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DECOMMISSIONING PROJECT

Murchison Decommissioning EIA Scoping Report

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Glossary and Abbreviations

Abbreviation	Full Meaning	Abbreviation	Full Meaning
BAT	Best Available Technique	MMO	Marine Mammal Observer
BEP	Best Environmental Practice	MoD	Ministry of Defence
BERR	Department for Business, Enterprise and Regulatory Reform	MSF	Module Support Frame
CH_4	Methane	NLGP	Northern Leg Gas Pipeline
CNRI	Canadian Natural Resources International	N_2O	Nitrous Oxide
CoP	Cessation of Production	NO_x	Nitrogen Oxide
CO_2	Carbon Dioxide	OPEP	Oil Pollution Emergency Plan
CO	Carbon Monoxide	OSPAR	Oslo Paris Convention
DETR	Department for Transport	PAM	Passive Acoustic Monitoring
DECC	Department of Energy and Climate Change	P&A	Plug and Abandon
DP	Dynamic Positioning	PTS	Permanent Threshold Shift
EDC	Engineering Down and Cleaning	ROV	Remotely Operated Vehicle
EIA	Environmental Impact Assessment	SAC	Special Area of Conservation
EoFL	End of Field Life	SHE	Safety, Health and Environment
ES	Environmental Statement	SSCV	Semi-Submersible Crane Vessel
EU	European Union	THC	Total Hydrocarbon Concentration
HLV	Heavy Lift Vessel	TTS	Temporary Threshold Shift
ICES	International Council for the Exploration of the Seas	UK	United Kingdom
IMO	International Maritime Organisation	UKCS	United Kingdom Continental Shelf
JNCC	Joint Nature Conservation Committee	VOC	Volatile Organic Carbon
LAT	Lowest Astronomical Tide	WDR	Waste Disposal Register
MBES	Multi-beam Echo-Sounder	UKHO	United Kingdom Hydrographic Office
MCA	Maritime Coastguard Agency		

1 BACKGROUND AND CONTEXT

1.1 Introduction

The Murchison Field, in Block 211/19a of the UKCS, was discovered in 1975, and has been producing oil since 1980. It is now approaching the end of its economic life. Discussions are being held with 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).

1.2 Purpose of this Scoping Report

This scoping report has been prepared as part of the planning and consents process for the future decommissioning of the Murchison Field, and as a first stage in preparing the ES. The report:

- Describes the proposed options for the Murchison decommissioning project and its context.
- Describes the site of the project and its environmental sensitivities.
- Identifies the potential environmental risks associated with each decommissioning option.
- Identifies the potentially significant risks that will be examined in detail in the full EIA.
- Identifies mitigation measures for the significant risks.
- Describes the work being undertaken by the project to gather more information to gain a greater understanding of the main environmental risks.

- Summarises the further programme of consultation that have been and will be carried out by CNR International during 2011-2012.
- Summarises views and concerns already expressed by stakeholders.
- Seeks the views of interested stakeholders and members of the public.

The scoping report is intended to present a review of the main environmental issues as they are presently understood, and to inform the consultation that will be carried out by CNR International.

1.3 Location of the Murchison Field

The Murchison Field is situated in Block 211/19 of the northern North Sea, and the Murchison platform is located in that Block at 61° 23' 49.0" north, 01° 44' 25.5" east, approximately 240 km northeast of the Shetland Islands and 2 km west of the UK/Norway median line. Water depth in the Murchison Field is approximately 156 m.

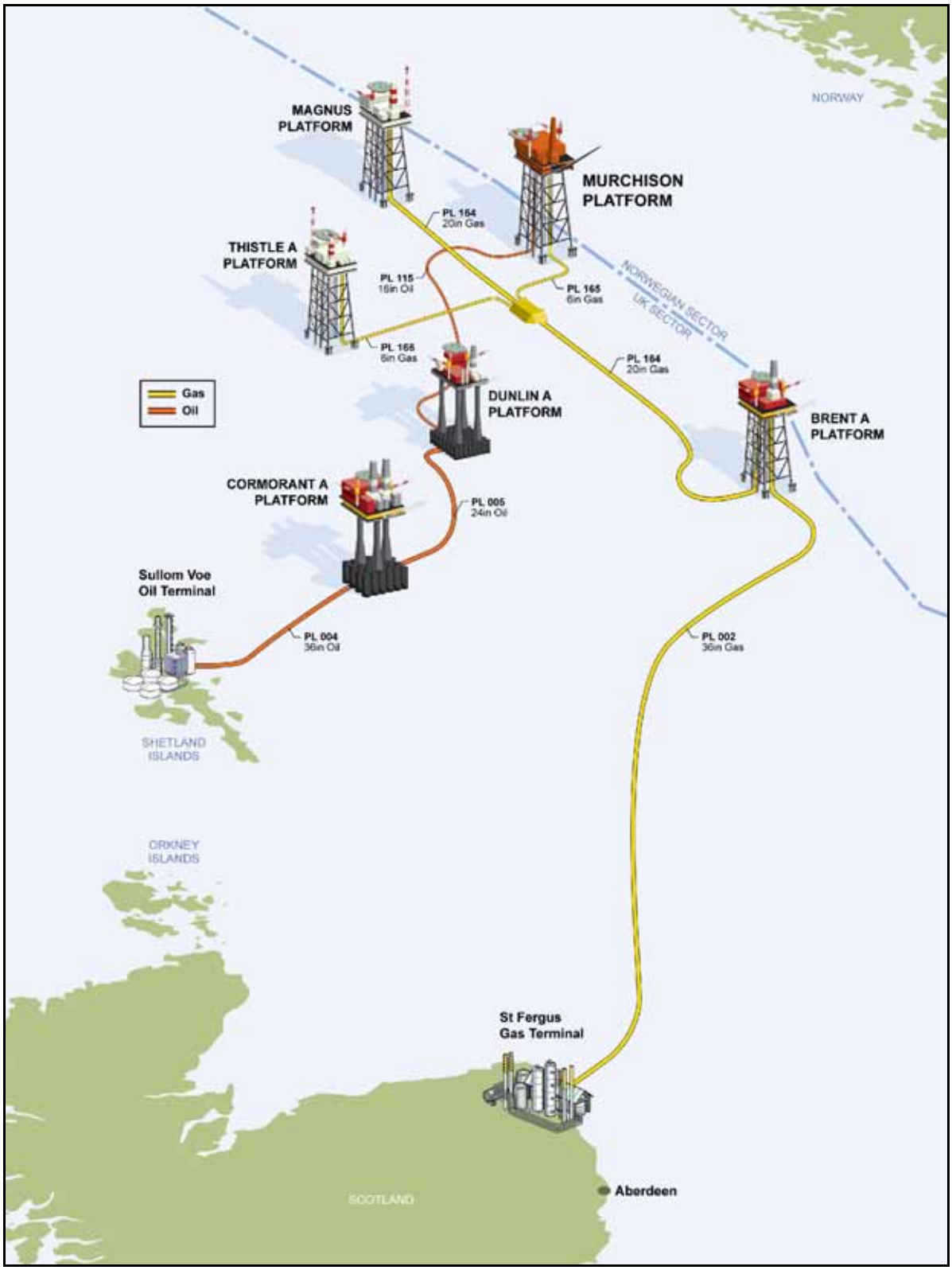


Figure 1: The location of the Murchison Field

1.4 Regulatory Context

The decommissioning of offshore oil and gas infrastructure in the UKCS is principally governed by the **Petroleum Act 1998**, as amended by the **Energy Act 2008**. The Petroleum Act sets out the requirements for a formal Decommissioning Programme which must be approved by DECC before the owners of an offshore installation or pipeline may proceed with decommissioning.

At present there is no statutory requirement to undertake an EIA for decommissioning. However, under the DECC Guidance Notes on the **Decommissioning of Offshore Oil and Gas Installations and Pipelines under the Petroleum Act 1998** (hereafter referred to as 'DECC Guidance Notes') the Decommissioning Programme must be supported by an EIA. In addition, DECC have advised the Industry that under the Marine and Coastal Access Act 2009 and the Marine (Scotland) Act 2010 an Environmental Impact Assessment will be required for all licence applications relating to decommissioning operations.

The DECC Guidance Notes state that an EIA should include an assessment of the following:

- All potential impacts on the marine environment, including exposure of biota to contaminants associated with the installation, other biological impacts arising from physical effects, conflicts with the conservation of species, with the protection of their habitats, or with mariculture, and interference with other legitimate uses of the sea.
- All potential impacts on other environmental compartments, including emissions to the atmosphere, leaching to groundwater, discharges to surface fresh water and effects on the soil.
- Consumption of natural resources and energy associated with re-use and recycling.
- Other consequential effects on the physical environment which may be expected to result from the option.
- Potential impacts on amenities, the activities of communities and on future uses of the environment.

OSPAR Decision 98/3 sets out the UK's international obligations on the decommissioning of offshore installations. Decision 98/3 prohibits the dumping and leaving wholly or partly in place of offshore installations. The topsides of all installations must be returned to shore, and all installations with a jacket weight of less than 10,000 tonnes must be completely removed. However, the Decision recognises there may be difficulty in removing large steel jackets weighing more than 10,000 tonnes and concrete gravity base structures, and as a

result provides a facility for derogation from the main rule of complete removal, such that the option of leaving the jacket footings or concrete structure in place may be considered. Exceptions will only be granted if a comparative assessment and consultation shows that there are significant reasons why an alternative disposal option is preferable to complete removal.

Other regulatory drivers applicable to the Murchison decommissioning project include:

- Coast Protection Act 1949
- Controlled Waste Regulations 1992 (as amended)
- Convention on International Trade in Endangered Species (CITES)
- Convention on the Protection of the Marine Environment of the North East Atlantic 1992 (OSPAR Convention)
- Council Directive on Hazardous Waste 91/689/EEC
- EC Framework Directive 2008/98/EC on Waste
- Environment Protection (Duty of Care) Regulations 1991
- Environmental Protection Act 1990, Part 2 (Duty of Care)
- EU Directive on packaging waste (94/62/EC)
- EU Directive on the landfill of waste (99/31/EC)
- Food and Environment Protection Act 1985
- Hazardous Waste (England and Wales) Regulations 2005
- International Maritime Organization (IMO) Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf in the Economic Exclusion Zone1989
- Marine (Scotland) Act 2010
- Marine and Coastal Access Act 2009
- The Merchant Shipping (Oil Pollution Preparedness, Response and Co-operation Convention) Regulations 1998
- Merchant Shipping (Prevention of Pollution by Garbage) Regulations 1998.
- Offshore Combustion Installations (Prevention and Control of Pollution) Regulations 2001
- Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007
- Offshore Marine Conservation (Natural Habitats &c.) (Amendment) Regulations 2009
- Offshore Marine Conservation (Natural Habitats &c.) (Amendment) Regulations 2010
- OSPAR Recommendation 2006/5 on a Management Scheme for Offshore Cuttings Piles
- Radioactive Substances Act 1993
- Revised Guidance Notes on the Decommissioning of Offshore Oil and Gas Installations and Pipelines (March 2011 version 6)
- Special Waste Amendment (Scotland) Regulations 2004
- The Greenhouse Gas Emissions Trading Scheme Regulations 2005 (as amended)
- The Offshore Chemical Regulations 2002
- The Offshore Petroleum Activities (Conservation of Habitats) (Amendment) Regulations 2007
- The Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001
- The Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005

- The Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) Regulations 1999
- The Offshore Petroleum Production and Pipelines (Assessment of Environmental Effects) (Amendment) Regulations 2007
- The Transfrontier Shipment of Radioactive Waste and Spent Fuel Regulations 2008
- The Waste (Scotland) Regulations 2011

In the event that any of the infrastructure from the Murchison Field is taken to Norway for dismantling and subsequent recycling or disposal, CNRI would follow the relevant Norwegian legislation. The key Norwegian legislation pertaining to waste includes:

- Pollution Control Act 1981
- European Economic Area Agreement 1994
- Norwegian Pollution Control Act 1981
- Environmental Information Act

1.5 EIA Process

Environmental Impact Assessment (EIA) is a systematic process that considers how a project will change existing environmental conditions, and assesses what the consequence and significance of such changes will be. EIA is an iterative process that should be initiated at the project's inception, providing an aid to project decision-making throughout the project's various design phases so that, where practical, significant environmental effects can be mitigated at source. The process and outcomes from the EIA are documented in a formal report called an Environmental Statement (ES).

Table 1: Key stages of the EIA process for decommissioning

EIA Stage	Description
Scoping	Scoping of the EIA study allows the study to establish the key issues, data requirements, and impacts to be addressed in the EIA and the framework or boundary of the study
Consideration of Alternatives	Demonstrates that other feasible approaches, including alternative project locations, scales, processes, layouts, and operating conditions have been considered.
Description of project actions	Provides clarification of the purpose of the project, and an understanding of its various characteristics – including stages of development, location and processes.
Description of environmental baseline	Establishes the current state of the environment on the basis of data from literature and field surveys, and may involve discussions with the authorities and other stakeholders.
Identification of key impacts and prediction of significance	Seeks to identify the nature and magnitude of identified change in the environment as a result of project activities, and assesses the relative significance of the predicted impacts.
Impact mitigation and monitoring	Outlines the measures that will be employed to avoid, reduce, remedy or compensate for any significant impacts. Mitigation measures will be developed into a project environmental management plan. Aspects of the project which may give rise to significant impact which cannot be mitigated to an acceptable level of impact may need to be redesigned. This stage will feed back into project development activities.
Presentation of the ES	Reporting of the EIA process, through the production of an Environmental Statement (ES), which clearly outlines the processes above. The ES provides a means to communicate the environmental considerations and environmental management plans associated with the project to the public and stakeholders.
Monitoring	Project impacts will be monitored during the operational phase of the project to verify that impact predictions are consistent with the subsequent outcomes.

1.6 EIA Scoping

Scoping is a two stage process comprising:

- an initial identification of potential effects, then
- a preliminary evaluation of their significance, based on available information.

Those effects that are identified as likely to be significant will then be examined in more detail in the full EIA. Effects which are identified as unlikely to be significant will be noted in the Environmental Statement but will not be examined in detail unless information emerges which changes the evaluation.

For some effects, it may not be possible to judge their likely significance at this stage. As further information becomes available, these effects will be kept under consideration to determine whether they require more or less detailed examination. In practice, it is not unusual for there to be substantial areas of uncertainty at the scoping stage and there may well be other issues that have yet to be identified.

The scope of the assessment defined in this report will therefore be kept under review as work progresses, and in the light of responses from stakeholders to this report and other consultations, to ensure that the final assessment addresses all likely significant issues.

2 DESCRIPTION OF THE DECOMMISSIONING PROJECT

2.1 Consideration of Alternative Use

During the initial planning stages of the Murchison decommissioning CNRI conducted a study to investigate the potential re-use of the Murchison Field infrastructure for supporting offshore renewable power generation, use of the facilities for carbon capture, and re-use of deck or jacket components in other locations (Noble Denton, 2011).

Offshore renewable energy generation (wind, wave or tidal) options were found to be commercially unviable. The capital outlays combined with annual operational and maintenance costs were found to far outweigh the revenue from energy generation. The cost of maintaining the large and ageing Murchison platform *in situ* presents major issues such that potential *in situ* alternative uses for the platform, e.g. as an offshore sub-station / hub, marine research station, training centre or for carbon capture, were not considered to be viable. Relocation of the Murchison platform to another site for re-use was rendered impractical by the condition, size and age of the platform (Noble Denton, 2011). No viable alternative uses were identified for the Murchison platform once production ceases, and therefore CNRI will continue the planning process for the removal and disposal of the Murchison Platform infrastructure.

