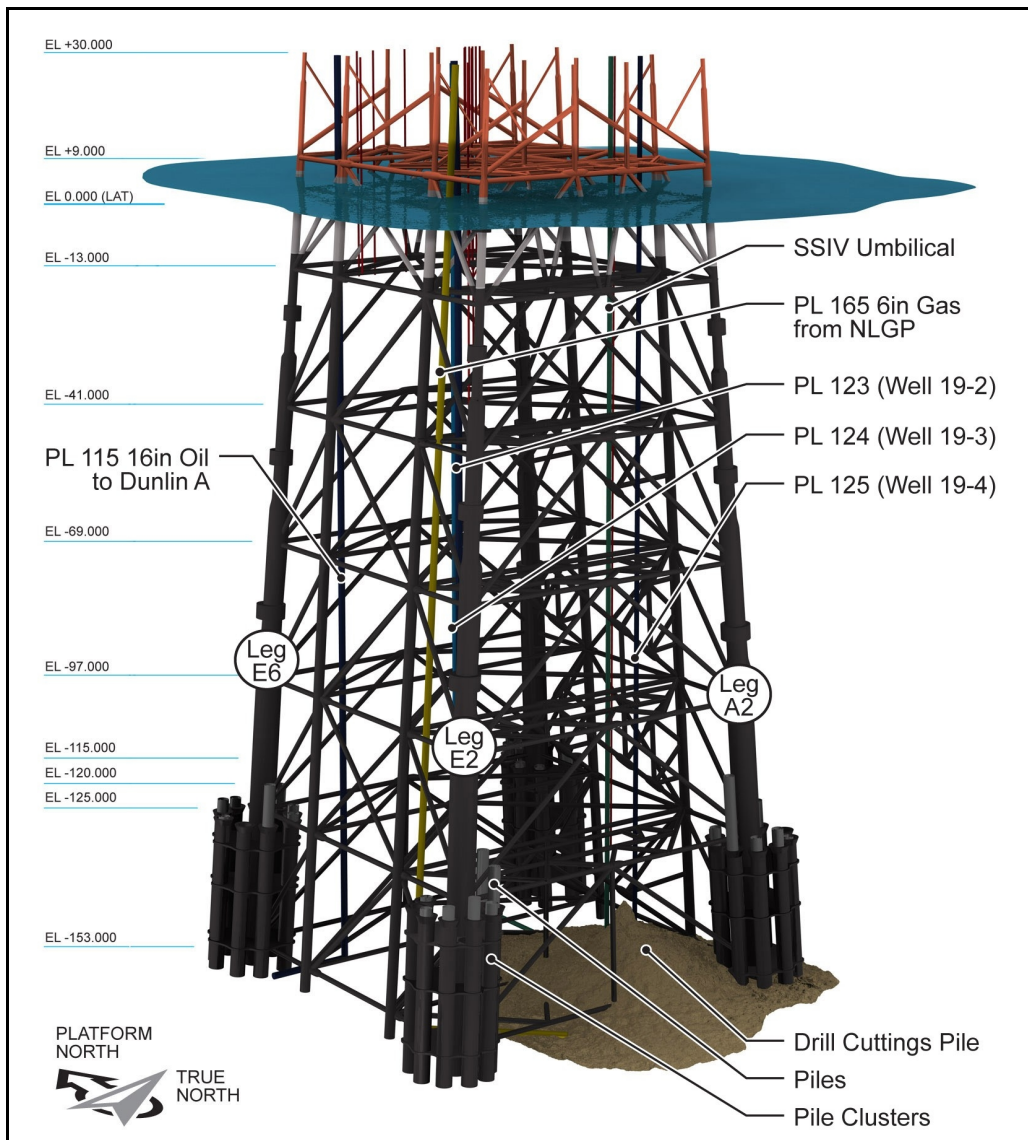


Figure 4: Murchison platform general arrangement

1.6 Well and Pipeline Facilities

The Murchison Field has four abandoned subsea tie-back wells, one of which is connected to the platform by a disused bundle (PL123) (Figure 5). There are also two disconnected bundles (PL124 and PL125). Well 211/19-2 is located approximately 0.8 km west of the Murchison platform and was suspended in 1982; well 211/19-3 is located approximately 2 km north-northwest and was abandoned in 1982; and well 211/19-4 is located approximately 1.24 km north-northeast and was abandoned in 1984 (Figure 5). An exploration well (211/19-6) was drilled on the Playfair prospect and was subsequently suspended in January 1997. On two of the wells, the temporary guide-base and production guide-base remain in place with a corrosion cap installed on the wellhead. Removal of this equipment will form part of the Murchison decommissioning work scope.