2.2 Scope of the Operations

The main facilities included in the Murchison decommissioning project are the Murchison topsides and jacket, the drill cuttings pile at Murchison, the oil export pipeline to Dunlin Alpha (PL115), the Dunlin riser and topside facilities for Murchison production, the gas export pipeline to NLGP (PL165) (which is owned by the NLGP partners and which will be cut adjacent to the Murchison platform), four associated sub-sea wells, and tie-back pipeline bundles to the Murchison platform.

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 decommissioning of the Dunlin riser; and
- the cleaning and decommissioning of those parts of the Dunlin topsides facilities that relate to Murchison production.

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.

2.3 Murchison Topsides Facilities

The Murchison topside comprises 17 modules, arranged on two levels, with a combined weight of approximately 24,000 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 2 shows the general arrangement of the modules and other facilities on the topsides.

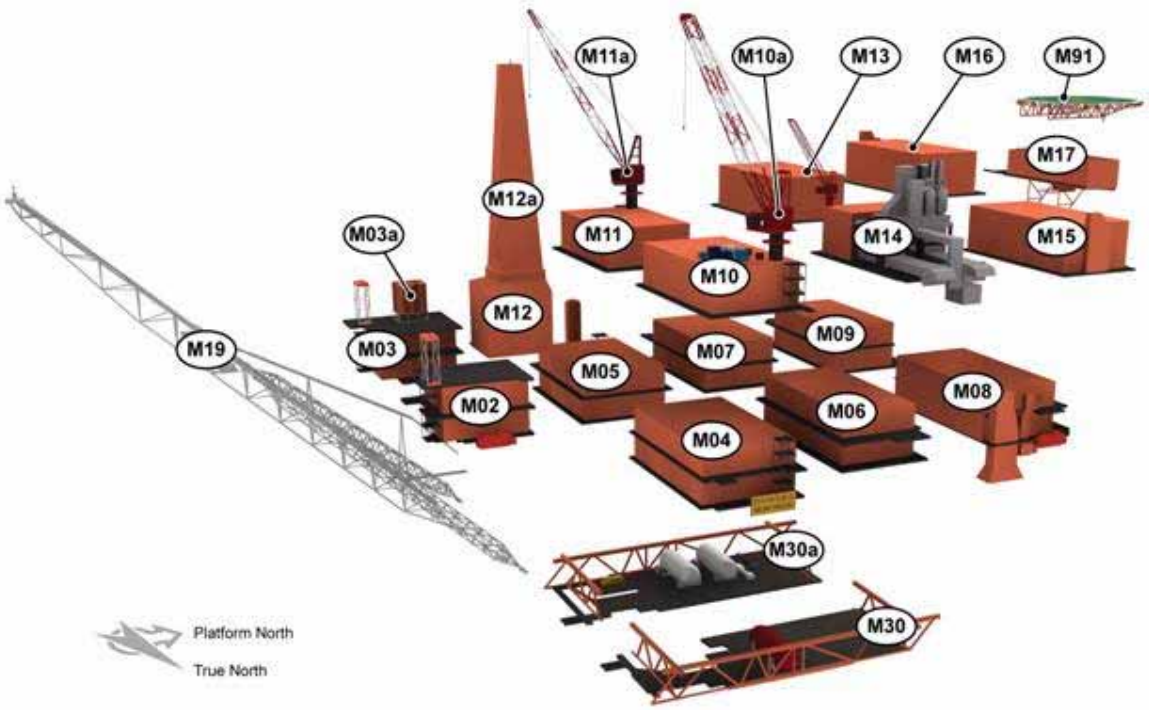
The Murchison topsides were installed in the late 1970s using semi-submersible crane vessels (SSCV). The Module Support Frame (MSF) was installed first, in two sections, with each section having 8 stabbing cones which acted as guides to locate the MSF sections, which were then welded in position.

2.4 Topsides Engineering Down and Cleaning

Decommissioning of the topsides facilities will begin with a phased well plug and abandonment (P&A) campaign, which is anticipated to be executed using the existing drilling derrick and facilities but may also use rig-less abandonment and conductor recovery technology.

On completion of the well abandonment programme the Murchison topside production systems will be transferred to the Engineering Down and Cleaning (EDC) contractor. CNRI will flush the topside systems to ensure that minimal hydrocarbons remain in the system prior to EDC.

During engineering down, all the systems will be progressively depressurised, purged and rendered safe for removal operations. Pipework and tanks may then be cleaned, or initially cleaned, to remove sources of potential spills of oils and other fluids. The modules will be prepared for separation by severing connecting pipework in a carefully planned programme of cutting and sealing pipes. Some EDC operations, which do not compromise the well P&A activities or interfere with the life support systems and facilities, may begin during the well P&A programme.



MODULE	DESCRIPTION
M02	Wellbay East (WBE)
M03	Wellbay West (WBW)
M03a	Bulk Storage Tanks (BST)
M04	Separation Module (SEP)
M05	Metering Module (MET)
M06	Gas Compression Module (GCM)
M07	Gas Sales Module (GSM)
M08	Utilities Module East (UME)
M09	Utilities Module West (UMW)
M10	Drilling Power & Fabrication Workshop (DPF)
M10a	East Platfrom Crane (ECR)
M11	Mud Module (MUD)

MODULE	DESCRIPTION
M11a	West Platform Crane (WCR)
M12	Drilling Substructure (DRS)
M12a	Drilling Derrick (DRK)
M13	MCR and Workshop (MCR)
M14	Power Generation Module (PWR)
M15	Accommodation East (LQE)
M16	Accommodation West (LQW)
M17	Accommodation New (LQN)
M19	Flare Boom (FLB)
M30	Module Support Frame East (MSFE)
M30a	Module Support Frame West (MSFW)
M91	Helideck (HEL)

Figure 2: Arrangement of modules on the Murchison topsides

2.5 Topsides Removal Options

The topsides shall be removed and returned to shore for recycling and disposal. The removal options being considered by CNRI for the decommissioning of the Murchison topsides include:

- Reverse installation
- Piece small deconstruction offshore
- Single lift

1. Reverse installation (multiple lifts)

For reverse installation, modules would be separated by deconstruction of the module interfaces and then removed individually by a dedicated crane vessel. They would be back-loaded to the deck of the crane vessel or to a cargo barge, and then transported in batches to an onshore disposal yard. The modules would be offloaded either directly from the vessel to the quayside or via a cargo barge towed to the quayside. The modules may then be assigned for re-use or broken down for recycling or disposal.

2. Piece small offshore deconstruction

In the piece small option, modules and other facilities on the topside would be dismantled offshore using mechanical excavators equipped with cutting tools. Manual hot and cold cutting techniques would be used to break down the facilities into small manageable sections, which would then be sorted and loaded into containers for transportation to shore on supply vessels. The three main phases of this option would be:

- Phase 1. Work in this phase would be supported by the existing accommodation, life support and utility systems on the platform. Modules would be removed piece small, and some preparatory work for lifts would be undertaken.
- Phase 2. Work in this phase would be supported from an accommodation vessel located alongside the platform. This would allow the accommodation, life support and utility systems to be removed piece small.
- Phase 3. After removal of all the modules and facilities, the module support frame would be removed by reverse installation, using a heavy lift vessel.

During preparation work to dismantle the topsides modules, all hazardous waste, cables, and waste electrical and electronic equipment would be removed. Once materials had been sorted into the relevant groups, they would be loaded into separate containers and shipped to an onshore disposal site.

3. Single lift

Removal of the Murchison topsides by a single lift vessel was initially considered, but, on commencement of engineering studies this option has now been ruled out as not technically feasible because there are no single lift vessels with sufficient width capacity to accommodate the Murchison topsides. This option will not be considered further.

2.6 Murchison Jacket Removal Options

The Murchison platform comprises a welded, tubular steel, eight-legged jacket structure (Figure 3). 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 approximately 23,000 tonnes and is 188 m high from the seabed to the top of the MSF.

Since the total weight of the jacket in air, excluding conductors, is >10,000 tonnes, 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 indicates that this would provide significant safety or environmental benefits in comparison with total removal. The footings of piled steel jackets are defined under OSPAR 98/3 as those parts of a steel installation which:

I. are below the highest point of the piles which connect the installation to the sea-bed; or

II. are so closely connected to the parts mentioned in paragraph (I) as to present major engineering problems in severing them from those parts.

Accordingly, the decommissioning options being considered by CNRI for the decommissioning of the Murchison jacket are:

1. **Full removal.** The jacket and footings (including the piles down to a depth of 3 m below the seabed) would be removed using one of the following options:
    - cutting into sections and lifting onto an HLV for transfer to shore; or
    - flotation of the whole jacket in one piece, using buoyancy tanks.

Note: the single lift option for the full removal of the Jacket has been studied and found to be technically unfeasible.

2. **Partial removal.** The jacket would be cut down to the footings, with the aim of severing the jacket from the footings at about -125 m (Figure 4). The exact depth of the cut would depend on:

    - the selected removal technique; and
    - the cutting equipment technology development.

    The upper part of the jacket would be removed using one of the following options:

    - cutting into sections and lifting onto an HLV for transfer to shore; in this option the cut would be at about -125 m;
    - flotation of the whole jacket in one piece using buoyancy tanks; in this option the cut would be at about -123 m; and
    - removing the whole jacket by single lift using a novel vessel; in this option the cut would be at about -111 m.

    Note: further studies in the design phase will define exactly what the cutting elevation will be. It is not anticipated that explosives would be required to cut jacket members or any of the associated sub-sea equipment.

    The recovered jacket material would be returned to shore for recycling and the remaining footings, within the cuttings pile would be left in place.

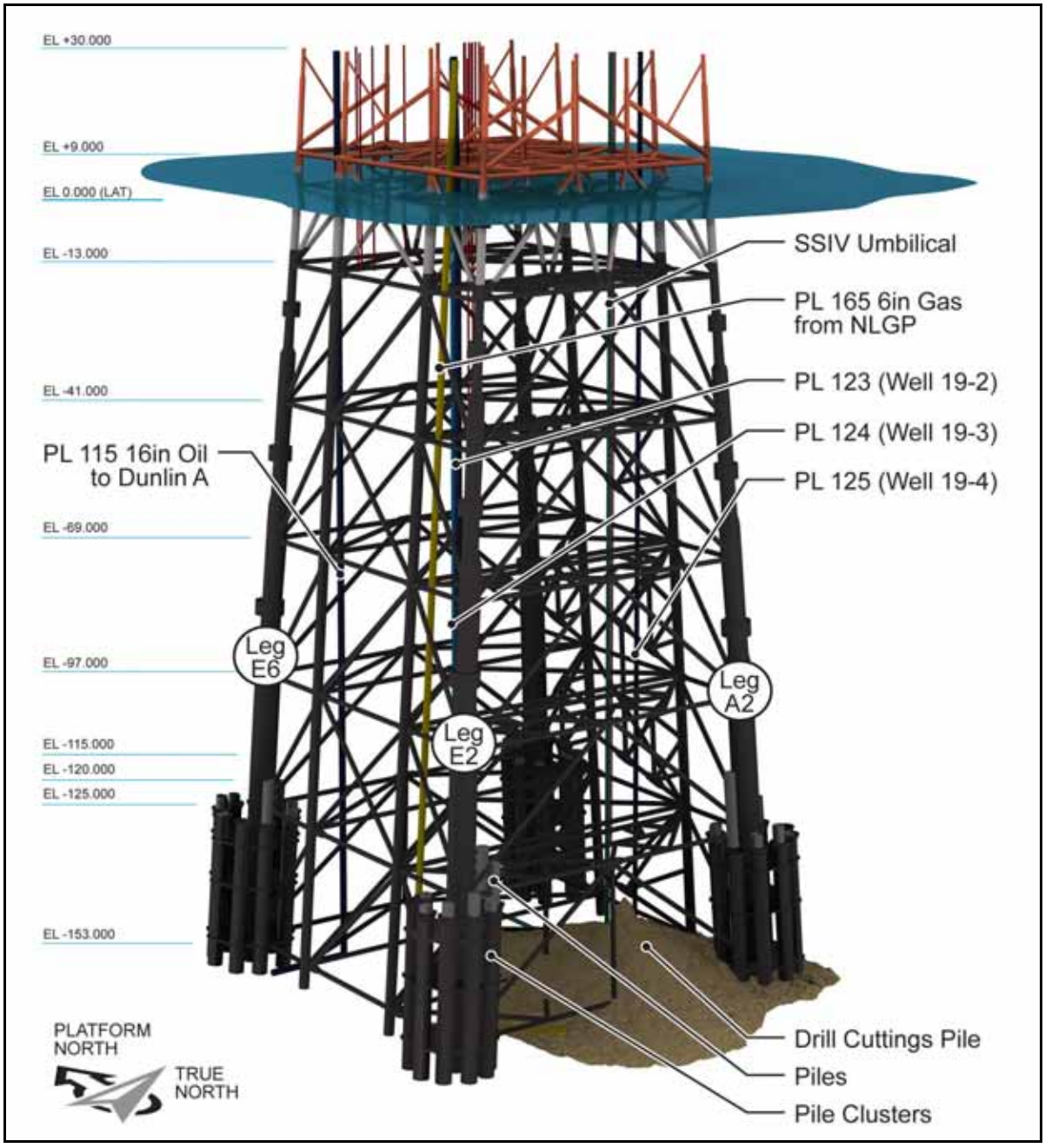


Figure 3: Murchison platform general arrangement

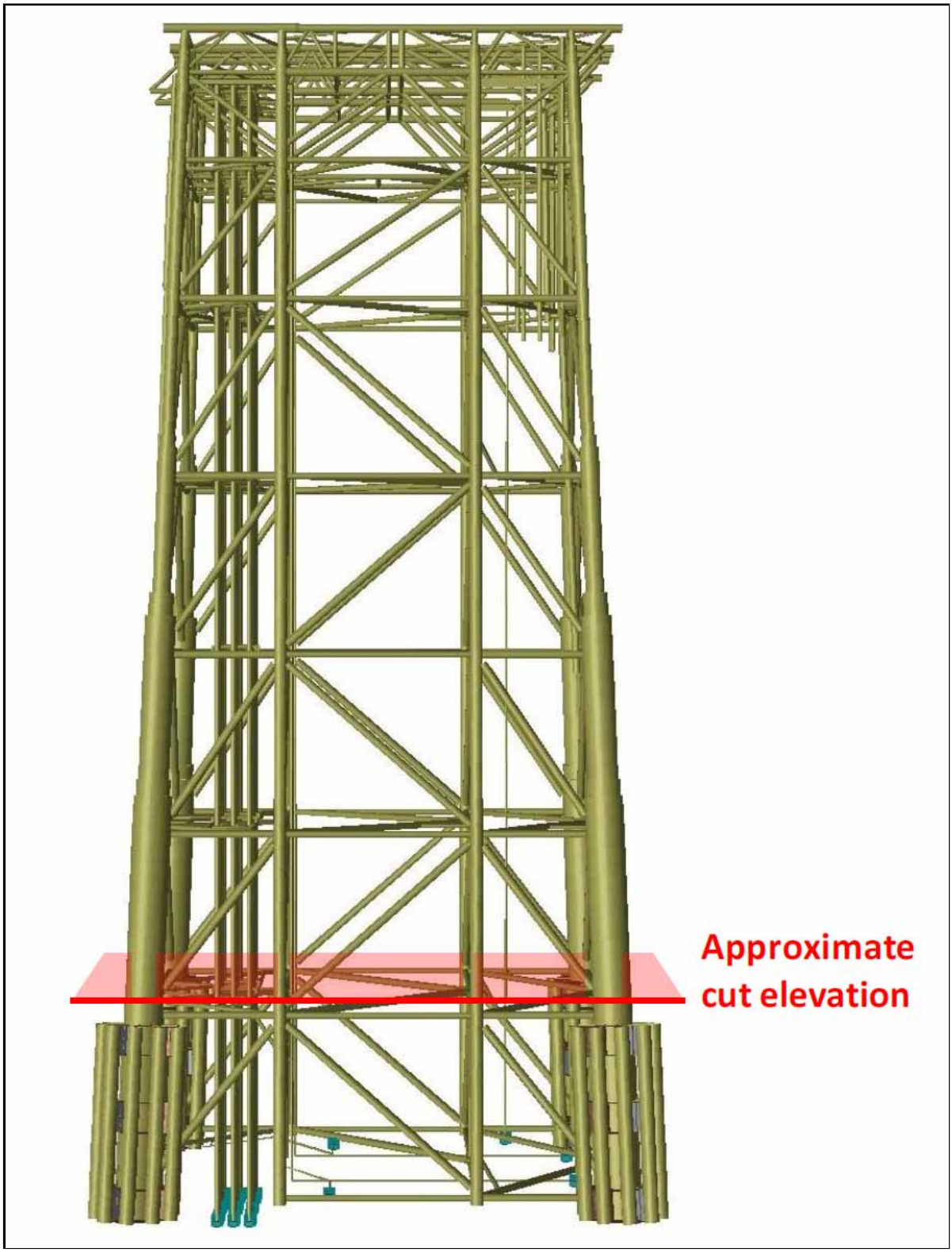


Figure 4: Murchison jacket, showing the approximate location of any cut to sever the upper jacket from the footings.

2.7 Well and Pipeline Decommissioning Options

The Murchison Field has four abandoned subsea tie-back wells, one of which is connected to the platform by a disused bundle (PL123) (Table 2). 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 (Table 2). 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.

Table 2: Murchison Field pipeline details

Pipeline Number	To	Diameter (inches)	Length (km)	Pipeline Type	Materials	Current Condition and Crossings
PL155	Dunlin Alpha	16	19.1	Production pipeline – oil export line	Steel API 5L X52 seamless	56% rock dump, 44% exposed. Spans exist. Crossings: 6'' Thistle NLPG spur; 20'' Gas pipeline PL164 (Magnus - Brent A); Penguin Control Umbilical PL1902 (Brent C-Penguin); 18'' Oil Export PL1828 (Penguin-Brent C)
PL123	Well 211/19-2	12	0.8	Production bundle 2 production bundles and 4 control lines	Carbon Steel Outer casing, external thin film epoxy coating 114kg Al-Zn-In anodes, attached to bundle	100% exposed. The bundles and control lines were flushed through before isolation subsea, and removal of tree topsides. The pipeline end remains connected to wellhead. Wellhead protection cover remains *in situ*. Riser / bundle subsea connector remains *in situ*. Tree has been removed, with outer casing and 4 off control lines terminating at +24 m level with Cameron hub, and bundles terminating at +33 m level.
PL124	Well 211/19-3	12	2	Water-injection bundle 2 water-injection bundles and 4 control lines	Carbon Steel Outer casing, external thin film epoxy coating 114kg Al-Zn-In anodes, attached to flow-line	100% exposed. End connections of each flow-line have been removed at wellhead, with end of bundle lying undisturbed and partially buried on seabed. Riser / bundle subsea connector remains *in situ*. The bundle ends have been left open to sea, following disconnection from the wellhead. Termination to Cameron tree remains *in situ*, with pipework removed downstream of tree.
PL125	Well 211/19-4	12	1.23	Production bundle 2 production bundles and 4 control lines	Carbon Steel Outer casing, external thin film epoxy coating 114kg Al-Zn-In anodes.	100% exposed Bundle has been cut just short of wellhead, with end of bundle lying undisturbed and partially buried on seabed. The wellhead tree has been removed, but the Production Guide Base remains in place. The bundles ends have been left open to sea, following disconnection from the wellhead.

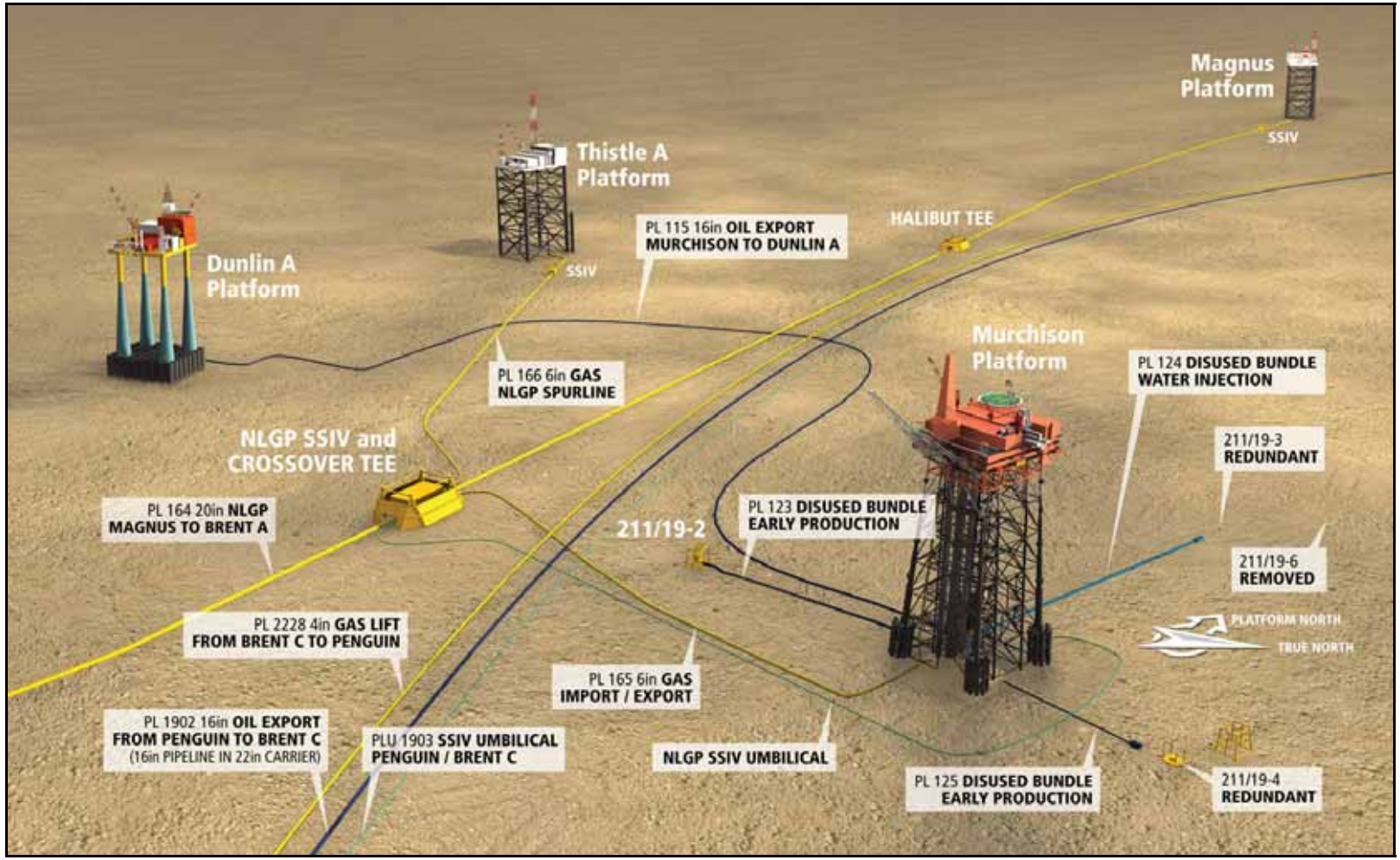


Figure 5: Murchison platform and Field layout schematic

Pipeline decommissioning is governed by the Petroleum Act 1998 and the requirements are set out within the DECC Guidance Notes ('Guidelines'). The Guidelines state that there are no prescribed options for pipeline decommissioning; all feasible options must be considered and a comparative assessment 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:

1. **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.

2. **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.

3. **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.

4. **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.

5. **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.

2.8 Cuttings Pile Management Options

The Murchison platform has an historic drill cuttings pile, located more or less directly beneath the jacket. The drill cuttings pile has a surface area of 6,840 m^2 and volume of

22,545 m^3, which was calculated based on the MBES topography mapping of the cuttings pile (ISS, 2011). The drill cuttings pile was created as a result of drilling of 98 wells (excluding tiebacks and re-drills), 48 of which were drilled using OBM (ERT, 2008). Under the OSPAR Recommendation 2006/5 'Management Regime for Offshore Cuttings Piles' all cuttings piles must undergo a two stage assessment. Stage 1 comprises the initial screening of the cuttings pile to determine whether the pile meets the thresholds for rate of oil loss and persistence specified in the Recommendation. Where results indicate that both the rate and persistence are below the thresholds, no further action is required and the cuttings pile may be left *in situ* to degrade naturally. If either the rate or the persistence is above the threshold, a Stage 2 assessment is required to determine the Best Environmental Practice (BEP) for the management of the pile.

The Murchison development area has been subject to ten environmental surveys between 1978 and 2006. Samples collected during these surveys indicated that levels of total hydrocarbon concentration (THC) which exceed the OSPAR Recommendation 2006/5 threshold of 50 mg/kg were measured at stations located at distances of up to 500 m from the platform. All other stations, out to 14,000 m from the platform, exhibited THC values below the OSPAR persistence threshold (Hartley Anderson Ltd., 2007).

In 2008 CNR conducted a technical review of their North Sea assets with regards to the OSPAR Recommendation 2006/5. This determined that for the Murchison cuttings pile the rate of loss of oil to the water column was 2.46 te/yr and area persistence was 55 km^2 yrs (ERT, 2008). Since both of these values were estimated to be below the OSPAR thresholds (10 te/yr and 500 km^2yrs, respectively), it was concluded that no further action was required (ERT, 2008). This initial assessment was, however, based on an estimated pile volume rather than actual measurements.

CNRI conducted a pre-decommissioning environmental survey in Spring 2011 which included measurements of cuttings pile volume and total hydrocarbon concentrations for the use in calculating the area of likely 'ecological effect' footprint, which is defined by OSPAR as the area of seabed where the surface sediment hydrocarbon concentrations are greater than 50 mg/kg dry weight. CNRI are currently in the process of repeating the OSPAR Stage 1 screening process for the Murchison cuttings pile using the results from the pre-decommissioning environmental survey to recalculate the area of persistence and rate of oil loss. If the characteristics of the pile are found to be below the OSPAR thresholds then no further action will be taken, but if the pile exceeds the OSPAR thresholds a full comparative assessment for the management of the Murchison drill cuttings piles will be considered. In addition, full removal of the Murchison jacket would require displacement / removal of a large proportion of the drill cuttings pile. To inform the comparative assessment of the jacket removal options, therefore, a full comparative assessment for management of the drill cuttings pile will be under taken. A comparative assessment of drill cuttings pile

management options for either an OSPAR Stage 2 assessment or for excavation of the pile to access the jacket footings will consider the options outlined in Table 3.

Table 3: Management options for Murchison drill cuttings pile

OSPAR Stage 2	Excavation of cuttings pile to access jacket footings
Leave *in situ* and do nothing	n/a
Leave *in situ* and cover	n/a
Removal from the seabed followed by re-injection	
Removal from the seabed and recovery of cuttings to the surface, for treatment offshore and disposal to the seabed	
Removal from the seabed and recovery of cuttings to the surface, for treatment onshore and disposal to landfill	
Excavation and redistribution of cuttings to another area of seabed	

2.9 Decommissioning Schedule

The End of Field Life (EoFL) has yet to be determined for the Murchison Field and this will be dependent on several factors including future development opportunities and continuing production profiles. CNR are working towards early, mean and late projections for the EoFL and Cessation of Production (CoP), and as a responsible operator have initiated the pre-planning stage for the decommissioning of the Murchison Field based on projections of an early EoFL and CoP date of 2014. Figure 6 shows a high level project execution plan based on an early CoP date.

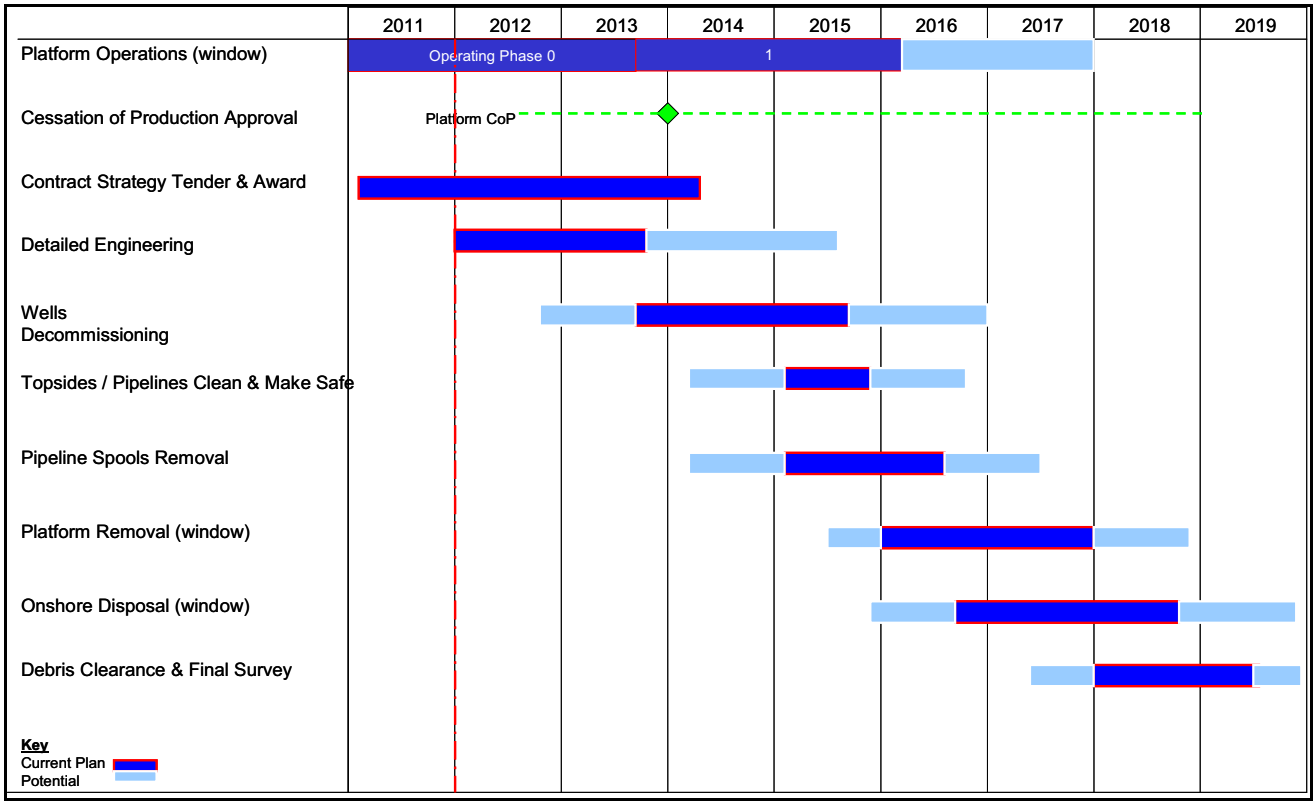


Figure 6: Murchison decommissioning high level project plan

3 DESCRIPTION OF THE ENVIRONMENTAL SETTING

3.1 Physical and Chemical Environment

3.1.1 Meteorology, Oceanography and Hydrography

The Murchison Field is located in the area influenced by the northern North Sea water mass (NSTF, 1993). The maximum surface tidal current speeds are relatively weak (0.26 m/s to 0.39 m/s) and residual current speed ranges from 0.0 m/s to 0.01 m/s (UKDMAP, 1998). Mean sea surface temperature is approximately 12.5°C in summer and 8°C in winter. Mean bottom water temperature varies less, and is approximately 9°C in summer and 7°C in winter. The salinity of the water column is around 35 ppt throughout the year (UKDMAP, 1998). Winds in the Murchison area originate from all directions, although winds from the south southwest and south are most dominant (Meteorological Office, 1998).