Oil from the Murchison field is exported to the Sullom Voe Terminal in the Shetland Islands via a 16" diameter pipeline (PL115) to the Dunlin Alpha platform (Figure 5) which includes a riser to the Dunlin platform and topside facilities for transporting Murchison oil. Gas is imported or exported from the Northern Leg Gas Pipeline (NLGP) via a 6" pipeline (PL165) from Murchison to the NGLP (Figure 5). The gas export pipeline (PL165) and the sub-sea isolation valve (SSIV) control umbilical are owned by the NLGP partners (of which CNRI is a partner) and as such are not within the CNRI scope of work for Murchison decommissioning. CNRI will consider the potential environmental impacts of cutting the gas export pipeline and umbilical adjacent to the Murchison platform.

Pipeline decommissioning is governed by the Petroleum Act 1998 and the requirements are set out within the DECC Guidance Notes¹ ('Guidelines'). The Guidelines state that there are no prescribed options for pipeline decommissioning; all feasible options must be considered and a comparative assessment (Section 3) undertaken to determine which decommissioning option provides the most acceptable outcome on the basis of the criteria outlined in the Guidelines.

The options being considered by CNRI for the decommissioning of the Murchison pipelines and umbilicals are:

Full removal (base case). The pipelines would be completely removed, either by the reverse S-lay method or by cutting the lines with an underwater pipe cutter and lifting the cut pipeline sections onto a vessel for transportation to shore.

Left *in situ* – rock dump. Pipelines decommissioned *in situ* must be left in such a manner that they do not pose a risk to other users of the sea, e.g. fishermen. Pipelines may be covered by rock dump to a pre-determined height to avoid any risk of snagging by bottom-towed fishing gear. This option may involve selective cutting and recovery of pipeline sections.

Left *in situ* – trench and bury. The pipelines may be trenched to a pre-determined depth and back-filled to eliminate snagging risks for bottom towed fishing gear. This option may involve selective cutting and recovery of pipeline sections.

¹ <http://og.decc.gov.uk/en/olgs/cms/explorationpro/decommissionin/decommissionin.aspx>

Minimal removal. Removal of the spool-pieces, wellhead guide base, protective structures, Dunlin Alpha platform approaches and protective mattresses. Some mattresses may have to be left *in situ* if it is unsafe to remove them. Remedial burial (rock dumping or re-trenching and burial) of spans and exposures along the buried section of the pipelines will occur.

Removal of exposed sections: This option is similar to the minimal removal scheme, but only buried pipeline sections remain *in situ*.

The Murchison Field also contains well heads, protection structures, bridges and stabilisation features (e.g. mattresses, grout bags, concrete covers) and debris, all of which will fall within the scope of this EIA. It would be CNRI's intention to remove all of this material, as required by the Guidelines, unless there were significant safety or practical reasons why it would be preferable to leave them in place.