3.1.2 Seabed Sediments

The seabed in the Murchison area is mainly flat. Samples taken at distances of more than 250 m from the Murchison Platform indicated that the sediment generally consists of poorly or very poorly sorted medium sands, with a mean diameter of 281-400 µm and a low proportion of fines (< 7%) (Hartley Anderson Limited, 2007). In contrast, sediment at the station closest to the Murchison Platform (250 m away) comprised extremely poorly sorted coarse silt with a mean diameter of 45 µm and 54% fines (Hartley Anderson Limited, 2007). The organic content of the sediment was less than 1% at all stations apart from the two innermost stations (250 m and 500 m from the platform), where it was around 3% to 4%. The elevated proportion of fines, higher organic content and differing granulometry at the station closest to the platform are probably related to drilling activity at the platform.

3.1.3 Seabed Chemistry

In the 2006 survey, the THC values at most sampling stations within the Murchison area were within expected background levels (9.41-40.10 µg/g; UKOOA, 2001) for this area of the North Sea, but moderately elevated (86 µg/g) and slightly elevated (61.3 µg/g) at the 250 m and 1,000 m stations, respectively (Hartley Anderson Limited, 2007). The pattern of relative concentrations was similar for other hydrocarbon parameters. Analysis indicated that the source of hydrocarbon contamination was likely to be weathered diesel at the innermost sampling station and relatively fresh lower molecular weight oil at the station 1,000 m from the platform (Hartley Anderson Limited, 2007).

At the innermost sampling station, concentrations of metals were found to be elevated with respect to expected background concentrations. Zinc and barium concentrations were also

elevated at the 500 m station. In general, it was observed that there was a pattern of decreasing metal concentration with distance from the platform. The results suggest that within 500 m of the platform, the seabed sediments had been contaminated by drilling discharges (Hartley Anderson Limited, 2007).

This concurs with the estimates that the "effect footprint" of the Murchison cuttings pile, defined as the region within which hydrocarbon concentration is greater than the OSPAR threshold of 50 mg/kg, extends to less than 500 m from the platform (ERT, 2008).

3.2 Biological Environment

3.2.1 Conservation Areas

Table 4 lists Annex I habitats and Annex II species of the European Union Habitats Directive (92/43/EEC) that are considered for the identification of SACs in UK offshore waters. There are no known Annex I habitats in the vicinity of the Murchison Field. The only Annex II species sighted within the Murchison area is the harbour porpoise, sighted in very high numbers in February and July and in low numbers in May, June, August and September (Reid *et al*., 1998; UKDMAP, 1998; see Section 3.2.5).

Table 4: Annex I habitats and Annex II species known to occur in UK offshore waters

Annex I habitats considered for SAC selection in UK offshore waters	Species listed in Annex II known to occur in UK offshore waters
• Sandbanks that are slightly covered by seawater all the time • Reefs (bedrock, biogenic and stony) – Bedrock reefs – made from continuous outcroppings of bedrock which may be of various topographical shape (e.g. pinnacles, offshore banks); – Stony reefs – these consist of aggregations of boulders and cobbles which may have some finer sediments in interstitial spaces (e.g. cobble and boulder reefs, iceberg ploughmarks); and – Biogenic reefs – formed by cold water corals (e.g. *Lophelia pertusa*) and the polychaete worm *Sabellaria spinulosa*. • Submarine structure made by leaking gases • Submerged or partially submerged sea caves	• Grey seal (*Halichoerus grypus*) • Harbour or common seal (*Phoca vitulina*) • Bottlenose dolphin (*Tursiops truncates*) • Harbour porpoise (*Phocoena phocoena*)

3.2.2 Plankton

Phytoplanktonic organisms are the marine primary producers of the ocean and fix the energy of sunlight by means of photosynthesis. The most common phytoplankton groups are the diatoms, dinoflagellates and the smaller flagellates and together they are responsible for a majority of the primary production of the North Sea. In the northern North Sea, within which the Murchison Field is located, the dinoflagellate genus *Ceratium* dominates the phytoplankton community (DTI, 2001).

Phytoplankton is grazed by the secondary producers, including some of the zooplankton species. The most abundant group in the North Sea is the copepods, which are dominated by *Calanus* spp. (DTI, 2001; Johns and Reid, 2001). Other zooplanktonic organisms of the North Sea include Euphausiids (krill), Thaliacea (salps and doliolids), siphonophores, medusae (jellyfish) and the larval stages of starfish and sea urchins (echinoderms), crabs and lobsters (decapods) and fish (Johns & Reid, 2001). The zooplankton communities across the North Sea are broadly similar (DTI, 2001).

3.2.3 Seabed Fauna

Infauna and Epifauna

Analysis of samples taken during surveys between 1979 and 2006 have shown that the macrofaunal community of the Murchison Field is typical of the wider northern North Sea but shows some indication of a moderately modified community close to the platform. CNRI conducted a pre-decommissioning survey in Spring 2011, the results of which will be presented in the full Murchison decommissioning EIA.

Polychaete worms were the dominant species in all surveys (UK Benthos, 2004). Surveys in 1979 to 1980 found a community dominated by polychaetes such as *Amythasides macroglossus*, *Aonides paucibranchiata* and *Exogone* spp., nematoda and bivalve molluscs such as *Limatula subauriculata* and *Thasari sarsi*, as expected for this area of the northern North Sea. Surveys in 1985 and 1987 found an increase in opportunistic polychaete species such as capitellids and *Rhaphidrilus* spp. In 1990 and 1993, a high abundance of opportunistic species indicative of organic enrichment were found, including capitellids, cirratulids, *Raricirrus beryli* and *Paramphinome jeffreysii* (UK Benthos, 2004), as well as juveniles of brittle star *Ophiura* spp, which favour disturbed sediments (MarLIN, 2011).

The 2006 survey (Hartley Anderson Limited, 2007) found that the macrofaunal composition was typical for this sediment type and water depth in the northern North Sea and was similar between sampling stations located at varying distance from the Murchison platform. However, analysis revealed a modified faunal community at the sampling station closest to the platform (250 m away), with a high abundance of opportunistic species including the

polychaetes *Paramphinome jeffreysii*, *Raricirrus beryli*, cirratulids and capitellids, and the presence of *Thyasira sarsi*, a species associated with organically enriched sediments. There was moderately reduced diversity at this station in comparison with stations further from the platform. However, the magnitude of the modification of the faunal community was moderate, and diversity remained high at all sampling stations. A less pronounced modification of the faunal community was also found at the next closest sampling station, 500 m from the platform (Hartley Anderson Ltd, 2007).

Marine Growth

ROV digital footage taken during a number of ROV surveys from 2002 to 2010 has shown that the Murchison platform jacket supports an extensive cover of marine growth (BMT Cordah, 2010; ISS, 2010), and that the composition of this community varies with depth (Table 5). The overall composition of the marine growth community and the pattern of marine growth on the Murchison platform were found to have remained relatively unchanged since 2002 (BMT Cordah, 2010).

The platform is extensively colonised by the cold-water coral *Lophelia pertusa*, particularly below 80 m. Individual colony thickness ranged from approximately 20 mm to more than 900 mm. The number of colonies, the percentage cover and the thickness of *Lophelia pertusa* on the Murchison platform have increased in all depth zones between 2006 and 2009; in 2006, the maximum average percentage cover was 33%, at depths between 130 m and 140 m, and in 2009 it was 50%, at depths between 125 m and 130 m (BMT Cordah 2010).

Table 5: Summary of community composition of marine growth on the Murchison platform as a function of depth below the sea surface

Depth range (m below sea surface)	Dominant organisms	Other organisms
6 to 20	Seaweeds, hydroids and mussels	Tubeworms, barnacles, soft coral and anemones.
27 to 69	Anemones and tubeworms.	Hydroids, soft coral, sponges and *Lophelia pertusa*. Mussels and barnacles only at -27 m.
78 to 87	Anemones, hydroids and tubeworms.	*Lophelia pertusa*.

Source: BMT Cordah (2010)

3.2.4 Finfish and Shellfish

The main commercial fish species in the northern North Sea are whiting, cod, haddock, saithe, Norway pout, lemon sole, monkfish, herring and mackerel (DTI, 2001). The Murchison Field lies within spawning grounds for cod (*Gadus morhua;* January to April),

whiting (*Merlangius merlangus;* February to June), Norway pout (*Trisopterus esmarkii*; January to April), haddock (*Melanogrammus aeglefinus*; February to May) and saithe (*Pollachius virens*; January to April) and nursery grounds throughout the year for haddock, Norway pout, herring (*Clupea harengus*), ling (*Molva molva*), mackerel (*Scomber scombus*), spur dog (*Squalus acanthias*), and blue whiting (*Micromesistius poutassou*) (Figure 7 and Figure 8).