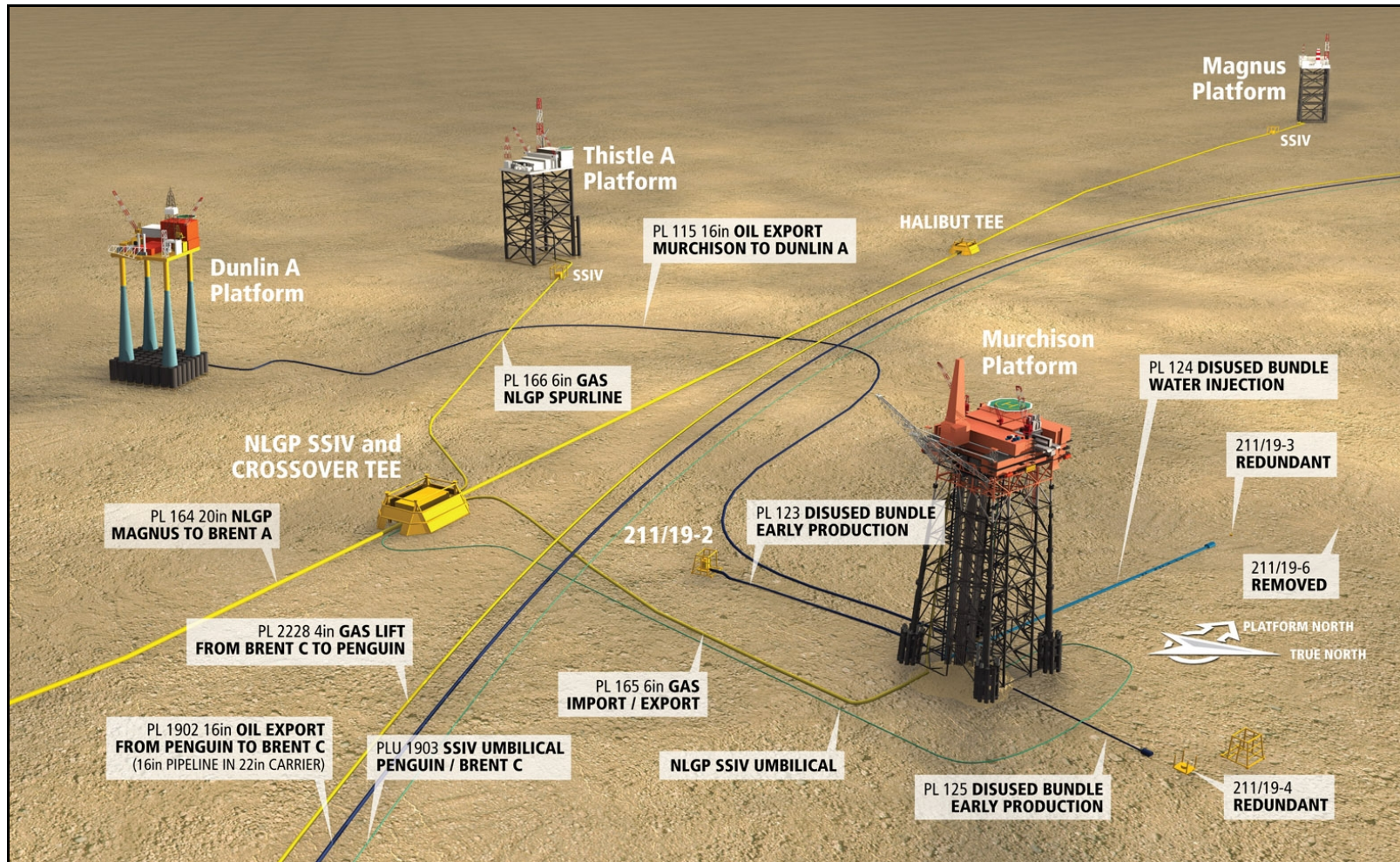
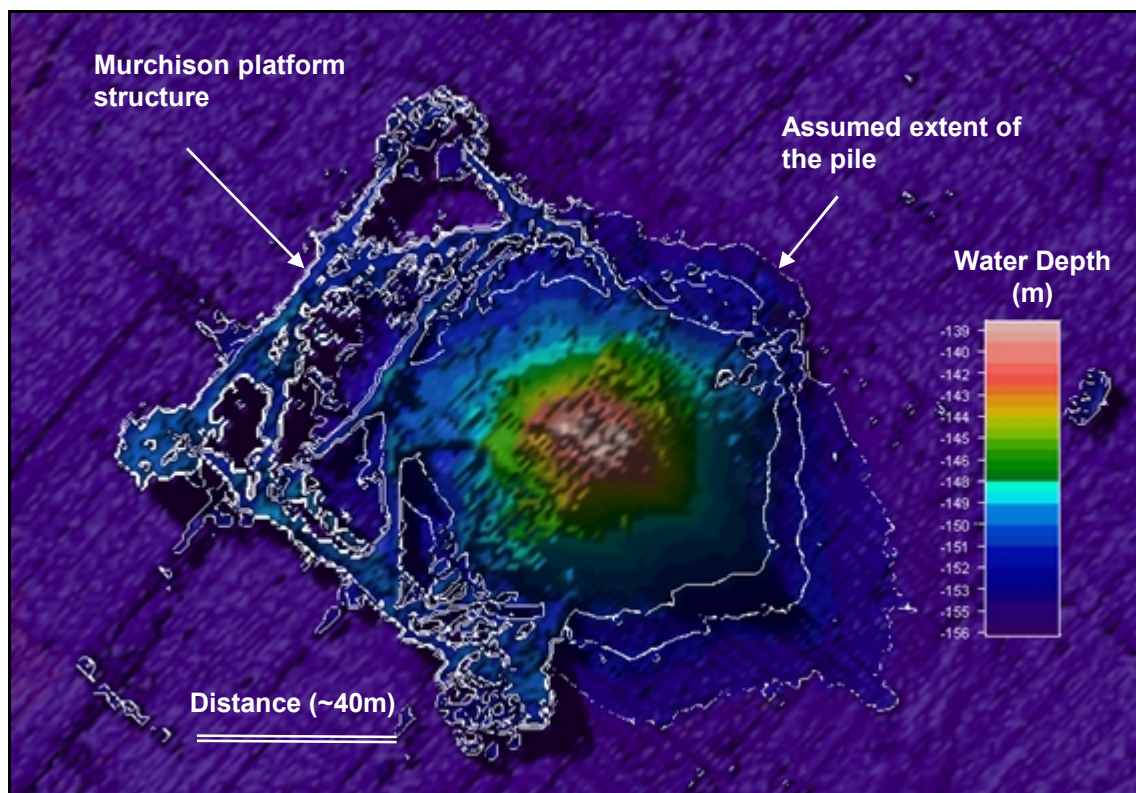


Figure 5: Murchison platform and Field layout schematic

1.7 Drill Cuttings Pile

During the life of the platform, approximately 21,234 m³ of cuttings have been discharged to the sea (Fugro ERT, 2008²). Of the 98 wells drilled in this field oil based mud (OBM) was used and discharged with drill cuttings at 48 of the wells (ERT, 2008³). A proportion of these discharged drill cuttings and drilling mud now exist as a mound on the seabed immediately below the jacket, covering the bottom bracing level of the jacket.

Multi beam echo sounder (MBES) mapping of the cuttings mound (Fugro ERT, 2011) estimated that the pile has a volume of 22,545 m³ (Figure 5) and footprint area of 6,840 m². This figure excludes the platform legs but includes other general platform debris that may be present (e.g. dropped objects such as scaffold poles, welding rods, tools and gratings). The drill cuttings pile has a maximum height of 15.34 m beneath the south-east edge of the platform (Fugro ERT, 2011). The edge of the pile extends approximately 40 m north-east, and 75 m south-east, and has a clear north-west/south-east orientation which is aligned with the direction of the seabed current.



Source: ISS, 2011

Figure 6: MBES survey data of the Murchison drill cuttings pile

² Fugro ERT, 2011. Murchison Pre-decommissioning Environmental Baseline Survey, April/May 2011. Project Number: J36037-Rev02

³ ERT, 2008. Technical Review of Data from Around CNR's North Sea Assets with Regards to OSPAR Recommendation 2006/5. CNR079224