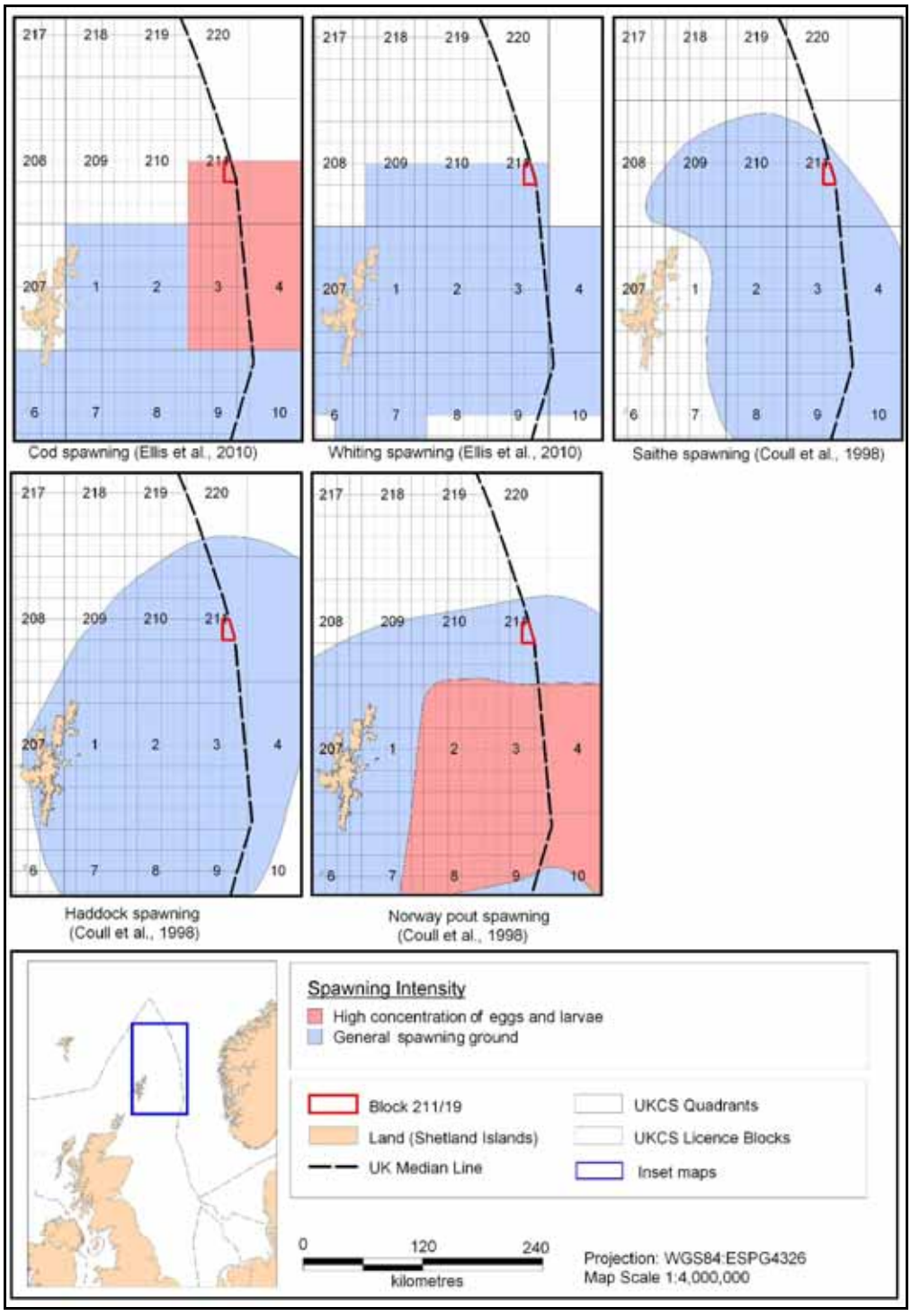


Figure 7: Fish spawning grounds in the vicinity of the Murchison Field

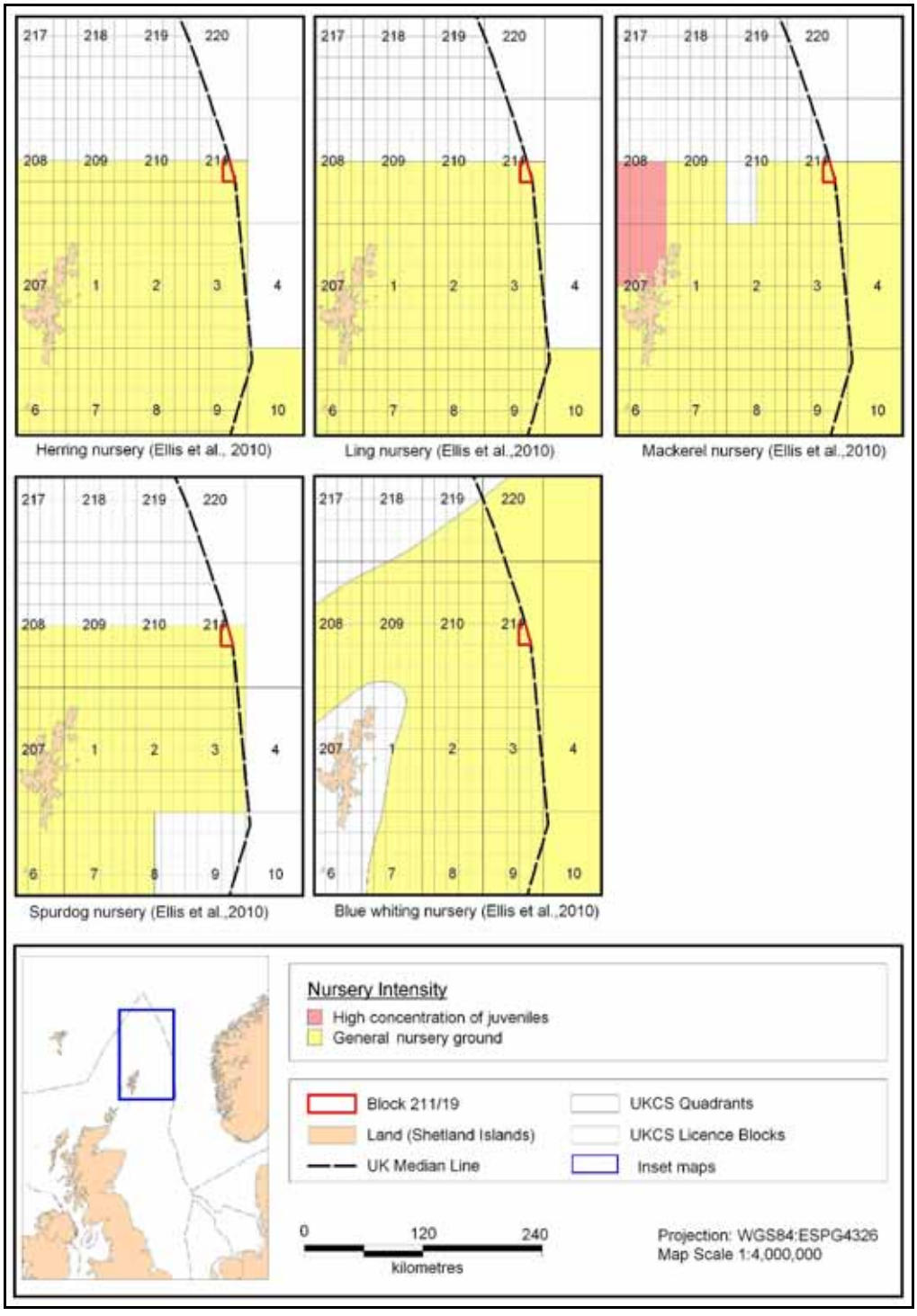


Figure 8: Fish nursery grounds in the vicinity of the Murchison Field

3.2.5 Marine Mammals

Cetaceans

The main cetacean (whale and dolphin) species occurring in the Murchison area are minke whale (*Balaenoptera acutorostrata*), long-finned pilot whale (*Globicephala melas*), killer whale (*Orcinus orca*), white-beaked dolphin (*Lagenorhynchus albirostris*), white-sided dolphin (*Lagenorhynchus acutus*) and harbour porpoise (*Phocoena phocoena*); most sightings occur in the summer months (Table 6; Reid *et al.*, 2003; UKDMAP, 1998). In addition, sperm whales have occasionally been sighted in the vicinity of Block 211 between May and October (UKDMAP, 1998).

Table 6: Seasonal cetacean sightings in the Murchison area

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minke whale					L							
Long-finned pilot whale								VH				
Killer whale					M	M		L				
White-beaked dolphin							L					
White-sided dolphin					L	L		VH				
Harbour porpoise		VH			L	L	VH	L	L			

KEY		
		No animals / no data
	L	Low densities (0.01 to 0.09 animals/km)
	M	Moderate densities (0.10 to 0.19 animals/km)
	H	High densities (0.20 to 0.49 animals/km)
	VH	Very high densities (≥ 0.50 animals/km)
		Sightings within Quadrant 211
		Sightings within surrounding Quadrants

Source: UKDMAP (1998)

Pinnipeds

The grey seal (*Halichoerus grypus*) and the harbour or common seal (*Phoca vitulina*), are both resident in UK waters and occur regularly over large parts of the North Sea (SCOS, 2009). As the Murchison Field is 150 km from the nearest coastline, however, it is unlikely that significant numbers of grey or common seals would be found in the vicinity of the field.

3.2.6 Seabirds

Seabirds found in offshore North Sea waters include fulmars, gannets, auks, gulls, kittiwake and terns (DTI, 2001). In general, offshore areas of the North Sea contain peak numbers of seabirds following the breeding season and through winter, with birds tending to forage closer to coastal breeding colonies in spring and early summer (DTI, 2001).

In the Murchison area (UKCS Block 211/19 and surrounding blocks), the overall seabird vulnerability to surface pollution is "low" (JNCC, 1999; Table 7). The most sensitive times of year are March, July, October and November when vulnerability to oil pollution is "high" in some of the area; vulnerability ranges from "moderate" to "low" for the remainder of the year.

Table 7: Seasonal seabird vulnerability to oil pollution in the Murchison area

Block	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Overall
211/13	3	4	3	4	3		2	4	3	3	4	4	4
211/14	3	4	3	4	3		3	4	3	3	4	4	4
211/15	3	4	3	4	3		3	4	3	3	4	4	4
211/18	3	3	3	4	3	4	2	4	3	3	4	4	4
211/19	**3**	**4**	**3**	**4**	**3**	**4**	**2**	**4**	**3**	**3**	**4**	**4**	**4**
211/20	3	4	3	4	3	4	2	4	3	3	4	4	4
211/23	3	3	2	4	3	4	2	4	3	2	2	4	4
211/24	3	3	4	4	3	4	2	4	3	3	2	4	4
211/25	3	3	4	4	3	4	2	4	3	3	2	4	4

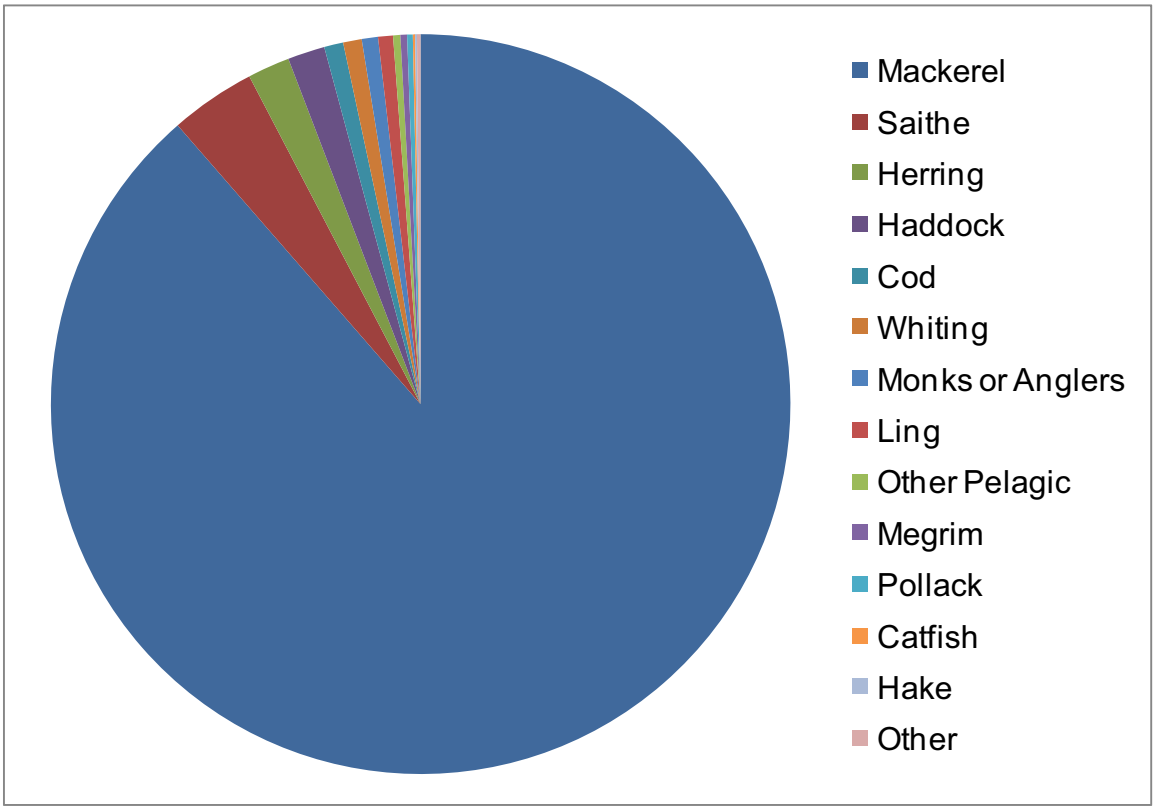
KEY	
1	Very high seabird vulnerability
2	High seabird vulnerability
3	Moderate seabird vulnerability
4	Low seabird vulnerability
	No data

Source: JNCC (1999)

3.3 Socio-economic Environment

3.3.1 Fisheries

Commercial fishing effort (days spent fishing) in the area around the Murchison Field (International Council for the Exploration of the Seas (ICES) Statistical Rectangles 51F1 and 52F1) is very low in comparison with other areas of the North Sea (Marine Scotland, 2010b), with approximately 230 days each year in ICES Rectangle 51F1. The fishing effort is dominated by demersal fishing gears but the catch by weight, which between 2007 and 2009 amounted to an annual average of 8,490 tonnes in 51F1, is dominated by pelagic species (Marine Scotland, 2010a). The relative value of the catch is "moderate" in 51F1. The main species caught are mackerel (*Scomber scombrus*) and saithe; other species landed include cod, haddock, herring, monkfish (*Lophius piscatorius*) and whiting (Figure 9; Marine Scotland, 2010a).



Source: Marine Scotland (2010a)

Figure 9: Catch composition by weight in the Murchison area (ICES rectangle 51F1 in the years 2007 to 2009

3.3.2 Oil and Gas Industry

Oil and gas development in this area of the North Sea is relatively intense, with several other developments close to the Murchison Field. These include Playfair (6 km away in UKCS Block 211/19), Thistle (8 km; UKCS Block 211/18), Don (11 km; UKCS Block 211/18), Statfjord A and Statfjord N (15 km; Norwegian continental shelf Blocks 33/9 and 33/12) and Penguin East (18 km; UKCS Block 211).

3.3.3 Shipping

The Murchison Field is located in an area of moderate to low shipping activity (DTI, 2001a). There are four shipping lanes in the vicinity of the adjacent Block 211/29 and an average of 0.5 to 10 vessels per day are known to use each shipping lane (DTI, 2001a). Shipping lanes are used by shuttle tankers, supply and stand-by vessels serving the offshore oil installations in the area.

4 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 8.

Table 8: 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

Table 8 Continued. List of decommissioning studies

Decommissioning Aspect	Study Title
HSE	QRA of Decommissioning and Removal Options
	Murchison Decommissioning Assessment of the Safety Risk to Fishermen Murchison Pipelines And Platform Fishing Risk Analysis - Technical Note
	Pre-decommissioning Environmental Baseline Survey
	Commercial Fisheries – Socio-economic Impact Study
	Underwater Noise Impact Assessment for the Murchison Field Decommissioning
	Energy and Emissions Report for the Decommissioning of Murchison
	Murchison Drill Cuttings Pile Long-Term Cuttings Pile Characteristics
	Murchison Drill Cuttings Pile Leaching Rate and Seabed Footprint in Relation to OSPAR 2006/5
	Murchison Drill Cuttings Pile Modelling the Effects of Human Disturbance of the Cuttings Pile
Waste Management	Facilities for Onshore Receipt of Decommissioning Structures
	Post CoP Alternative Use Appraisal

5 SCOPING METHODOLOGY

5.1 Impact Identification

CNRI conducted a desk-top study to identify the potential impacts that may be associated with the decommissioning activities being considered. The impacts that might arise during the decommissioning project were identified by:

1. Examining the proposed options for decommissioning the Murchison topsides, jacket and subsea infrastructure, and identifying the specific activities within these high level decommissioning phases which may give rise to an environmental impact. High level activities were identified as:
   - The use of vessels, and offshore transportation, during ALL types of offshore operations
   - The handling, dismantling, treatment and disposal of materials at inshore and onshore sites
   - The plugging and abandonment of wells
   - The decommissioning of topsides offshore
   - The decommissioning of the jacket
   - The decommissioning of the pipelines and subsea infrastructure, and the Dunlin riser and topsides decommissioning
   - The decommissioning of the drill cuttings pile
2. Assessing the characteristics and sensitivities of the offshore environment in which the Murchison facilities are located. CNRI have identified the potential environmental receptors and other considerations which may be impacted by the proposed decommissioning operations. These receptors fall within four broad categories: physical environment, biological environment, human aspects and other considerations. Other users of the sea will include any potential 'new receptors' arising, for example, from recent and future developments in marine renewables. The specific receptors are detailed in Figure 10.

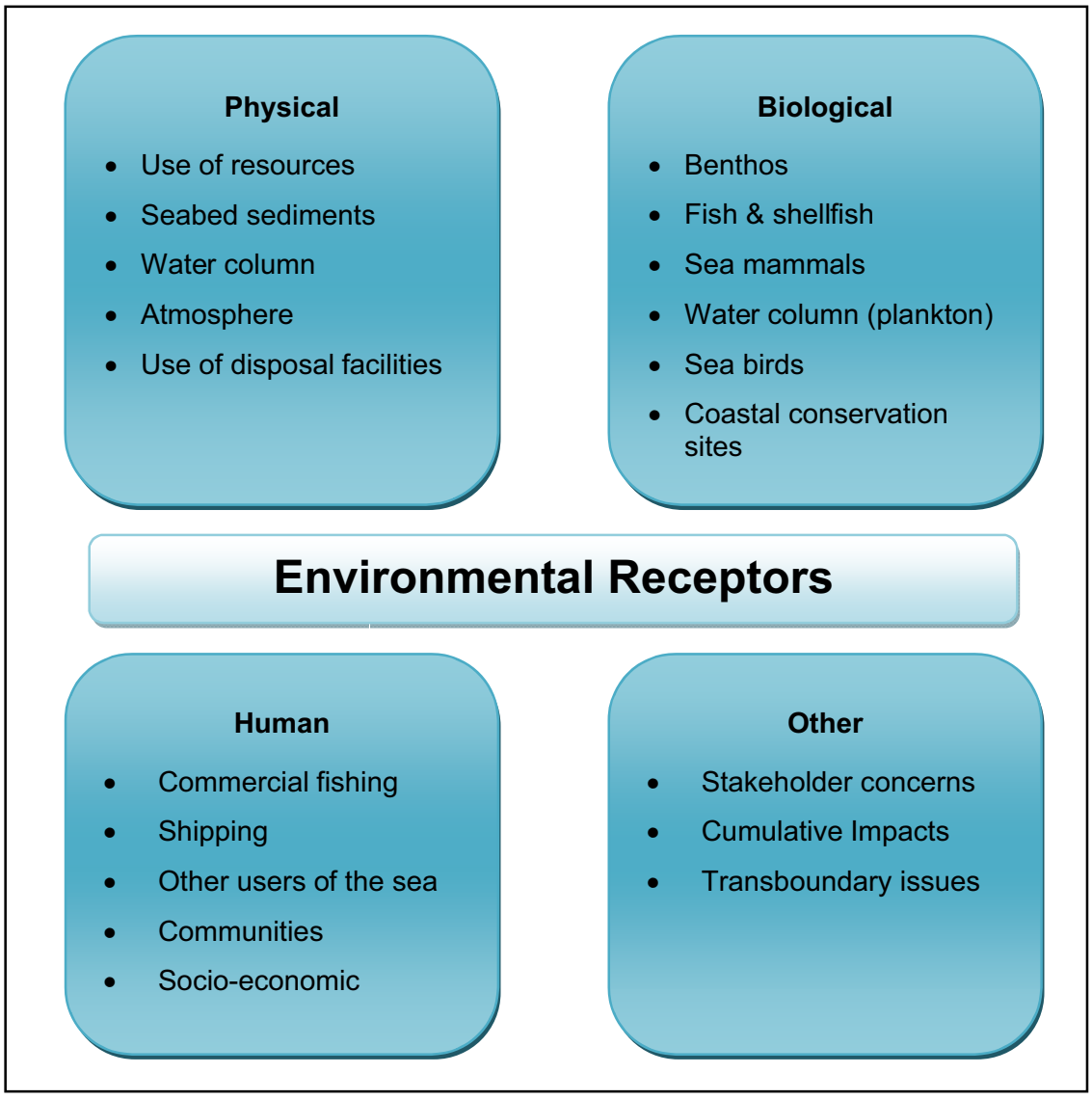


Figure 10: List of environmental receptors

Based on the high level activities identified above and the list of environmental considerations, CNRI conducted a scoping exercise to identify the aspects of the project that could have an effect on any of the environmental receptors. This process is described in Section 5.2 below.

5.2 Impact Evaluation

The scoping exercise was conducted in two parts; the first part formed a preliminary desk-top assessment of the potential impacts; this was followed by a scoping workshop in which the decommissioning team discussed each of the proposed activities and their potential impact.

Potential impacts were evaluated taking into account the sensitivity of the affected receptor and the magnitude of the impact, specifically the nature, and where possible scale and duration, of any resultant physical, chemical, biological or social / economic effects. The initial appraisal was informed by:

- the body of knowledge that already exists about the Murchison Field and the wider northern North Sea area (including: Coull et al. 1998; UKDMAP, 1998; JNCC, 1999; DTI, 2001; UK Benthos, 2004; Hartley-Anderson, 2007; BMT Cordah, 2010; Marine Scotland, 2010a);
- CNRI's present knowledge of the effects that the ongoing operations at the Murchison Field may be having on the local environment;
- CNRI's ongoing operational activities including, chemical discharges (PON15D), oil in water discharges (pollution permits - OPPC), atmospheric emissions (PPC), environmental site-surveys (including: UK Benthos, 2004; Hartley-Anderson, 2007);
- the effects that past operations in and around the Murchison Field have had (for example, the historic discharge of drill cuttings) (Hartley-Anderson, 2007; ERT, 2008); and
- the growing body of evidence available from other offshore decommissioning projects (Total, 2003; BP, 2006; Total, 2007; Shell 2007). This material provides additional predictive or modelling information, and data from decommissioning surveys.

The evaluation of each impact's significance was based on the predefined significance criteria shown in Table 9.

- Impacts that fell into the categories described as: "none", "negligible" and "minor" were assessed to be **non-significant**;
- Impacts that were classified as potentially being of "moderate", "major" or "severe" significance were highlighted as **key issues** that should be assessed in more detail in the full Environmental Impact Assessment.

The results of the scoping exercise are detailed in impact assessment tables presented in **Appendix A**. These tables record the level of environmental impact (as defined in Table 9) assessed for each receptor and identify which impacts are classified as key issues within the scope of the Murchison decommissioning project.

Section 6 details the main operations or activities in each of the high-level phases of the Murchison decommissioning project, and identifies which environmental receptors (defined in

Figure 10) these activities may impact. The impacts that were classified as key issues (**Appendix A**) are summarised at the end of **Section 6**.

Table 9: Criteria used to assess the significance of potential impacts

Colour Code	Level of Environmental Impact	Definition
	Severe	• Change in ecosystem leading to long term (>10 years) damage and poor potential for recovery to a normal state. • Likely effect on human health. • Long term loss or change to users or public finance.
	Major	• Change in ecosystem or activity over a wide area leading to medium term (>2 years) damage but with a likelihood of recovery within 10 years. • Possible effect on human health. • Financial loss to users or public.
	Moderate	• Change in ecosystem or activity in a localised area for a short time (<2 years), with good recovery potential. Similar scale of effect to existing variability but may have cumulative implications. • Potential effect on health unlikely, may cause nuisance to some users.
	Minor	• Change which is within scope of existing variability but can be monitored and/or noticed. • May affect behaviour but not a nuisance to users or public.
	Negligible	• Changes which are unlikely to be noticed or measurable against background activities. • Negligible effects in terms of health or standard of living.
	None	• No interaction and hence no change expected.
	Beneficial	• Likely to cause some enhancement to ecosystem or activity within existing structure. • May help local population.

Source: UKOOA Offshore Environmental Statement Guidelines (1999)

6 POTENTIAL IMPACTS FROM THE MURCHISON DECOMMISSIONING PROJECT

This section lists the main operations or events in each of the high-level activities / phases of the Murchison decommissioning project, and identifies the potential impacts of these activities on the environmental receptors listed in Section 5.1. All of these potential impacts will be assessed in the EIA, with particular attention being paid to a thorough assessment of those issues identified as being "key issues".

6.1 Impacts of the Use of Vessels, and Offshore Transportation, During ALL Types of Offshore Operations

All phases of the Murchison decommissioning operations, including topsides removal, jacket and pipeline decommissioning, and post-decommissioning surveys, will require intensive use of specialist vessels to dismantle the structures offshore and transport them to shore for processing and disposal. Table 10 summarises the potential impacts arising from these activities.

Table 10: Potential impacts associated with ALL vessel use

Activity	Impacted receptor
Physical presence	Fishing, shipping
Anchoring on seabed	Sediments, benthos
Drill cuttings disturbance	Sediments, benthos
Vessel discharges e.g. sewage	Water column
Vessel discharges e.g. Ballast water	Water column, plankton, benthos, fish, stakeholders
Energy use and atmospheric emissions	Atmosphere, cumulative (global) impacts
Inshore / onshore noise	Communities
Underwater noise	Marine mammals and fish
Non-routine events	
Loss of fluids from subsea tool	Water column
Vessel collision	Physical, biological, inshore conservation sites, socio-economic, stakeholder
Worst case vessel spill	
Accidental fuel spills	

6.2 Impacts of the Handling, Dismantling, Treatment and Disposal of Materials at Inshore an Onshore Sites

The majority of material generated from decommissioning the topsides, jacket, pipelines and subsea structures from the Murchison Field will comprise different metals with the major

component being structural steel. It is expected that the steel will be brought back onshore, smelted and re-used, and other components such as wood, glass and plastics will be recycled. Where possible, plant equipment such as generators will be brought back onshore and reconditioned for reuse. The remaining material which cannot be reused or recycled will be treated and processed for disposal to landfill. Table 11 summarises the potential impacts arising from these activities.

Table 11: Potential impacts associated with disposal of materials near-shore / onshore

Activity	Impacted receptor
Dismantling structures inshore/near-shore – dust and noise generation	Atmosphere and communities
Dismantling structures onshore – dust and noise generation	Atmosphere and communities
Cleaning marine growth from jacket – odour from organic material decay	Atmosphere and communities
Recycling / reprocessing	Atmosphere
Landfill disposal – reduced capacity, leachate and landfill gas	Use of resources, groundwater, atmosphere, use of disposal facilities, communities

6.3 Impacts of Plugging and Abandonment of Wells

Murchison decommissioning will commence with a phased well P&A campaign. Well P&A activities may be executed using the existing drilling derrick and facilities and/or using rig-less abandonment and conductor recovery technology. Table 12 summarises the potential impacts arising from this activity.

Table 12: Potential impacts associated with the plugging and abandonment of wells

Activity	Impacted receptor
Mechanical cutting of casing	Atmosphere, benthos, marine mammals

6.4 Impacts of Decommissioning the Topsides Offshore

The Murchison topside superstructure will be removed using either reverse installation, piece small deconstruction offshore or single lift. Topsides removal involves the cutting, separation, removal, transfer to shore, onshore dismantling and subsequent reuse of selected components, recycling of bulk steel and disposal of waste materials from the topsides modules. Table 13 summarises the potential impacts arising from these activities.

Table 13: Potential impacts associated with topsides decommissioning offshore

Activity	Impacted receptor
Flushing and cleaning of topsides	Water column, fish, transboundary
Loss of minor items	Sediments, benthos, fishing
Preparation for removal (paint flakes PCB, hot cutting , welding etc)	Sediments, water column, benthos, fish, atmosphere
Non-routine events	
Module loss during lifting and transportation	Sediments, benthos, fishing
Loss of residual fluids from topsides	Water column, fish, transboundary

6.5 Impacts of Decommissioning the Jacket

The Murchison platform jacket is a tubular steel structure weighting approximately 23,000 tonnes and has a total height of 188 m. There are two options under consideration for the decommissioning of the jacket - full removal, and partial removal leaving the footings in place. Table 14 summarises the potential impacts arising from these activities.

Table 14: Potential impacts associated with jacket decommissioning

Activity	Impacted receptor
Underwater noise	Marine mammals, fish
Drill cuttings disturbance	Sediments, water quality, benthos, mammals
Abrasive cutting	Water column
Potential impacts of leaving the footings in place	
Reef effect	Benthos, fish
Degradation of footings	Sediments, water column, benthos, fish
Manufacture new materials	Use of resources, atmosphere
Snagging risk	Commercial fishing, stakeholder
Loss of access	Commercial fishing, stakeholder
Non-routine events	
Dropped object	Sediments, benthos, fishing

6.6 Impacts of Decommissioning of the Pipelines and Subsea Infrastructure, and the Dunlin Riser and Topsides Decommissioning

The potential options under consideration for the decommissioning of each of the Murchison pipelines are: full pipeline removal; partial removal and trench remaining pipeline sections; and partial removal and cover remaining section with rock placement. Each of these options is likely to involve the selective cutting of pipeline sections. Table 15 summarises the potential impacts arising from these activities.

Table 15: Potential impacts associated with pipeline decommissioning

Activity	Impacted receptor
Underwater noise	Marine mammals, fish
Full pipeline removal	Sediments, benthos
Trenching	Sediments, water column, benthos
Rock-placement	Sediments, water column, benthos, other users of the sea, stakeholder
Selective cutting	Marine mammals, fish
Drill cuttings disturbance	Sediments, benthos
Snagging risk	Commercial fishing, stakeholder
Loss of access	Commercial fishing, stakeholder
Pipeline degradation	Sediments, water column, benthos, fish
Non-routine events	
Loss of residual fluids	Sediments, water column, benthos, fish
Exposed pipelines	Commercial fishing, stakeholder

6.7 Impacts of Decommissioning of the Drill Cuttings Pile

Drill cuttings pile management options are being considered in detail, options that are being considered include: leave *in situ* and cover; leave *in situ* and do nothing; excavate the cuttings and recover to the surface for disposal to landfill, recover to surface, treat offshore, discharge sediments back to sea or move cuttings to another area of seabed. Table 16 summarises the potential impacts arising from these activities.

Table 16: Potential impacts associated with the cuttings pile management options

Activity	Impacted receptor
Disturb drill cuttings	Sediments, water column, benthos, fish, stakeholder
Leaching of contaminants	Sediments, water column, benthos, fish, stakeholder, commercial fishing
Long-term pile and contaminant persistence	Sediments, water column, benthos, fish, stakeholder, commercial fishing
Re-suspension to disperse over adjacent seabed	Sediments, water column, benthos, fish, stakeholder, commercial fishing
Onshore disposal	Use of resources, groundwater, atmosphere, use of disposal facilities, communities
Covering pile	Sediments, water column, benthos, fish, stakeholder

The key issues identified in Table 10 to Table 16 have been grouped across the high level phases of the Murchison decommissioning project into specific types of impact, e.g. underwater noise, such that all activities with the potential to give rise to this impact will be assessed together. The activities identified 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.

7 OVERVIEW OF POTENTIAL ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE MURCHISON DECOMMISSIONING PROJECT

7.1 Introduction

This section of the scoping report provides:

- A description of the decommissioning activity or operation that might give rise to potentially significant effects.
- A description of how the effects would be assessed in the EIA, with an assessment of the adequacy of existing knowledge and whether more information is required.
- A description of the mitigation that is in place, or will be incorporated in the design or operation of the project.
- A description of the work being undertaken by the project to gather more information to understand the issue better.

7.2 Physical Presence of Vessels Causing Potential Interference with Other Users of the Sea

7.2.1 Description of Impact

Decommissioning of the Murchison Field will require a relatively intense programme of vessel activity both in terms of the number and size of vessels. Depending on the decommissioning option chosen topsides or jacket components may be transported from the field back to the onshore disposal facilities in one or two trips by a large heavy lift vessel (HLV), or by more numerous trips by supply vessels and barges. This activity may result in local, temporary inconvenience to or disruption of other users of the sea, such as fishermen and marine traffic.

7.2.2 Assessing the Effect in the EIA

Murchison is located in an area of moderate to low shipping activity. CNRI will assess the potential impacts to other users of the sea from increased vessel activity during decommissioning operations by predicting the potential vessel use and likely schedules, and comparing with current vessel traffic data for the Murchison area and proposed onshore transportation routes. This will include commercial vessel traffic, fishing vessel and Ministry of Defence (MoD) activity.

7.2.3 Mitigation Proposed

CNRI will apply for a license for their decommissioning activities under the MCAA 2009, and will also require Consent to Locate under the Energy Act 2008. The use of HLVs and other vessels which are anchored to the seabed, within the 500 m zone of an installation, will require notification of activities. The MCA and other navigational consultees will be informed through the Consent to Locate process, and CNRI will also inform the UKHO and Kingfisher. CNRI will also establish lines of communication to inform and discuss with other sea users, including fisherman, their vessel operations during decommissioning activities.

The mandatory 500 m safety zone will remain around the Murchison installation throughout the decommissioning project. The majority of decommissioning vessels will be located within this zone and their effect on other sea users is therefore likely to be small.

7.2.4 Further Studies Commissioned

CNRI are conducting technical engineering studies to determine the type and number of vessels that will be required to support the decommissioning of the Murchison Field.

7.3 Effects of Seabed Disturbance during Decommissioning Operations

7.3.1 Description of Impact

Disturbance to the seabed as a result of the Murchison decommissioning operations may arise as a result of activities associated with several of the decommissioning options being considered, including the anchoring of the HLV, pipeline trenching, rock placement and dropped objects. Certain types of vessel utilised during the decommissioning operations, such as the HLV, will be held in position by a series of anchors deployed to the seabed. The deployment and retrieval of anchors may result in direct impact on invertebrates living on and in the sediments, through physical disturbance to the sediments. Depending on the nature of the seabed, anchors and anchor chains lying on, and sweeping over, the sediments can create gouges and scour marks.

Trenching of a pipeline is usually undertaken using either a plough towed by a vessel or water jet system from a dedicated vessel. Trenching operations will disturb the seabed sediments and benthic organisms along the route of the trenches and the organisms in a narrow corridor next to the trench (perhaps up to 10 m on each side of the trench). Rock placement along decommissioned pipelines will have an impact on the sediment structure of the seabed, and will result in localised smothering of animals and an alteration of the local habitat through a change of substrate, although the impact will be limited to a few metres either side of the pipeline. Dropped objects will result in localised smothering of

animals on impact of the object on the seabed, which would be recolonised by fauna from adjacent sediments once the object is recovered.