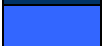



1.8 Summary of Seasonal Environmental Sensitivities

Table 2: Seasonal environmental sensitivities in the Murchison area (key appears opposite)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<p>Habitats Directive: Annex I Habitats</p> <p>There are no known Annex I habitats in the Murchison area. Although <i>Lophelia pertusa</i> has colonised the Murchison Platform, it would not have occurred without the presence of the platform and therefore does not constitute an Annex I habitat.</p>											
<p>Habitats Directive: Annex II Species</p> <p>Of the Annex II species, only the harbour porpoise has been sighted in the development area, with very high abundance in February and July and low numbers throughout the summer months (May, June, August and September).</p>											
<p>Benthic Fauna</p> <p>Benthic communities in the development area are similar to those found throughout a large surrounding area of the Northern North Sea. No rare species are known to occur in this area.</p>											
<p>Plankton</p> <p>The plankton in the Murchison area is typical of the Northern North Sea. Peak productivity occurs in spring and summer.</p>											
<p>Finfish and Shellfish</p> <p>The Murchison Field is located in spawning grounds for cod (January to April), whiting (February to June), haddock (February to May), Norway pout (January to April) and saithe (January to April) and nursery grounds for herring, ling, mackerel, spur dog, haddock, Norway pout and blue whiting (throughout the year).</p>											
<p>Marine Mammals</p> <p>Marine mammals sighted in and around the Murchison area include minke whale, long-finned pilot whale, killer whale, white-beaked dolphin, white-sided dolphin, harbour porpoise and sperm whale. Peak sightings generally occur from May to September.</p>											
<p>Seabirds</p> <p>Seabird vulnerability to oil pollution in the Murchison area is “high” in March, July, October and November and “moderate” to “low” for the rest of the year. The overall vulnerability in the Murchison area is “low”.</p>											
<p>Fisheries</p> <p>The Murchison area is of “low” to “very low” relative value. Fishing effort is “low” to “very low” and dominated by demersal gear types. However, pelagic species historically dominate the landings in the vicinity of the proposed development area.</p>											
<p>Shipping</p> <p>The Murchison Field is in an area of moderate to low shipping activity.</p>											

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

Table 2 continued: Seasonal environmental sensitivities in the Murchison area

KEY		Very high sensitivity
		High sensitivity
		Moderate sensitivity
		Low sensitivity
		Not surveyed / No data available

3. Overview Of The Comparative Assessment Process

Under the Petroleum Act 1998, and as described in the DECC Guidance Notes (DECC, 2011) detailed Comparative Assessments (CA) are required to identify the best overall option for decommissioning the:

- (i) Murchison jacket, which falls within the category of structures that may be considered as a candidate for derogation from the general rule of “total removal” (OSPAR, 1998), and
- (ii) all pipelines.

CNRI are following the DECC framework for CA’s, which outlines five main criteria by which each decommissioning option should be assessed (Table 3). Where appropriate, these five main criteria have been further defined into sub-criteria (Table 3). The subcriteria were selected in light of:

- The “matters to be considered” listed in the OSPAR framework and the DECC Guidance notes.
- The range of safety, technical, environmental, societal and economic assessments and studies that CNRI decommissioning projects have undertaken or shall undertake.
- CNRI’s SHE Policy, CNRI vision and mission statements.

Table 3: The criteria and sub-criteria to be used in CNRI Comparative Assessments

Criterion	Sub-criteria
Safety	Risk to project personnel offshore
	Risk to project personnel onshore
Environment	Impacts of operations
	Impacts of end-points
	Total energy consumption (Gj) and CO ₂ emissions
Technical	Technical feasibility
	Ease of recovery from excursion
	Use of proven technology and equipment
Societal	Commercial impact on fisheries
	Socio-economic impacts – amenities
	Socio-economic impacts – communities
Economic	Total project cost

The assessment of the performance of each decommissioning option against each of the DECC criteria and sub-criteria shall be informed by appropriate engineering, environmental, societal, safety and economic studies, completed either by suitably experienced and qualified CNRI in-house personnel, or by suitably experienced and capable external organizations.

CNRI will use a structured approach to compare each of the decommissioning options and to balance their performance across the different assessment criteria and sub-criteria in order to identify the overall recommended option.

4. Overview Of The Options Available For Decommissioning

The viable options that CNRI are considering for the decommissioning of the Murchison Field and which therefore will be covered by the full EIA are summarised in Table 4.

Removal of the topsides and jacket in a single piece was studied but has been discounted: the top of the jacket is too wide to permit the Pieter Schelte (currently under construction and potentially the only vessel which would have the lifting capacity to remove the topsides in its entirety) to position itself under the topsides (Allseas, 2011).

Table 4: Overview of shortlisted decommissioning options for each facility.