7.3.2 Assessing the Effect in the EIA

In general, the seabed conditions and benthic communities of the northern North Sea are well understood. The characteristics and status of the benthic communities in and around the Murchison field have been surveyed and assessed on several occasions, primarily to assess the effects of the permitted discharge of drill cuttings at the site (See Section 3). The characteristics of the seabed sediments in the area of the Murchison Field, where the water depth is approximately 156 m, are relatively uniform, and there are no remarkable, threatened or vulnerable physical features or habitats (Hartley Anderson Limited, 2007).

Existing data will be used to inform the assessment of the potential significance of disturbance or local mortality of the benthic communities. The sizes of the areas of seabed that will be covered or disturbed will be estimated once the final decommissioning options for the Murchison Field have been agreed. An initial assessment, however, indicates that the area of disturbance will be minimal in relation to the area of similar seabed in the vicinity that will not be disturbed.

7.3.3 Mitigation Proposed

The operations required to decommission the Murchison infrastructure will be carefully designed and executed so as to minimise the area of seabed disturbed. Recolonisation of the clean sediment by fauna typical of the surrounding area should begin as soon as decommissioning has been completed.

CNRI will use recent bathymetric survey data to plan the locations for anchor deployment and minimise the number of anchor deployments. Where possible, CNR will encourage their Contractors to utilise vessels that operate on DP in preference to vessels that require anchor deployment.

7.3.4 Further Studies Commissioned

CNRI recognise that various activities conducted during the decommissioning operations may result in the disturbance of benthic organisms and sediments in the vicinity of the Murchison Field. In order to accurately predict the significance of these disturbances, CNRI conducted a pre-decommissioning environmental survey in Spring 2011 to determine the current status of benthic communities in the area, results from this survey will be presented in the full Murchison decommissioning EIA.

7.4 Effects of Drill Cuttings Disturbance

7.4.1 Description of Impact

The Murchison drill cuttings pile has a surface area of 6,840 m^2 and volume of 22,545 m^3, which was calculated based on MBES topography mapping of the cuttings pile (ISS, 2011). It is estimated that the "effect footprint" of the Murchison cuttings pile, defined as the region within which hydrocarbon concentration is greater than 50 mg/kg, does not extend beyond 500 m from the platform (ERT, 2008).

Removal of the Murchison jacket footings which are currently covered with historic cuttings would result in the re-suspension in the water column and subsequent re-settlement on the seabed of cuttings material and contaminated sediment. The anchoring of vessels next to the Murchison platform during decommissioning and during pipeline removal operations may also result in disturbance of the cuttings pile. It is likely that any disturbance to the drill cuttings would occur on the periphery and within the "effect footprint" of the Murchison cuttings pile, therefore re-suspended sediments would likely contain a variety of contaminants including hydrocarbons and heavy metals. The proposed operations therefore have the potential to impact the local water quality, contaminate seabed sediments, and impact benthic fauna, fin-fish and shell-fish in the vicinity of the decommissioning activities.

7.4.2 Assessing the Effect in the EIA

CNRI will use pre-decommissioning environmental survey data to establish the nature, magnitude and extent of contamination of the Murchison historic cuttings pile and surrounding sediments. This data will be used in conjunction with descriptions of feasible jacket footings removal methods, pipeline removal methods and proposed anchor locations to quantify and predict the potential environmental impacts that may arise from disturbing the cuttings pile during these decommissioning operations. CNRI are conducting cuttings pile dispersion modelling to predict the likely extent and levels of contamination levels arising from the cuttings disturbance.

7.4.3 Mitigation Proposed

CNRI will conduct a comparative assessment to evaluate the proposed jacket decommissioning options to ensure that over a range of criteria the best available technique (BAT) for decommissioning the jacket is selected. Anchoring, and all methods considered for the removal of the jacket footings and pipelines, will be engineered to minimise disturbance to the surrounding cuttings pile.

7.4.4 Further Studies Commissioned

CNRI recognise that various activities conducted during the decommissioning operations may result in the disturbance and re-suspension of contaminated cuttings and sediments from the Murchison cuttings pile. In order to accurately predict the significance of these disturbances CNRI conducted a pre-decommissioning environmental survey in Spring 2011 to determine the current nature and extent of the cuttings pile. Results from this survey will be presented in the full Murchison decommissioning EIA.

7.5 Effects of Energy Use and Atmospheric Emissions

7.5.1 Description of Impact

Activities during all phases of the Murchison Field decommissioning project will use energy and give rise to atmospheric emissions, specifically from the following operations:

- Vessel use during dismantling and transporting the topsides modules back to shore;
- Vessel use during cutting, lifting and transporting the Murchison jacket to shore;
- Vessel use during pipeline decommissioning either by removal to shore or trench and burial / rock dump if left *in situ*;
- Near-shore and onshore dismantling and processing of decommissioned structures; and,
- Vessel use during future monitoring surveys of the decommissioned field.

The main exhaust gas emitted by diesel-powered engines is CO_2, together with small quantities of NO_x, CO, SO_x and trace quantities of VOCs, N_2O and CH_4. Emissions of these gases have the potential to impact local air quality, which may result in transboundary effects given the proximity of the Murchison platform to the median line, and contribution to regional/global effects such as acid rain, low level ozone formation and global climate change.

7.5.2 Assessing the Effect in the EIA

CNRI have commissioned independent engineering studies to determine the feasibility and practical methods for undertaking the various different decommissioning options described in Section 2. These studies will detail the number and types of vessel required to undertake each of the decommissioning options, which will be used to estimate the potential scale of energy use and gaseous emissions associated with each decommissioning option. The

energy use and gaseous emissions of options will be compared, and presented in context with reference to relevant national and regional data.

7.5.3 Mitigation Proposed

All engines, generators and combustion plant on the vessels would be well maintained and correctly operated to ensure that they are working as efficiently as possible to minimise energy use and gaseous emissions. CNRI will encourage their Contractors to use low sulphur fuel wherever possible.

7.5.4 Further Studies Commissioned

CNRI are conducting technical engineering studies to determine the type and number of vessels that will be required to support the decommissioning of the Murchison Field; this information will feed into an energy and emissions assessment of the different decommissioning options.

7.6 Effects of Underwater Noise Generated During Decommissioning Activities

7.6.1 Description of Impact

Underwater noise and vibrations generated during the Murchison decommissioning activities will arise from a number of different sources, including vessels and helicopters employed in decommissioning activities, and abrasive cutting techniques used during jacket and pipeline removal operations. Noise from various sources may combine to produce a pattern of noise in the marine environment that is characterised by variations in frequency and noise level. Underwater noise levels are attenuated by distance (through dispersion in three directions) and by absorption by water, and therefore have the greatest potential impact within the vicinity of the activity.

Sound is important to marine mammals for navigation, communication and prey detection; and as a result marine mammals are the most sensitive marine receptor to underwater noise from offshore operations (Southall *et al*., 2007; Richardson *et al*., 1995). Animals moving into or through the Murchison area may experience a growing level of noise as they approach the decommissioning activities. Typically, the impact of noise on marine mammals is classified into the following categories depending on the magnitude of the noise disturbance:

- detection level (zone of audibility);
- strong avoidance (zone of responsiveness);

- masking level (noise level could mask species vocalisation);
- Temporary Threshold Shift (TTS – temporary change in hearing ability);
- Permanent Threshold Shift (PTS – permanent change in hearing ability); and
- physical damage to organism's auditory system.

Underwater noise may therefore result in the exclusion of marine mammals from important habitats or the impedance of reproductive and feeding patterns (Richardson *et al*., 1995). There is also the potential for underwater noise to disturb prey species.

7.6.2 Assessing the Effect in the EIA

CNRI will conduct an assessment of the potential zones of acoustic effect from the decommissioning operations, and in particular for vessel operations.

For each activity associated with the proposed Murchison decommissioning, the likely sources of noise (e.g. vessels) will be identified and the typical level of noise generated by each source identified, where available, from published studies and reports. The sources of noise associated with each activity will be summed to give a cumulative noise level for each activity and the propagation of noise away from the source for each activity will be then modelled using the underwater noise transmission equation given by Richardson *et al*. (1995).

The likely impact of noise generated by the proposed Murchison decommissioning on marine mammals in and around the Murchison location will be assessed by comparing the received noise levels with the criteria for injury and disturbance to marine mammals given in the study by Southall *et al*. (2007).

A variety of marine mammals have been recorded within the vicinity of the Murchison field including minke whale, long-finned pilot whale, killer whale, white-beaked dolphin, white-sided dolphin and harbour porpoise, with most sighting occurring in the summer months (see Section 3.2.5; Reid *et al*., 2003; UKDMAP, 1998). The density of marine mammals within the vicinity of the Murchison field ranges from low to very high.

7.6.3 Mitigation Proposed

A trained Marine Mammal Observer (MMO) will be present on the vessels during those operations which have been identified as having the potential to generate noise levels that may pose a disturbance to marine mammals, to spot marine mammals within a zone of 500 m radius from the vessels. (In daylight hours with good visibility, MMOs can see

mammals up to distances of 500 m). Operations will only commence if mammals are absent from the area of operations.

7.6.4 Further Studies Commissioned

CNRI are conducting technical studies to determine the methods for decommissioning the Murchison platform, which will include an assessment of vessel requirements and cutting methods. These studies will be used to inform the noise modelling study to predict the levels and extent of noise impacts on marine mammals.

7.7 Effects Associated with Near-shore and Onshore Dismantling of Structures

7.7.1 Description of Impact

Near-shore and onshore operations to dismantle the topsides, jacket and pipeline structures may expose onshore personnel and local communities to excessive dust and fumes. Noise generated during these operations may also impact local communities in the vicinity of the onshore decommissioning yard. Discharges from cleaning and dismantling of structures at these facilities may also impact the local environment.

7.7.2 Assessing the Effect in the EIA

The dismantling location will be a port or other similar site at which commercial or industrial activity is already being undertaken. It is therefore likely that the effects of this aspect of the decommissioning project would be similar to those already experienced from time to time at the selected site. The characteristics of the onshore site will be obtained when a site has been selected. All the potential impacts will be fully evaluated in the EA.

7.7.3 Mitigation Proposed

The site selected for dismantling will be suitably equipped to handle the different components, and the vessels required to receive them from offshore. CNRI will make site visits to assess environmental issues associated with using a particular dismantling site. Activities at the site would be controlled by the existing regulations, practices, and emergency procedures, and would be subject to inspection by regulatory agencies.

7.7.4 Further Studies Commissioned

CNRI will identify suitable sites and make a selection based on several factors including capacity to deal with the Murchison components, accessibility, distance from the Murchison field, management and technical capability, socio-economic benefits and commercial proposal.

7.8 Cleaning of Marine Growth from Murchison Jacket

7.8.1 Description of Impact

Encrusted marine growth on the Murchison jacket will be cleaned from the structure once it has been transported back to the onshore dismantling yard. This may cause a short-term deterioration in air quality as a result of the subsequent decay of organic material in the atmosphere.

7.8.2 Assessing the Effect in the EIA

The marine growth on the Murchison jacket legs has been regularly monitored during recent years (Section 3), and therefore the types and quantities of marine growth expected to be recovered with the jacket legs can be predicted. CNRI will undertake an assessment of the likely impact of bringing this marine growth back to shore to the dismantling yard and assess any alternative disposal routes.

7.8.3 Mitigation Proposed

If there are significant quantities of marine growth recovered on the Murchison jacket CNRI will discuss management options for the disposal of the marine growth with the selected onshore treatment and disposal yard. If necessary, CNRI would consider cleaning of the jacket sections offshore before they are brought on shore.

7.8.4 Further Studies Commissioned

CNRI have conducted recent marine growth surveys (BMT Cordah, 2010) for the Murchison platform which will provide up-to-date data for the assessment. No further studies to cover this issue are proposed at present.

7.9 Landfill Disposal and Associated Impacts

7.9.1 Description of Impact

Landfill space in the UK is limited by its very nature and therefore every addition of waste to a landfill site reduces its future capacity.

7.9.2 Assessing the Effect in the EIA

CNRI will assess the potential for reuse and recycling of all of the materials recovered from the Murchison Field and make predictions regarding the potential reuse and recycling levels achievable.

7.9.3 Mitigation Proposed

CNRI will manage waste arising from the Murchison decommissioning activities in compliance with the applicable regulatory framework and other obligations as required by CNRIs' SHE policy. A Waste Disposal Register will be used to track the type and volume of Controlled Waste resulting from decommissioning and how these wastes are being re-used, recycled or sent for treatment or disposal during the decommissioning process.

Through engaging with contractors, CNRI will aim to identify effective technical solutions that support waste minimisation, by, wherever possible, reusing or recycling material.

CNRI will conduct an initial review of the materials within the Murchison Field with the aim of minimising the quantity of Controlled Waste that requires treatment or disposal. This review will involve close liaison with the oil and gas community so that equipment and large components (for example) can be re-used where it is possible to do so. The results of the review will be prepared in the form of a Forecast Inventory which identifies the predicted type and quantities of Controlled Waste that will be generated and how this is linked to key stages in the decommissioning process.

7.9.4 Further Studies Commissioned

CNRI have commissioned detailed materials and hazardous materials inventories of the Murchison platform and subsea infrastructure. These studies will be used to inform the development of a decommissioning waste management plan for the project.

7.10 Safety Risk to Fishermen from Derogated Footings

7.10.1 Description of Impact

One of the possible impacts associated with the partial removal of the jacket is the potential for the jacket's footings to present a snagging risk to demersal fishermen. Fishermen using bottom-towed gear close to the derogated footings may risk losing their net or even total loss of vessel if the net became permanently entangled on the footings.

7.10.2 Assessing the Effect in the EIA

Fisheries and fishing methods will be investigated in the area of the Murchison location to establish the types of fishing gear which are likely to interact with any structures left on the seafloor. These data will be assessed to estimate the potential risk to fishermen if the footings of the Murchison jacket were left *in situ*.

7.10.3 Mitigation Proposed

Should the footings be left *in situ*, their location would be recorded on admiralty charts and entered on the FishSafe location system. This system clearly locates subsea structures relative to a ship's position and provides early warning so that avoidance action can be taken by fishing vessels.

7.10.4 Further Studies Commissioned

CNRI propose to conduct an independent study to predict the potential risk to fishermen posed by leaving the footings of the Murchison jacket *in situ*.

7.11 Socio-economic Impact to Fishermen from the Derogated Footings

7.11.1 Description of Impact

If left *in situ*, the jacket footings might present a potential safety risk to demersal fishermen in the area, and as a result fishermen may modify their fishing activities and fishing patterns to ensure that the area of the footings is avoided. This could result in negative effects on the commercial success of their fishing operations.

7.11.2 Assessing the Effect in the EIA

CNRI will conduct a socio-economic assessment of the potential impacts of a loss of fishing grounds to the fishing industry if the Murchison footings were left in place. This assessment will be based on the following data:

- Types and proportion of different fishing methods used in the vicinity of the Murchison area in terms of catch per unit effort and catch by weight;
- Consultation with fishermen working in the vicinity of the area;
- Total monetary value of the demersal catch from the Murchison area; and
- Impact of the loss of fishing grounds in relation to the imposed EU fish quotas.

Commercial fishing effort (days spent fishing) in the area around the Murchison Field (ICES Rectangles 51F1 and 52F1) is very low in comparison with other areas of the North Sea (Marine Scotland, 2010b), with the catch by weight being dominated by pelagic species.

7.11.3 Mitigation Proposed

On completion of the decommissioning operations for the Murchison Field a post-decommissioning debris survey will be conducted to ensure that all debris that may present a hazard to fishermen has been removed from the field. This will minimise the potential snagging risks to fishermen once the 500 m safety zone has been removed and will minimise the area around any derogated footings that fishermen will need to avoid.

7.11.4 Further Studies Commissioned

CNRI are conducting engineering studies to investigate the decommissioning option for the Murchison jacket footings that will present the lowest safety risk both during decommissioning operations and subsequently, during the future lifetime of the footings. These studies will inform the comparative assessment of options for the jacket.

7.12 Non-routine events – Hydrocarbon or other fluid Spill

7.12.1 Description of Impact

All offshore activities carry a potential risk, however small, of a hydrocarbon or chemical spill to sea. The impact that may be caused by a spill is dependent on the location of the spill, its size, the properties of the hydrocarbon, the prevailing weather and metocean conditions at the time of the spill, the environmental sensitivities that could be impacted by the spill, and the success of the contingency plans and response. Potential sources of environmental risk that could occur from accidental spills and non-routine events during the Murchison decommissioning programme include:

- sinking of a vessel due to collision;
- worst case spill from a vessel;
- loss of fluids from subsea or topsides; and
- accidental fuel spillages during the routine re-fuelling.

Serious accidental events, such as vessel collisions, could cause a loss of vessel inventory, but accidents leading to total loss of vessel inventory are extremely rare events. In the unlikely event of an accidental spill of diesel fuel from a vessel, a diesel slick would form on the sea surface. The slick would be localised and would disperse and degrade rapidly as a result of wave action, currents, evaporation, and microbial and photolytic action. Much of the vessel activity associated with the Murchison decommissioning programme will involve bringing materials and structures back to shore, and if a vessel collision occurred close to

land (the onshore reception yard is currently not known) the spill could impact sensitive coastal sites.

7.12.2 Assessing the Effect in the EIA

Up-to-date data on shipping intensity will be obtained and used to assess the potential collision risks along the vessel routes.

CNRI will, where necessary, undertake oil spill modelling assessments for the potential worst case spill scenarios for the Murchison decommissioning operations to fully assess the potential impacts to local receptors, both inshore and offshore.

7.12.3 Mitigation Proposed

Preparation of Oil Pollution Emergency Plans (OPEP) and response is standard practice for all offshore projects. The Murchison decommissioning project will follow this process, which begins with the preparation of interface procedures that specify the responsibilities, lines of communication and actions to be taken by the various parties involved in the project to minimise the risk of emergencies and provide an adequate response should an emergency occur. Consultation will be conducted with the statutory authorities, conservation agencies, the coastguard, port authorities and fishermen. A systematic risk identification and assessment will then be followed by the development of emergency procedures, which include the project OPEPs.

All vessels will be equipped to deal with minor on-board spills and specialist oil spill contractors will be available if a response to a larger spill is required. All of the vessels will be equipped with satellite positioning equipment, navigational aids and communication technology. Vessels will follow pre-determined routing and towing plans, and pilots will be used where required.

7.12.4 Further Studies Commissioned

CNRI will, where necessary, undertake an oil spill modelling study to predict the extent and potential impact of a worst case loss of inventory following a vessel collision.

7.13 Impacts of Drill Cuttings Pile Management Options

CNRI commissioned a technical review of all cuttings pile data from the Murchison Field (ERT, 2008) to respond to the implementation of OSPAR Recommendation 2006/5 on a ‘Management Regime for Offshore Cuttings Piles’, as implemented by BERR (now known as DECC). This review focussed on the requirements of the Stage 1 screening process which included the collation and evaluation of environmental monitoring data for the

Murchison Field and determination of its adequacy with regard to the thresholds as outlined in the Recommendation. Stage 2, which includes the characterisation of the cuttings pile and the best available techniques (BAT)/best environmental practice (BEP) for management of the cuttings pile, is applicable only to those piles which may exceed the thresholds set out in the Recommendation, as determined during Stage 1. These thresholds are as detailed below:

1. Rate of oil loss to water column: 10 te/yr

2. Persistence of the area of seabed contaminated: 500 km^2yrs

The study concluded that the quantities of OBM-contaminated cuttings discharged during exploration and development in the Murchison Field were too small in terms of both potential oil leaching rate and persistence to warrant further assessment for decommissioning. In line with the guidance given in OSPAR 2006/5, the best option for such a pile would be to leave the contents to biodegrade naturally. Nevertheless, the potential remains that decommissioning activities could disturb contaminated cuttings on the seabed, and cause adverse environmental effects.

CNRI are currently in the process of repeating the OSPAR Stage 1 screening process for the Murchison cuttings pile using the results from the pre-decommissioning environmental survey to recalculate the area of persistence and rate of oil loss. Any impacts associated with the management options selected on the basis of the OSPAR Recommendation will be assessed in the EIA.

Full removal of the Murchison jacket would require displacement / removal of a large proportion of the drill cuttings pile. To inform the comparative assessment of the jacket removal options therefore a full comparative assessment for management of the drill cuttings pile will be under taken. A comparative assessment of drill cuttings pile management options for either an OSPAR Stage 2 assessment or for excavation of the pile to access the jacket footings will consider the options outlined in Table 17.

Table 17: Management options for Murchison drill cuttings pile

OSPAR Stage 2	Excavation of cuttings pile to access jacket footings
Leave in situ and do nothing	n/a
Leave in situ and cover	n/a
Removal from the seabed followed by re-injection	
Removal from the seabed and recover cuttings to the surface for treatment offshore and disposal to the seabed	
Removal from the seabed and recover cuttings to the surface for treatment and disposal to landfill	
Excavation and redistribute cuttings to another area of seabed	

8 CNRI ENVIRONMENTAL MANAGEMENT

CNRI's Safety, Health and Environmental Management System (SHEMS) provides the means by which CNRI:

- complies with SHE legislation and industry standards;
- manages SHE risks in the business, and
- delivers continuous improvements in SHE performance.

The SHE Policy is a public commitment to conducting CNRI's activities in a manner that protects the health and safety of people and preserves the integrity of the environment within which they operate. The policy also includes CNRI's commitment to "take all reasonable precautions in conducting business in order to minimise harm to the natural environment".

In the North Sea, the Environmental Management Systems (EMS) for CNRI's directly managed platforms, including Murchison, are certified to ISO14001:2004. The EMS provides a structured approach to the management and minimisation of environmental impacts arising from their activities. Key elements of the EMS include:

- Identification of relevant environmental legislation;
- Identification of significant environmental impacts from offshore oil and gas exploration and development activities, and associated onshore support;
- Setting goals for the planned measurement of progress towards minimising impacts;
- Documenting the necessary actions to manage and minimise any impacts;
- Ensuring and demonstrating legislative compliance, where necessary;
- Establishing the mechanisms for monitoring progress and compliance, such as audits; and
- Identifying competency levels and training required.

The scope of CNRI's EMS is offshore oil and gas exploration and development activities, and associated onshore support. Environmental management of the Murchison decommissioning activities are governed by CNRI's EMS procedures and CNRI are currently developing additional decommissioning-specific procedures where necessary;

these include a PLANC (permits, licenses, actions, notifications and consents) register, a decommissioning waste management strategy, and a decommissioning waste management plan. CNRI plan to formally review and if necessary expand the current scope of their EMS to encompass their future decommissioning activities.

9 CONSULTATION

9.1 Aims of the Consultation Programme

In accordance with the requirements of the DECC Guidance Notes, and following best practice, CNRI will conduct a comprehensive consultation programme during 2011/2012. CNRI are committed to consulting early, widely and transparently as part of a rigorous process that spans the planning, execution and post-decommissioning phases, so that it can propose the most appropriate decommissioning options for the Murchison Field. The purpose of this programme will be to:

- Gather views and issue of all stakeholders about the proposed decommissioning project.
- Obtain further more detailed information about potential impacts from individuals and organisations with specialist or local knowledge, and take account of these data in the full EIA.
- Further refine the plans for the decommissioning project.

9.2 CNRI Stakeholder Engagement Strategy

CNRI will actively work with stakeholders in developing the decommissioning programme by:

- Communicating the various issues and factors raised by the decommissioning studies so that they are understood and considered by the stakeholders; and
- Gaining stakeholders' feedback and views on decommissioning options.

CNRI is developing a decommissioning website to support the public consultation process, keep interested parties informed of the project's progress, and to provide an enquiry and response interface between stakeholders and the decommissioning team. CNRI's views of the importance of stakeholder engagement are as follows:

- Stakeholder feedback will provide important input into CNRI's decision-making process.
- Stakeholder feedback will complement but not replace the statutory approvals process or CNRI's own approvals process.
- CNRI will make available to stakeholders all information and data that can reasonably be provided and will treat all stakeholders equally.

- Stakeholder dialogue will be managed through a single contact point, the Compliance Lead, to ensure consistency and accuracy of messages and responses.
- Communications will be targeted and the dialogue performed on a low-key but proactive basis reflecting a 'business as usual' philosophy compatible with CNRI's normal approach.

The process will be supported by a stakeholder database which will record relevant details of stakeholders, dialogue interactions and support communications delivery.

9.3 Stakeholder Consultations on Environmental Background Data

CNRI has conducted preliminary targeted consultations with DECC and selected consultees relating to the collection of background environmental data which will be used to inform the EIA process. Records of these consultations are summarised below in Table 18.

Table 18: Summary of consultation responses to the environmental survey scope

Stakeholder	Comment	Influence on EIA
DECC, Marine Scotland and JNCC	CNRI are conducting a pre-decommissioning environmental baseline survey around the Murchison platform. CNRI consulted with DECC, Marine Scotland and JNCC on the proposed scope of work for this survey. All parties confirmed that the Murchison survey scope of work met their requirements.	N/A
JNCC	CNRI discussed the presence of *Lophelia pertusa* on the legs of the Murchison platform and requested advice from JNCC with regards to the definition of 'significant' growth that would trigger the requirement for an Appropriate Assessment. JNCC formally responded in writing (8th December 2010): JNCC recommend an assessment of the extent and distribution of *L. pertusa* on the legs of the installation to be reported in the ES, to present an interpretation of the significance of the occurrence. JNCC advise that as *L. pertusa* would not have occurred without the presence of the platform, mortality as a result of decommissioning operations would not be considered as an issue of significant concern for the EIA.	Regular assessments of the marine growth on the Murchison platform have been conducted during 2002, 2004, 2006 and 2010. The extent of *Lophelia pertusa* growth was recorded during each of the surveys and results will be reported and assessed in the decommissioning EIA.

9.4 Stakeholder Consultations on the Murchison EIA Scoping Report

CNRI released the first revision of the Murchison EIA scoping report onto their website on the 7th June 2011. In parallel, a wide range of consultees and interested parties were contacted on an individual basis to raise awareness of the Murchison decommissioning programme and to invite comment on the EIA scoping report. CNRI provided individual responses to stakeholder comments describing how any concerns will be addressed within the final Murchison Environmental Impact Assessment. The main points raised by stakeholder comments are summarised as follows:

- Contamination of the marine environment is considered to be the most important issue, and modelling of the fate of the contaminants is encouraged.
- There may be significant fishing activity within the Murchison Field by vessels registered in countries outside UK.
- It very important to consider the "legacy" impacts of anything left behind, and compare these with the short-term impacts of the actual decommissioning work.
- Marine growth may fall off the structure during transit to or at the demolition yard, which has the potential to introduce marine invasive species.
- The Murchison jacket may be currently acting as an artificial reef providing shelter for fish; removal of the jacket will remove any positive impacts that may be associated with fish recruitment.
- Cumulative impacts of leaving pipelines in place should be considered.
- Impacts associated with resource usage and atmospheric emissions should be considered for all decommissioning options.

9.5 Contacting CNRI

If you have any views, concerns, comments or questions about the Murchison Decommissioning Project, you can contact CNRI in the following ways:

By e-mail: decom@cnrinternational.com

Website address: www.cnri-northsea-decom.com

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11 APPENDIX A – IMPACT ASSESSMENT TABLES

The impact assessment summary tables presented in Appendix A use the colour coding from Table 9, Section 5.2 to indicate the impact significance level for each of the decommissioning activities and the receptors that they may impact.

Appendix A.1. Impact assessment for use of vessels - all decommissioning activities

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Water column	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Use of Vessels - All Decommissioning Activities																				
○ Physical presence																				✓
○ Anchoring on seabed																				✓
○ Drill cuttings disturbance																				✓
○ Vessel discharges e.g. sewage																				
○ Vessel discharges e.g. Ballast water																				
○ Energy use and atmospheric emissions																				✓
○ Inshore / onshore noise																				
○ Underwater noise																				✓
Emergency and non-routine events																				
○ Loss of fluids from subsea tool																				✓
○ Vessel collision																				✓
○ Worst case vessel spill																				✓
○ Accidental fuel spills																				✓

Appendix A.2. Impact assessment for the disposal of materials near-shore / onshore

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Ground water	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with disposal of materials near-shore / onshore																				
○ Dismantling structures inshore/near-shore – dust and noise generation																				✓
○ Dismantling structures onshore – dust and noise generation																				✓
○ Cleaning marine growth from jacket – odour from organic material decay																				✓
○ Recycling / reprocessing																				
○ Landfill disposal – reduced capacity, leachate and landfill gas																				✓

Appendix A.3. Impact assessment for the plugging and abandonment of wells

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Ground water	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with the plugging and abandonment of wells																				
○ Mechanical cutting of casing																				

Appendix A.4. Impact assessment for topsides decommissioning offshore

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Water column	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with topsides decommissioning offshore																				
○ Flushing and cleaning of topsides																				
○ Loss of minor items																				
○ Preparation for removal (paint flakes PCB, hot cutting , welding etc)																				
Emergency and non-routine events																				
○ Module loss during lifting and transportation																				
○ Loss of residual fluids from topsides																				

Appendix A.5. Impact assessment for jacket decommissioning

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Water column	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with jacket decommissioning																				
○ Underwater noise																				✓
○ Drill cuttings disturbance																				✓
○ Abrasive cutting																				
Potential impacts of leaving the footings in place																				
○ Reef effect																				
○ Degradation of footings																				
○ Manufacture new materials																				
○ Snagging risk																				✓
○ Loss of access																				✓
Emergency and non-routine events																				
○ Dropped objects																				

Appendix A.6. Impact assessment for pipeline decommissioning

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Water column	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with pipeline decommissioning																				
○ Underwater noise																				✓
○ Full pipeline removal																				
○ Trenching																				
○ Rock-placement																				
○ Selective cutting																				
○ Drill cuttings disturbance																				✓
○ Snagging risk																				✓
○ Loss of access																				✓
○ Pipeline degradation																				
Emergency and non-routine events																				
○ Loss of residual fluids																				
○ Exposed pipelines																				✓

Appendix A.7. Impact assessment for cuttings pile management options

Phase and aspect of the decommissioning project	Physical Environment					Biological Environment						Human Environment					Other			Key Issue
	Use of resources	Seabed sediments	Ground / Water column	Atmosphere	Use of disposal facilities	Benthos	Fish & shellfish	Sea mammals	Water column (plankton)	Sea birds	Coastal conservation sites	Commercial fishing	Shipping	Other users of the sea	Communities	Socio-economic	Stakeholder concerns	Cumulative Impacts	Trans boundary issues	Overall Significance
Potential impacts associated with the cuttings pile management options																				
○ Disturb drill cuttings																				✓
○ Leaching of contaminants																				✓
○ Long-term pile and contaminant persistence																				✓
○ Re-suspension to disperse over adjacent seabed																				✓
○ Onshore disposal																				✓
○ Covering pile																				