Facility	Decommissioning Option	Sub-option
Wells	Plug & Abandonment (P&A) and conductor recovery	
Topsides	Full Removal	Reverse Installation
		Piece Small
Jacket	Full Removal	Cut and Lift
		Flotation in One Piece
	Partial Removal	Cut and Lift
		Flotation in One Piece
Pipelines	Full Removal	
	Removal leaving crossings <i>in situ</i>	
	Trench and bury	
	Removal of exposed sections	
	Minimal removal	
	Leave <i>in situ</i>	
Umbilical	Full Removal	
	Removal leaving crossings <i>in situ</i>	
	Leave <i>in situ</i>	
Bundles	Full Removal	
	Leave <i>in situ</i>	
Subsea Wellheads	Full Removal	
Cuttings Pile	Leave <i>in situ</i>	
	Full Removal	Separation, treatment of liquids offshore, transportation and treatment of solids onshore
		Transport slurry to shore, separation and treatment onshore for disposal
		Offshore injection of slurry
Dispersion / redistribution offshore		

5. Potential Impacts From The Murchison Decommissioning Project

The key issues identified during the Murchison decommissioning EIA scoping phase (BMT Cordah, 2011⁴) as having the potential to give rise to a significant environmental impact have been grouped into the following potential impacts:

1. Physical presence of vessels causing potential interference with other users of the sea;
2. Effects of seabed disturbance during decommissioning operations - vessel anchoring, trenching pipelines, rock placement;
3. Effects of drill cuttings disturbance;
4. Effects of energy use and atmospheric emissions;
5. Effects of underwater noise generated during decommissioning activities;
6. Effects associated with near-shore and onshore dismantling of structures – noise and dust;
7. Cleaning of marine growth from Murchison jacket;
8. Landfill disposal and associated impacts;
9. Safety risk to fishermen from derogated footings, pipelines, rock placement, dropped object;
10. Socio-economic impact to fishermen from the derogated footings and pipelines;
11. Non-routine events – spillage of hydrocarbons and other fluids;
12. Effects associated with Murchison cuttings pile management.

⁴ BMT Cordah, 2011. • Murchison Decommissioning EIA Scoping Report. MURDECOM-BMT-EN-REP-00036

6. Studies Commissioned In Support Of Murchison Decommissioning

CNR have commissioned a number of studies to support the initial decommissioning planning process and option evaluation, in order to determine the preferred decommissioning option and engineering solution. These studies are detailed in Table 5.

Table 5: List of decommissioning studies

Decommissioning Aspect	Study Title
Inventory	Asset Inventory Study Report
	Materials Inventory and Residual Materials Study Report
Engineering	Platform Removal Technology Study
	Platform Shut-down Procedure
	Engineering and Clean Down
Topsides	Topside Offshore Deconstruction
	Topside Reverse Installation Removal
	Topsides Single Lift Removal
	Module Separation Study
	Topside Weight Review
	Topsides Comparative Assessment
	Topsides Process Study
	Idle Phase Requirements
	Utility and Life Support Systems
	Topside 3d Laser Survey
Jacket	Jacket Buoyancy Tank Assembly Removal Option
	Jacket Removal in Sections
	Jacket Single Lift Removal
	Jacket Weight Report
	Jacket Comparative Assessment
	Jacket Long Term Monitoring Requirements
	Murchison Preliminary Footings Life Assessment
	Murchison Jacket Structure Intelligent USFOS Modelling
	Subsea Cutting Techniques Study
	Evaluation of Removal Options for Jacket
Pipeline	Murchison Subsea and Pipeline Assets - Decommissioning Report

7. Further Information

Stakeholders can find additional and more detailed information in the following documents, available on request:

- Murchison Decommissioning EIA Scoping Report. MURDECOM-BMT-EN-REP-00036 (revised February 2012 to incorporate initial stakeholder comment).
- Murchison Decommissioning Environmental Impact Assessment (EIA) – Draft Project Description. MURDECOM-BMT-EN-REP-00124 (work in progress, Feb 2012).
- Murchison Decommissioning Environmental Impact Assessment (EIA) – Draft Environmental Description. MURDECOM-BMT-EN-REP-00126 (work in progress, Feb 2012).
- Murchison Pre-decommissioning Environmental Baseline Survey. MURDECOM-ERT-EN-REP-00056.

To request further information, documents and/or to make comments regarding the pre-planning for the Murchison decommissioning project, please contact:

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